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AEMC Reliability Frameworks Review - consultation on issues paper - ARENA submission

This submission provides background information on projects funded by the Australian Renewable Energy Agency (ARENA) as relevant to the AEMC Reliability Frameworks Review.

To assist AEMC with its review, this submission outlines ARENA's relevant experience with renewable energy generation, storage technologies, and their interaction(s) with the electricity system - both the secure and reliable operation of the grid, as well as the implications for market operations. The latter part of this submission comments on issues for market design. In summary:

- ARENA is focusing on innovation for secure and reliable electricity to help smooth the transition to a higher share of renewable energy in Australia's electricity system.
- ARENA supports the overall approach to the review, considering the range of mechanisms together in a holistic way.
- Reliability is a characteristic of the system as a whole. It can be delivered by various elements contributing in different ways, rather than individual generators (or other resources) contributing in the same way.
- As the proportion of solar and wind energy increases, various approaches will be able to contribute to reliability. These could include geographic diversity, energy source diversity, demand response and storage with various ratios of power to energy. A degree of underutilisation of variable renewable energy facilities will also increase the availability or capacity factor of individual facilities.
- More electricity will come from distributed resources in the future. The operation of energy markets and incentives at smaller scales, with lower transaction cost, will therefore be increasingly important to encourage distributed resources to provide security and reliability services.

- The energy market framework should be robust to a wide range of plausible outcomes - including a wide range of shares of variable renewables and distributed energy, and different levels of energy consumption - and accommodate a wide range of approaches and contributions to delivering overall electricity system reliability.
- ARENA can help industry get practical experience 'ahead of the curve' by funding demonstration (proof-of-concept) projects. This could inform market design.

About ARENA

ARENA was established to make renewable energy solutions more affordable and increase the supply of renewable energy in Australia.

ARENA provides financial assistance to support innovation and commercialisation of renewable energy and enabling technologies. This assistance is designed to accelerate the commercialisation of these technologies by helping to overcome technical and commercial barriers.

A key part of ARENA's role is to collect, store and disseminate knowledge gained from the projects and activities it supports for use by the wider industry.

ARENA and the review

ARENA supports the approach of the review to look at both the capacity and pricing elements of the reliability framework, and to consider the range of options covering both market-based and intervention elements together. As the share of variable renewable electricity continues to increase, the ability to make efficient decisions about investment and retirement of capacity will be critical to maintaining an affordable, secure and reliable electricity supply.

A major focus for ARENA is supporting industry in developing, testing and commercialising a range of solutions that will be able to deliver secure and reliable electricity with higher shares of variable renewable energy. This includes both large scale generation and coordination of distributed energy resources. Lessons from these initial projects will help reduce costs and inform efficient investment decisions.

ARENA notes that the review will take into account learning from existing initiatives such as the demand response pilot program being trialled by ARENA and AEMO, and any other trials that ARENA and AEMO may undertake through their MOU that are relevant to reliability.

ARENA's project portfolio includes activities that facilitate greater penetration of renewable energy into electricity grids, are testing customer-focused or behind-the-meter solutions, and address knowledge gaps to help develop market rules, regulations and network practices.

ARENA supports a number of projects that aim to address these challenges, including through:

- studies, models and tools that allow for technology and cost optimisation of the whole energy system (for example, through the Australian Renewable Energy Mapping Infrastructure);

- Integrating Renewables into the Grid Stocktake: an online resource including information on studies, trials and demonstration projects providing practical knowledge and experience related to integrating renewable energy in distribution networks;
- tools for renewable energy resource forecasting (for example, Fulcrum 3D's cloud prediction technology, also used at Karratha Airport Solar Farm). This is especially relevant to the present inquiry given potential challenges in predicting both load and generation as both large scale and distributed renewable energy resources are deployed.
- distributed and utility-scale renewable energy storage (e.g. batteries, Concentrated Solar Thermal (CST), pumped hydro) to improve system-wide energy reliability and security (for example, through the AGL Virtual Power Plant); and
- new market designs that help realise the full value of renewable energy (for example, through the Institute for Sustainable Futures study into local electricity trading and local network charges).

