OPEN ENERGY NETWORKS CONSULTATION
AusNet Services Submission

Introduction

AusNet Services appreciates the opportunity to contribute our views on facilitating distributed energy resources ('DER') integration and uptake. We are supportive of the Project's objective to define an end-state for a fully 'orchestrated'[1] market framework for operation of distributed energy.

As the uptake of DER, such as solar PV and home batteries, increases around Australia, the existing market design and network management techniques are becoming increasingly under strain. Where the amount of energy flowing *from* households and businesses increases, and the existing capacity of local networks become exhausted, there is a need to find ways to:

- Minimise limits on customers' ability to trade energy from their DER, both in terms of physical capacity constraints, and barriers in the market framework that prevent DER from providing some services;
- Allow the greatest possible number of customer requests for new DER connection to be approved, and avoid prohibitive augmentation fees that early-adopters were not required to pay;
- Simplify individual customers' ability to maximise the value from their DER, such that the aggregate productivity of DER increases, lowering the average cost of energy from these sources;
- Maximise utilisation of existing assets, invest smartly in new shared infrastructure such as network and market platforms, and ensure new costs are paid for through the benefits they deliver; and
- Avoid voltage and power quality issues.

While the Open Energy Networks paper sets out alternative end-states for an orchestrated distribution market, the pathway to such a market deserves significant attention. Indeed, it is possible that in many locations, the available benefits do not justify the significant costs of implementing a fully orchestrated market. Therefore progressive lower-cost developments should be considered that may unlock some of the benefits. Depending on circumstances, different jurisdictions may progress at different pace and learn from those who have led earlier.

In this submission, we recommend additional focus on the following areas to ensure that development of the distribution market is shaped by the value that is delivered to customers, and the most cost effective ways to release that value to customers:

1. Detailing specific customer outcomes and improvements to be addressed; and quantification of benefits by jurisdiction;
2. Exploration of incremental or transitional 'no-regrets' actions that can be achieved under the current framework to address the above improvements;
3. Estimation of system-wide cost of making a proposed framework change; and a review of design options that can unlock the most value. We need to explore design factors that drive the most value and cost for customers; and
4. A 'programmatic' approach in making the transition to any end-state, with each transition linked to a clear business case for customers.

Whilst there is an imperative to maximise integration of DER into the power system and market, AusNet Services' critical underlying objectives are to maintain a safe, reliable network and keep costs for customers low cannot be compromised.

In the context of facilitating DER integration and uptake, this means:

- Ensuring interests of all connected customers, whether prosumers or consumers, are represented when providing options or proposing new design;
- Ensuring customers (including Aggregators and Retailers) are best placed to make the best economic choice in a DER investment, including:

[1] Fully 'orchestrated' distribution market is defined as where DER is dispatched having regard to both its market value and distribution constraints.

- being informed on current network hosting capacity;
- provided more choices in how their DER output could be maximised;
- supporting access to new markets; and

- Maximising utilisation of the distribution network to keep cost for customers as low as possible

Given the Consultation Paper ('Paper') highlights future challenges and proposes changes to the distribution market, the following principles should guide the next phase of work:

- Keeping focus on customer outcomes to be achieved – including value and equity considerations for all customers;
- Clarity on barriers and priorities to be tackled within our current phase of market maturity;
- Taking a structured approach to facilitate the market's development; and
- Using pragmatic principles to inform market design and development.

How all participants (customers, including DER owners, regulators, distributors, aggregators and retailers) agree to assess, manage and progress the development of a distribution market will determine success in achieving real customer savings and outcomes.

1. Customer opportunities and benefits

We appreciate that this project will be developing a business case in support of a White Paper next year.

In advance of this, the business case needs to:

- Quantify the benefits for customers from proposed market changes, including which class, and ensure the benefits justify any associated costs;
- Drive the optimal 'design' of any proposed market framework in a particular jurisdiction (or geography) and for wider NEM; and
- Consider incremental 'building blocks' that are suited to the DER markets as and when they emerge and mature.

1.1 Clarifying the opportunity or problem more specifically in each jurisdiction

Under a fully orchestrated distribution market, we see three major benefits derived:

- Increased customer access to full market value for each unit of energy sent out from customer premises by an active DER;
- Potential to stimulate DER uptake at particular locations to service requirements from buyers; and
- Reduction in 'planned costs' for buyers of service that are able to utilise above DER.