Approaches to achieve reliability with higher shares of variable renewable electricity

This section outlines a range of technical approaches with potential to contribute to overall system reliability.

Technical innovation and market evolution has already allowed Australia to move to higher levels of variable renewable generation than thought possible in past decades. This trend is expected to continue.

As the proportion of solar and wind energy increases, various approaches will be able to contribute to reliability - although not all in the same way or to the same extent. An effective market design would align the opportunities for investor revenue with the contribution of various options.

Contribution to reliability from variable renewable sources

While renewable resources such as solar and wind are inherently variable, in the context of an overall system they can nevertheless contribute to reliability, as outlined below.

One approach draws on the inherent diversity in the production profile of sources of supply: either between different energy resources, or through geographic diversity.

Australia has an abundance of solar and wind, plus the highest per capita global uptake of distributed solar. The time of day generation profiles of solar and wind broadly complement each other[1], increasing the value of these resources even before energy storage is taken into consideration.

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[1] Prasad A, Taylor R and Kay, M, 2017 Assessment of solar and wind resource synergy in Australia in *Applied Energy* 190 (2017) 354–367 . A study on wind-solar colocation opportunities conducted for ARENA by AECOM also illustrates the complementarity between these resources at selected sites.

The volume and timing of wind energy availability, for example, varies by location. Geographic diversity in wind farm locations will decrease the correlation in availability between different facilities, increasing the minimum available capacity across the generation fleet. Greater geographic diversity generally equates to a lower correlation due to the influence of different weather systems. For example, the correlation between the Tasmanian and South Australian wind resource is around 10 per cent, compared to 65 per cent for Victoria and South Australia[2]. Accessing this range of resources can help offset the lower probability of availability of individual facilities compared to thermal generation. While this would require sufficient investment in transmission to connect different regions, this may produce an overall cost saving. Analysis by the ANU suggests that in some scenarios, interconnecting uncorrelated weather systems in northern and southern areas could reduce the overall cost of meeting Australia's electricity needs by $2/MWh, assuming a $50/MWh levelised cost of electricity for wind and solar PV[3].

The wind regime in different locations also has differing correlation with demand. Siting decisions can therefore affect the contribution of an individual facility to overall system reliability.

As variable renewable energy technologies become cheaper, it will make economic sense for investors to build facilities even with an expectation they will not be fully utilised for part of the time. This is because it would increase the available electricity generation capacity at times of low resource availability - increasing the capacity factor, making better use of network infrastructure, and increasing the contribution to reliability. Large-scale solar facilities are already being built with the maximum direct current output from the panels being higher than the maximum alternating current output from the system at its connection point. Wind turbines are increasing in size, and this increase can be used to drive a generator at lower wind speeds - increasing availability.

A flexible market framework would allow all of the above contributions to reliability to be recognised in proportion to their contribution.

Contribution to reliability from flexible capacity sources

Energy assets specifically focused on flexible capacity can complement variable renewables.[4]

For example, batteries are capable of being optimised for a wide variety of energy reliability and grid security applications. By varying the power-to-energy ratio of the battery, the asset owner can both provide the optimal service mix for the market and help maximise revenue for the individual asset.

Other storage types such as pumped hydro, or thermal storage associated with concentrating solar power, will be more cost-effective at different power-to-energy ratios.

Key characteristics that vary between storage types are maximum power output (capacity), energy storage volume (which translates to a duration over which a particular level of power output can be maintained), and response time or ramp rate. A flexible market framework would

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[2] Leitch, D, 2016 'Do Australian wind turbines all blow at the same time?' http://reneweconomy.com.au/do-australian-wind-turbines-all-blow-at-the-same-time-27486/

[3] Stocks M, 2017 Pumped Hydro Storage AEMO Transmission Network Service Provider Workshop

[4] The term 'flexible capacity' as used in this submission refers to resources able to respond to changes in the supply-demand balance when needed. It differs from the term 'flexible energy sources' as used in the AEMC's issues paper.

encourage investors to build facilities with an appropriate level of these characteristics, as dictated by market conditions.

Forecasting

Better forecasting can help improve system wide investment outcomes and reduce costs of delivering reliability - for example by reducing the need for reserves to account for uncertainty.

Demand Response

ARENA and AEMO have developed a demand response funding initiative to drive innovation in how the grid is managed in the context of increasing levels of variable output from renewable energy generators.

Outcomes from the initiative will include:

a. Demonstrate that demand response is an effective source of reserve capacity for maintaining reliability of the electricity grid during contingency events, and that this resource can be rapidly established to provide such support;
b. Provide an evidence base to inform the design of a new market, or other mechanism, for provision of demand response to assist with grid reliability and security;
c. Inform price discovery, providing a benchmark for the cost of procuring demand response in the NEM; and
d. Improve the commercial and technical readiness of demand response providers and technologies, including those involved in more innovative approaches such as engagement with mass market customers, or behavioural demand response.

ARENA expects to contract approximately 160MW of reserves through the program with this capacity called on during grid contingency events. Projects are expected to be ready to provide reserves by the summer of 2017-18. The response from potential demand response providers to ARENA's Request for Information (issued prior to the program launch) suggests that nearly 2GW of demand response capacity could be made available by 2018-19 with appropriate incentives.

Insights gained through the program are intended to be available to inform design of a strategic reserve mechanism and other mechanisms to facilitate demand response in the wholesale energy market.

ARENA would welcome the opportunity to provide further insights and information to the AEMC regarding the operation and performance of the demand response program to assist in the development of a mechanisms for participation of demand response in the wholesale energy market, as well as use of demand side resources in a strategic reserve or other mechanism in the longer term.

Distributed energy participation and markets

ARENA funding recipients are also exploring the design and operation of new markets for localised network services. The distributed energy exchange (deX) project will involve a consortium of networks and aggregators of customer owned DER providing localised network support in response to granular pricing. deX is a globally unique pilot that will test the capacity and cost effectiveness of aggregated DER to provide network support in response to local price signals, with residential and SME consumers sharing in the value of these services. This “peer to grid” market may provide an early blueprint for how a new market underpinned by regulation could best enable and incentivise the efficient orchestration of DER. The model would also allow for incorporation of energy market signals, e.g. via retailers using DER as a hedge to manage exposure to market price extremes - contributing to reliability.

The deX project idea was developed through ARENA’s grid integration innovation process A-Lab, described further below.

We note the AEMC’s recent distribution market model project noted that distributed energy resources could be more effectively co-ordinated with the wholesale market in order to provide more flexible resources (either demand-side or supply-side) to better manage reliability within the NEM. Projects such as deX (noting AEMC’s participation in the reference group for this project) could demonstrate ways to improve coordination of these resources to provide a reliable electricity supply in a market with a higher share of renewable electricity, much of it provided by distributed resources.

Low transaction costs are particularly important for efficient participation of distributed energy resource in markets. At high shares of distributed resources, it may be appropriate to require market participation of smaller resources than is currently the case - whether directly in wholesale markets or through intermediary parties or platforms.

Market design issues and principles

As outlined above, different approaches can contribute to reliability in different ways. The AEMC could test market design options against the principles outlined in the AEMC’s issues paper, using as test cases a range of future scenarios and technical approaches able to contribute to reliability. This would test whether a proposed market design aligns revenue opportunities with the proportional contribution of various approaches.

Variable renewable generation is typically cheaper to build than new dispatchable generation on a levelised cost of energy basis and has much lower short-run marginal costs. Market conditions in recent years have meant little or no demand for new peak capacity. It should be no surprise investors have chosen wind and solar PV to meet climate change policy goals, rather than flexible or dispatchable capacity.

In conducting its review we suggest the AEMC consider whether perceived shortcomings in investment have been driven by:

- Electricity market design
- Electricity market settings (such as the current level of the reliability standard or market price cap)
- Policy settings or uncertainty in them, such as the climate policy outlook
- Market conditions such as relatively low growth in demand and a high overhang of historical capacity - which will affect investor decisions and contracting approaches.