Whilst variability and uncertainty from two-way energy flows on distribution networks are generally accepted as broad drivers for change, it is equally valuable to clarify the specific opportunity or problem to be addressed in facilitating greater uptake of DER and associated value in each jurisdiction – as this may vary from State to State.

Potential drivers for change include:

- Visibility to market of service requirements from buyers (AEMO, NSPs, Retailers) for DER owners;
- Visibility of distribution network hosting capacity so that customers can make informed choices to connect;
- Distribution network constraints preventing or limiting DER owners from fully meeting those service requirements;
- Distribution network constraints limiting DER owners from exporting generally;
- High volume combined with inefficiencies in current contracting and execution process for distributed energy transactions between 'buyers' and DER owners;
- Visibility of and perceived sub-optimal uptake of DER by customers at a particular network location or generally;
- Lack of wholesale and distribution market integration, that result in:
  - Sub-optimal forecasting and management of transmission and wholesale system requirements; and
  - Missed opportunity to procure wholesale services from DER within the distribution system.

Not all opportunities or problems will require a fully orchestrated distribution market and a threshold before this would be required and efficient.

There is further work required to clarify the relative importance of the opportunities or problems in each jurisdiction, so that appropriate responses can be put in place.

In Victoria, AusNet Services sees the immediate customer opportunities as:

- Providing better information to customers on network capacity to accommodate export for new DER connections;
- Improving DER hosting capacity[2] through 'dynamic strategies' – as described in the Paper – including for example, offering new smart customer connection options; and
- Improving network coordination with DER owners to better manage risk and opportunity from the same.

Where distribution network constraints may require a restraint on export, we refer to AEMC's recent paper on 'Economic Regulatory Framework Review'. They have acknowledged that:

- The current regime of 'open access'[3] should continue to apply to all distribution customers; and

[2] With the objectives of increasing the ability of customers to export more distributed energy; and avoid voltage and other power quality problems associated with increased DER uptake.

- In principle, all constraints should be 'built out' only on an economic basis.

Therefore, whilst AusNet Services will continue to explore new ways to maximise hosting capacity within this regime, there will be a physical and economic limit to how much DER can be connected without restriction and without adversely impacting other connected customers.

As part of the current Electricity Distribution Price Review, AusNet Services is engaging with customers to better understand the threshold of constraints before a capital investment is justified in customers' interest to increase physical network capacity to support distributed energy export.

We note that a vibrant 'orchestrated' distribution market provides an economic case for this capital investment. The value of energy produced at the customer end of the network could change rapidly in the future, given the wider transformation of generation sources and characteristics within the overall energy system.

1.2 Sizing the market value for additional DER services in each jurisdiction or geography

To establish a case for an 'orchestrated' distribution market, reference should be made to:

- Current and forecast size of the market – being transaction volume, economic value and trend of same for DER services demanded from buyers[4], as well as geospatial considerations (typically localised opportunities where 'micro' markets can develop);
- Volume of active DER currently available and forecasted; and
- Analysis of planned 'whole-of-system' costs (for Networks, AEMO or Retailer) that would be avoided through increasing number of services rendered, and passed through to Customers as savings.

We note that the current proportion of active DER is negligible on AusNet Services network in Victoria, as compared to passive DER. However, the majority of DER currently being installed is capable of active behaviour, though not initially configured as such. The extent to which these installations are retrofitted with a DER control system will presumably depend on new business models, market development and customer appetite

In terms of a 'market' for distribution network requirements today, we refer participants to the relevant Distribution Annual Planning Report ('DAPR') and the Demand Side Engagement Strategy.

The DAPR provides a good view of identified load-constrained network locations and timings, to which Distribution Network Service Providers ('DNSP') like AusNet Services, will be actively considering non-network solutions that could help avoid, defer or reduce any planned network expenditure. This extends to use of 'distributed generation' (including DER) or 'demand management' – depending on the nature of network constraints, circumstances and 'firmness' of response from such solutions.

In summary, the case for change may be different between each jurisdiction – given its dependency on market presence, DER uptake and business case for customers. Therefore, a fully 'orchestrated' distribution market design may be justified earlier in some States than others.

2. What can be done under the current market framework

There is value in exploring options that can be implemented under the current market framework. In effect, can a particular jurisdiction achieve some or significant benefits from increasing DER uptake and integration – without the cost of implementing a fully 'orchestrated' distribution market design?