Changes in electricity market design may not be the appropriate response to issues more closely associated with the other three factors in this list.

We outline below suggestions for how the AEMC could assess options using the market design principles in its issues paper.

Appropriate risk allocation and efficient investment in, and operation of, energy resources to promote a reliable supply

Efficient investment would allow co-optimising across energy production, energy use, reliability and security - some technologies and approaches can deliver more than one outcome.

Existing NEM market design implicitly includes a mechanism to value dispatchability: plant that is available to generate at times of tight supply-demand balance is able to realise higher revenue. This is particularly the case where these conditions were not predicted in advance, providing an implicit incentive for market participants to have some capacity in reserve. While the energy-only spot market in itself does not distinguish between 'dispatchable' and 'variable' energy sources, the financial contracts written on top of the market may do so. This would only become evident from examining power purchase agreements underpinned by variable renewable energy to determine whether there is a premium attached to the relative firmness of swap or cap option contracts typically underwritten by thermal or hydro facilities.

Aligning settlement timeframe with dispatch (5 vs 30 minutes) will also be important in order to reflect the economic contribution of fast-responding flexible capacity (whether that be demand response, storage or gas). We note the AEMC's recent draft decision to align settlement with dispatch timeframes.

Administratively-determined levels of capacity or 'dispatchability' imposed on individual facilities or market participants may transfer risk to consumers, with a risk of systematic overinvestment in assets which is then recovered through electricity prices or conversely a risk of systematic underinvestment leading to lower than desired reliability.

Financial markets provide a way to convert expected spot market outcomes into more certain revenue streams, which are generally necessary to obtain project finance. These include exchange-traded swaps and options (caps), dealer-facilitated (over-the-counter) products and bilaterally negotiated contracts or power purchase agreements. Through ARENA's involvement with the financing of large scale renewable generation and storage projects we observe there is commercial innovation occurring in the structure of dispatch rights for projects. New ideas are emerging for financial contract structures that could be underwritten by stand-alone flexible capacity options, such as storage. One example could involve a supply-following power purchase agreement from a variable renewable energy facility, and sale of a cap or swap futures contract for the same energy volume. Facilities might also be financed as part of a larger portfolio rather than on a stand-alone basis underpinned by financial contracts.

Many least-cost models of Australia's electricity system project a high share of variable renewable energy at high abatement levels. A market design question is whether the energy-only market design would in practice support this investment, given the very low short-run marginal cost of such facilities compared to their long-run marginal cost.

Several projects with ARENA funding have looked at the robustness of the electricity market design with high levels of renewables and comparative economics of different policy mechanisms in the NEM. For example Riesz et al. identified that energy-only markets could be viable with high proportions of short-run marginal cost generation (such as most renewables), provided certain conditions are met: limited market power, a well-functioning financial contract market, and review of the market price cap.[5] Least cost abatement papers by Jeppesen et al. and Brear et. al used the NEM's current design and current market price cap.[6] In contrast, Chattopadhyay et al. has suggested that adding a capacity component to the formal market design could provide a more economically efficient outcome with high levels of variable renewables where there is significant market power in the provision of thermal generation.[7]

The mechanism embedded in the National Electricity Rules for reviewing the market price cap (and other reliability settings) provides an inbuilt way of addressing a key aspect of investability if not enough capacity is expected to come forward. While appropriate that the reliability settings themselves are outside the scope of the review given the parallel consideration by the Reliability Panel, a key question for the review is whether changes to the settings will continue to be a sufficient tool. It is not clear at this stage what changes might be needed - it will depend on how technology costs evolve over time, and on the abatement trajectory of the system. Nevertheless the method for calculating market price caps is well established and is described in, for example, Power System Economics by Stoft.[8]

As well as risk allocation for investment, the AEMC could examine risk allocation for operational commitment decisions. Day-ahead markets are an option to be considered here. This may affect, for example, the incentives for generators to invest in resource forecasting.