The latter is best justified where:

- Market (or service requirements for DER) from buyers are significant in volume and economic value;
- Distribution system limits within that geography or network footprint provide a significant restraint on export – either for existing DER customers or customers seeking to increase additional DER for export; and
- Where there is potential exists for network optimisation (including active DER configuration) to efficiently increase the total market value of DER dispatched.

[3] Under an 'open access' regime, generators (including small customers with DER) do not pay charges for use of network but also do not receive guaranteed access to use network and may face constraints – p72 of the AEMC 'Economic Regulatory Framework Review'

[4] We refer to the various DER services identified in report – whether they be services traded in the NEM currently; procured services through bi-lateral agreements with AEMO, Networks or Retailers; or simply community energy sharing schemes.

Where minimal or no distribution constraints are present in a location, there is no immediate need to implement a design to 'orchestrate' the DER operation between a distribution 'market' and distribution network operator. A procurement platform (with no distributor integration) can still exist to facilitate a market for customers and buyers – if it helps to improve efficiency and timeliness in executing 'trades'; or to provide a form of locational signal for DER uptake.

Where constraints become more material and prevalent in a location, we agree that distributor-led 'coordination[5]' of network and DER operation to ensure safety and reliability for connected customers will result in:

- Increasing DER hosting capacity (e.g. increasing energy exported) – in lieu of applying 'blunt' static network management strategies; and
- If more sophisticated network-DERMS[6] integration is implemented, provide a forward-view of constraints on individual DER operation.

Here, a distribution 'market' can technically exist without need to 'orchestrate' DER dispatch with the local distribution operator – as long as 'coordinated' arrangements are in-place between DER owners and Distributors. However, deliverability of any distributed energy will depend on actual network conditions and constraints on the day.

This design will not provide distribution market integration into the wholesale market – without involvement of the local distributor. Nor will the market gain the benefit of a distributor's capability to optimise network and DER operation to increase total market value of energy dispatched.

Some incremental actions that can and are being undertaken today, within the existing market framework, that progress toward the market options considered in the Open Networks Paper are:

- Improving forward visibility of likely service requirements for DER, current tenders, and information regarding on-going requirements being serviced;
- Continued development of distribution network models (such as LV models) and constraints[7] to build the information base that is necessary for running local networks closer to their limits;
- Continued development of dynamic distribution network strategies – including dynamic operation of network and DER assets in response to current network conditions and limits;
- Continued development of distribution network optimisation system to operationalise 'constraints evaluation' and execute above 'dynamic' strategies;
- Establishing standards for DER monitoring, management and integration[8] with distribution network operation;
- Establishing standards and guidelines for DER connections and registrations – including a process to accommodate scenarios where proponents (e.g. Retailers or Aggregators) seek to establish high DER penetration zones;
- Develop 'co-ordinated' distribution market design which could serve as a suitable lower-cost transitional state that facilitates greater hosting capacity (see Section 4)
- Continued development of a fully 'orchestrated' distribution market – that can serve as a desired end-state to which progressive 'no-regrets' transitions can be justified.

[5] Briefly, coordination relates to Distribution operators and Aggregators establishing integrated operation between network and DER assets. In this arrangement, latest DER schedules and network conditions can be used to allow increased DER export within current system limits (than otherwise available under a 'static' regime). This enables better physical optimisation of the distributed energy, but not optimisation for its market value. We note that this is in parallel to DNSP works on other dynamic network strategies to improve hosting capacity. Section 4 provides more detail on a 'Coordinated' arrangement.

[6] DER Management System

[7] We would also recommend consideration of the Victorian smart meter specification in other States as an accelerator to assess hosting capacity

[8] Integration covers functionality to exchange master data and operating schedules; and to accept signals to alter DER settings or outputs. Use of a DERMS will likely be needed to facilitate this integration.

3. Market Framework Design and Cost to Implement

3.1 Progress towards a fully orchestrated market should consider all customers

Whatever 'orchestrated' market design is proposed should acknowledge that beneficiaries are:

- Principally, the DER owner and Aggregator who will have increased ability to monetise the value[9] of exported energy from their active DER;
- Buyers[10] of services from DER who benefit from savings against 'planned' costs by accessing above distributed generation; and
- To the extent that 'planned' costs are avoided by above buyers, some or all of these savings are passed to electricity customers, with size of savings depending on applicable regulatory or commercial model to that buyer.