Technology neutral

This submission outlines a range of approaches with the potential to contribute to reliability, including smart use of variable renewables as well as solutions specifically focused on flexibility. Given this context 'technology neutrality' would entail incentives for all these solutions in proportion to their contribution, allowing the most efficient options to come forward.

As renewables like wind and solar PV get cheaper and their share of the electricity mix increases, flexible capacity technologies will play an increasing role in balance out variability in supply and demand as well as maintaining a stable electricity network. Flexible capacity includes storage, demand response, and generation that can be quickly ramped up and down to

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[5] Assessing the viability of Energy-Only Markets with 100% Renewables: An Australian National Electricity Market Case Study

[6] M. Jeppesen, M.J. Brear, D. Chattopadhyay, C. Manzie, R. Dargaville, T. Alpcan, Least cost, utility scale abatement from Australia's NEM (National Electricity Market). Part 1: Problem formulation and modelling, Energy, Available online 31 March 2016, ISSN 0360-5442, http://dx.doi.org/10.1016/j.energy.2016.02.017

M.J. Brear, M. Jeppesen, D. Chattopadhyay, C. Manzie, T. Alpcan, R. Dargaville, Least cost, utility scale abatement from Australia's NEM (National Electricity Market). Part 2: Scenarios and policy implications, Energy, Available online 21 March 2016, ISSN 0360-5442, http://dx.doi.org/10.1016/j.energy.2016.02.020

[7] D.Chattopadhyay, T. Alpcan (2015). Capacity and Energy-Only Markets under High Renewable Penetration. IEEE Transactions on Power Systems.

[8] Stoft, S. (2002). Power system economics: Designing markets for electricity. Piscataway, NJ: IEEE Press.

help balance supply and demand. The framework should take into account the range of different technical options. It should also cater for the potential for reliability-enhancing technologies such as storage to be financed and built independently from renewable energy projects.

Given potential value from geographic diversity, a beneficial feature of market designs is to signal the relative benefit of generation investment in different locations - and for that signal to change as conditions change over time. It will also be important the review's recommended market design changes are balanced with the regulatory incentives for transmission to access resources either at the edges of a region, or interconnectors to access resources in other parts of the country. Getting this balance right will allow trade-offs between different options, depending on their costs and potential to deliver benefits to consumers.

Improved forecasting can help both variable generation and demand resources to contribute a reliable electricity supply. A beneficial market design feature will be the incentive for accurate forecasting of both generation and demand. This is similar to the benefit of achieving accurate pre-dispatch information in the current market design.

Flexible

The energy market is operating in a time of considerable uncertainty in regard to climate policies, demand trajectories and technological change - but this uncertainty could potentially resolve quickly at some stage in the future. Witness the rapid change in solar PV prices, with wind and and solar PV now clearly the cheapest new-build options on a levelised cost of electricity basis - a clear change from five years ago.

Given market reform involves long lead times, frameworks need to be in place that can work under a range of outcomes, allowing the market to make the investments necessary to support future reliability needs as and when uncertainties resolve. The framework should be able to operate in these contexts (among others):

- A wide range of shares of renewable energy
- generator retirement
- high shares of distributed resources (generation and demand).

To better enable participation of demand response, a critical factor is the interaction of wholesale market arrangements with retail contracts, and the transaction costs for the end user of participating. Low transaction costs for market participation are also important for other distributed energy resources to contribute to reliability.

In addition to covering changes to formal market design, the framework should also be developed mindful of the potential for new forms of financial contract to emerge (e.g. the potential to contract stand-alone flexible capacity services - important if expecting investments to be made just to deliver these services).

While the specific settings of climate policy remain unclear, it is possible to consider what the potential market effects of certain policies might be. To implement its principle of 'flexibility' when assessing options, the AEMC could test potential solutions in the context of several policy scenarios. This could include policy design scenarios as well as different emissions trajectories. However, the AEMC will need to decide whether to accommodate all possible policy choices. For example, contracts for difference have become a common policy tool globally in recent years. Depending on their design, they may undo the operational signals resulting from spot market prices and potentially the implicit signals for flexibility and capacity. The AEMC will need to decide whether the electricity market design should account for this e.g. through increased intervention or administrative mechanisms for capacity and operation.

Transparent, predictable and simple

The ability to forecast and manage risk on project revenues (e.g. via contract with counter-party) is critical to making project investment decisions. A transparent, predictable and simple framework will reduce the forecast price at which investors will come forward, particularly in larger-scale capital-intensive projects such as pumped hydro or concentrating solar thermal.

Predictability will not come from electricity market design alone but also from broader policies such as climate policy design and settings. If certainty cannot be delivered, there is a significant risk of such investment failing to come forward when needed or of additional price pressures. Have a robust market framework which provides appropriate investment signals is crucial to the timing of these investments. For projects such as these it is critical investors have reasonable certainty on the potential for long term revenue to support commercial returns. For example, compared to open-cycle gas turbines, a far higher proportion of PHES or battery storage costs relate to initial, upfront capital expenditure and less relates to ongoing operational expenditure. This makes the outlook on future revenues more important for the PHES investor, as this will determine the expected return on the upfront capital investment.

Market design options requiring more complex deals, such as design options requiring contracts between multiple project developers, are also likely to impose higher transaction costs on new investment.

Maximising value of proof-of-concept projects for industry

Proof-of-concept projects could help answer some of the market design issues that arise in providing a reliable electricity supply with higher shares of renewable electricity.

Some examples of how practical projects could help include:

- analysis of costs and benefits and design choices on demand response mechanisms and a standing reserve, drawing on data from ARENA's demand response funding round - as referenced in the AEMC's issues paper
- Decisions on the Generator Reliability Obligation by drawing on early insights into the potential to commercialise storage either independently or in conjunction with renewable

energy projects - for example Energy Australia's Cultana seawater pumped hydro study and Genex pumped hydro study, ESCRI, and other grid scale battery storage projects
- demonstration of how various dispatchable technology options can support reliability.

We would be happy to expand the existing working relationship with the AEMC to maximise this opportunity. In that regard we acknowledge the AEMC's existing involvement such as through

- Sitting on reference groups for relevant projects;
- drawing on AEMO advice, such as relating to the ARENA-AEMO demand response round; and
- Staff participation in A-Lab workshops, through which ARENA is facilitating co-design with industry to develop and test various market approaches.

Data to underpin good decisions

ARENA has invested in the open-source Australian Renewable Energy Mapping initiative to bring together datasets useful to potential renewable energy investors. This includes pre-competitive data on energy resources, electricity network characteristics, and existing generation. Data on the drivers of energy demand, such as that being collected through the Commonwealth Government-funded Energy Use Data Model, is also critical to inform good policy design and the forecasts that underpin energy investment decisions. We expect there will be opportunities to harmonise and extend the scope of datasets such as these over time so that decisions reflect overall optimal system outcomes.

ARENA is open to extending the datasets published on AREMI, for example if additional datasets would improve market decision-making under any changed market frameworks.

A-Lab: Energy System Innovation

A-Lab is ARENA's grid integration innovation lab. It draws on a network of people with a wide range of expertise and passion to drive systemic change in the electricity sector. A-Lab provides a space for these people to explore and define solutions to the most complex challenges of integrating renewables and grids, combining their respective strengths and building momentum for change.

Why did ARENA establish A-Lab?

Our research to explore and create A-Lab uncovered that despite the energy sector's focussed effort on research and understanding the challenges associated with the transition to a low carbon energy system, there was no dedicated resource to facilitate systemic innovation. There was no shared venue or established collaborative working method.

Our research found that stakeholders individually could not innovate across the entire system, and there was a need and desire for a facilitated opportunity to engage strategically and systemically.

A-Lab is the forum to drive systemic innovation. A-Lab can provide the space, people and methods to make genuine inroads towards an affordable, reliable and low carbon electricity ecosystem of the future.

How does A-Lab work?