Given that Network costs to support an 'orchestrated' market are funded by their distribution customers (whether they have DER or participate on this platform), we need to consider:

- As a minimum, all designs that can deliver cost-effective model for 'orchestration'; and
- Whether there is an appropriate commercial model that can more equitably account for the on-going costs of supporting this market framework for their customers.

3.2 Scope of 'market' framework

In terms of scope, it would be useful to confirm whether an 'orchestrated' distribution market needs to:

- Balance and manage all distributed energy in a geographic footprint, or
- Merely act as a market platform for any active DER seeking to provide additional services to buyers. In effect, making visible existing bi-lateral agreements for DER services within the geographic footprint of that platform.

If the immediate priority is to extract additional value for active DER from buyers, a market platform would achieve this simply by providing an avenue for active[11] DER dispatch, with the platform either:

- Governing all dispatch of active DER, or
- Signalling successful bids for dispatch of active DER[12].

If the longer-term objectives are to integrate wholesale-distribution markets and improve transmission-distribution forecasting, the DNSP remains best-placed to provide visibility of all distribution energy flows.

We note that both examples may form part of a progressive transformation to a fully integrated market for distribution and transmission.

3.3 Greater focus on design and architecture of the 'orchestrated' market framework

Greater focus should be applied to assessing optimal 'dispatch' design and architecture (e.g. centralised versus decentralised) – rather than responsibility for Roles.

In choosing the optimal design, we should ask whether it can unlock all or most of the value of 'orchestration', without necessarily incurring a wide set of costs. This can be seen as the balance between:

- Benefits from increasing the sophistication, accuracy and frequency of enabling inputs and processes (bids, offers, distribution constraints, network optimisation, etc) to decide and execute dispatch, and
- Cost of implementing and operating those enabling inputs and processes.

[9] This assumes the full market value for that unit of energy exceeds that payable under current Retailer feed-in tariff.
[10] Possible buyers for DER services (as identified in the Consultation Paper) under an 'orchestrated' market include AEMO, Networks, Retailers and in Peer to Peer scenario, customers.
[11] Passive DER generation would be exporting uncontrolled and not visible on this platform.
[12] It is unclear if an 'orchestrated' framework assumes active DER owners will continue to dispatch their energy, even where they have not successfully 'bid' for services on the market platform. Given a 'feed-in' tariff is still available from Retailers, it is presumed active DER would expect to continue exporting in this instance.

We view this as applying the *pareto* principle in designing this market framework, and assessing contribution of cost and benefit from each design element. Further innovation work in this area would be desirable. For example:

- Is there a need for a high frequency and real-time feedback loop and iterations in assessing offers, bids, constraints and optimisation?
- Does DER dispatch need to be executed in near or real-time? Can dispatch be scheduled on a 'day-ahead' basis for example, and still achieve most of the benefits desired by buyer?
- At what voltage level in the distribution network should DER dispatch be conducted; what simplifications to network models can be used to facilitate service specification and minimise calculations and processing?
- Do we need a real-time distribution network model at all voltage levels to assess distribution constraints, optimisation and dispatch? What simplifications, including use of 'constraint equations', can be applied to achieve most value with minimal or moderate processing or data input costs?

AusNet Services is exploring low-cost designs for evaluating network constraints, initially to facilitate a 'coordinated' design (see Section 4) that increases hosting capacity for customers. We expect to increase sophistication (and cost) where the business case (for customers) demands the same.

3.4 Considering who should do what

Subject to the more important question of design, a balanced consideration is needed to decide who fulfils a particular role in an 'orchestrated' market, in the interests of the customer.

This includes:

- Minimising cost – keeping responsibility for functions to parties who hold this today, or best understand or manage the underlying inputs; minimising hand-offs and duplication of processes;
- Minimising operational risk – keeping responsibilities with those who own, manage, have current capability and bear the underlying risk in executing that function;
- Providing the quickest route to facilitate market creation and growth; and
- Aligning interests with customers – either where natural alignment exists, or using market design or regulation to provide incentives to act in the long term interests of customers.

Based on above principles, AusNet Services would echo the Paper's concerns regarding the 'Independent DSO' – for the reasons of increased design complexity, costs and operational risk. The electricity market is complex with multiple parties involved performing different Roles. Significant justification would be required to clarify the net benefit of establishing an additional party and the impacts on current obligations and responsibilities of existing parties.