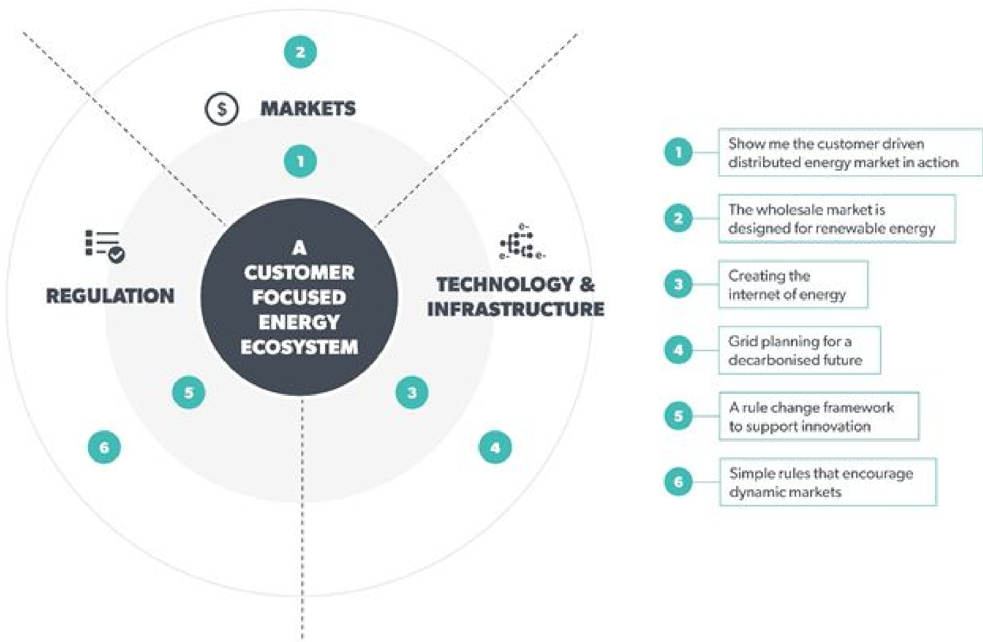
After undertaking research involving in depth stakeholder interviews and a review of existing research, publications and industry initiatives, ARENA, through the A-lab process, developed a set of six Innovation Frames that balance the need for a reliable and resilient system; vibrant new markets and choices; social equity; and low carbon impact.

Each Innovation Frame will be used to shape a period of work for A-Lab around a particular theme. The six frames encapsulate the current opportunities and needs for innovation to enable the energy sector to be transformed to meet the future vision of a low carbon energy system. Central to ARENA's vision for A-Lab is to not only understand the technical, commercial and regulatory challenges described in those Innovation Frames, but to take a people-centred approach to the transformation of the electricity system.

For each of the Innovation Frames, ARENA will work with participants to better understand the system, the drivers of change, competing or conflicting priorities and opportunities for innovation. A-Lab uses a disciplined innovation process to help participants design solutions, projects and experiments more rapidly, collaboratively and with the whole system in mind. These projects can then be presented to ARENA, and others, for funding support. Through this process we aim to build on ARENA's existing portfolio with projects that address key issues identified and have the potential to create systemic change.

What has ARENA done so far?

In 2016 we began the initiative with an intensive co-design and pilot process working across the industry. The initial focus was designing and testing approaches to new, customer oriented distributed energy markets (Innovation Frame 1 - 'show me the customer drive distributed energy market in action'). This pilot phase has already moved us from theoretical constructs to the tangible projects that will make our energy future more affordable, reliable and renewable. The recently announced decentralised energy exchange, or deX, is one of the initial A-Lab designed projects that will test the operation of a new market for customer-owned DER providing network services. Work on additional frames is underway.



A-Lab's six innovation frames

ARENA believes that A-Lab can enable industry stakeholders to develop practical solutions to the challenges posed by the electricity system's transformation. We would welcome the opportunity to work closely with the Expert Panel and Review team to explore how A-Lab can be used to deliver tangible projects, demonstrations, studies and trials to test the solutions and recommendations that emerge from the Review process.

Please don't hesitate to contact me on (02) 6159 7805 if you would like to discuss any aspect of ARENA's submission.

Yours sincerely

Oliver Story

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