The AEMC raised concerns on potential for 'Network Bias'[13] in DNSPs taking a central role in any (market) 'optimisation'. As previously indicated, this concern could be extended to any participant who has an interest in any value streams from active DER traded.

Given this, it would be useful to more specifically quantify the actual risk of 'bias'; consideration of necessary mitigation measures or safeguards (e.g. regulation); and likely efficacy of the same.

Under the framework options discussed, a key responsibility of the 'Distribution System Operator' ('DSO') role is to operate the distribution market that facilitates trades between buyers and DER owners. It is unclear under what scenarios (or if it is suggested) that the market operator would have rights to restrict requirements and bids. This framework should adopt as a key principle that the DSO should act as 'neutral market facilitator', something echoed in similar work being undertaken overseas jurisdictions[14].

4. Programmatic approach to making the transition to 'orchestration'

4.1 'Coordinated' market design as a transition point

Given the relative uncertainty of future DER scenarios and how the surrounding marketplace evolves, AusNet Services would favour more of an "incremental" or staged approach to the open energy framework design and ultimate operationalisation – as it reduces ecosystem investment risks.

[13] AEMC, Distribution Market Model final report, 2017
[14] See Energy Networks Association, Open Networks Project in United Kingdom.

Therefore, AusNet Services would recommend further consideration and design of a transition stage before a fuller 'orchestrated' market model. Specifically, this involves developing closer 'coordination' between Distribution Network Operations and DER operations by Aggregators/Retailers acting on behalf of DER owners.

This has been considered in previous Open Energy Networks analysis and we consider this as a natural next step to facilitate DER integration and uptake.

Key benefits include:

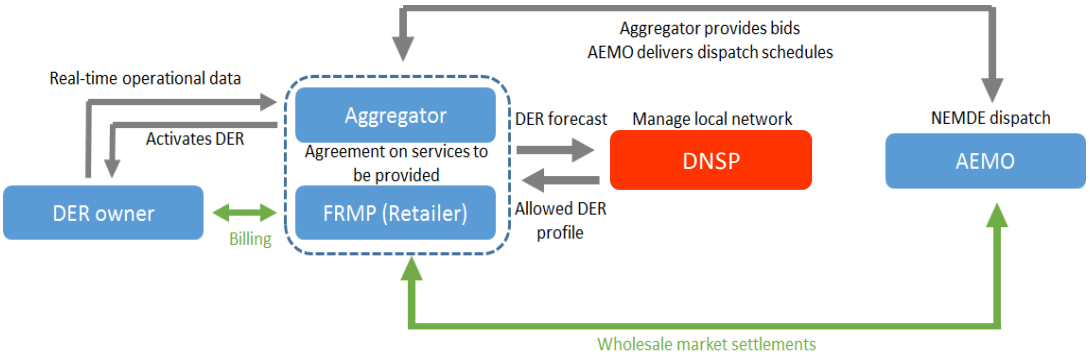
- 'Lower cost' to implement;
- Requires moderate uplift in Distribution operator capabilities – and considered 'no-regrets' should there be a subsequent shift in that jurisdiction to a more sophisticated 'orchestrated' market model;
- Minimal or no change to existing roles and responsibilities under current market framework;
- Customer benefits driven by increased hosting capacity that can be allowed through this 'dynamic arrangement' rather than current static methods (e.g. flexible DER operation based on DNSP signals, and configuring network elements such as transformer/voltage regulator tapping arrangements to better accommodate forecast DER activities);
- Provide confidence to Aggregator/Retailers in terms of active DER dispatch, and in turn, enables a market for DER services (with attendant benefits) where economic.

This 'coordinated' model is less sophisticated than an 'orchestrated' model where each unit of distributed energy is optimised based on its market value. The former focusses on optimising the physical volume of distributed energy that can be integrated into the local network by releasing latent locational, temporal based capacity within the existing network infrastructure.

We feel that, given the lower cost to implement and operate, a 'coordinated' market model would be justified earlier in terms of customer net benefits.

AusNet Services is actively exploring a design to facilitate the implementation of this 'coordinated' market model for both customers and participants within its distribution network.

Figure 1 'Coordinated' distribution market design



However, we note that this 'coordinated' design should be explored as likely transitory 'next step', and that a development of an 'orchestrated' design would:

- Unlock more benefits for customers as markets develop, and
- Serve as a more resilient solution in response to increasing activities and opportunities in the distribution market for the longer-term.

We look forward to participating and supporting the next phase of the Open Energy Networks project.