AEMC,
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30 January 2019

RE: EPR0068: Electricity network economic regulatory framework review 2019

Dear AEMC,

I write to support your work in the consideration and then potential design of a regulatory sandbox to encourage innovation. This is a very important development which would greatly impact how the NEM could change and adapt to both supply and demand challenges. My submission introduces how I would use potential sandboxes in my research and test sites. Attached I answer the AEMC questions. Here is a summary of my submission, followed by the expanded Background and a view of the larger picture.

> I am a built environment researcher and I study the way electricity consumers interact with supply sources that are unreliable and limited. Specifically I study the way that *renewable system sizing* can be balanced with *behaviour change* for *best-fit systems*. This is a newer approach that moves away from numerically sizing renewable generators to fit static demand profiles; or alternatively, designing behavior change programmes to broadly bring about conservation. The key to this study is to use group-focussed techniques in both behaviour change messaging, in concert with actual shared renewable energy infrastructure. A successful deployment thus would reduce grid peak demand impact and raise self-consumption to rates greater than are possible with present demand management and separate home solar and battery. I think this cannot be achieved with 'virtual power plants' for reasons I develop in this submission. Due to the complexity of this approach, key to determining the efficacy of such arrangements are special controlled deployments in actual homes. Such tests require sandboxes to change or relax cross-title energy sharing rules or to refine the concept of 'off-grid' to include *islanded* homes and sites.

Background

I am a postgraduate student and have recently had a thesis accepted on the potential for deep residential electricity demand reduction through group-based behaviour change. Some publications are attached. A critical component of this work is that it also anticipates actual shared renewable energy assets for providing 'baseload' power. I also consult as Generation Shared (genshr.com) and have provided support and advice for renewable energy sharing at the Merri Green (Northcote) and The Paddock (Bendigo) housing developments. Both are 'lighthouse energy commons' developments on single titles. My research interest is solutions

for brown fields involving multiple titles. In 2015 I won an ARENA grant to study the practicalities of urban microgrids across titles.

Shared electricity generation and storage systems can be used more efficiently than several systems kept separate (Szatow et al. 2014). Shared energy storage assets can be smaller in terms of storage volume and lower in terms of power because shared systems cope with lower rates of variance in demand than individual systems must accommodate on their own (the averaging effect (Hoff et al. 1998)). Shared critical systems have a long history in human civilisation and can self-manage as is the case in hundreds of thousands of 'commons systems' around the world (Leisher et al. 2016). I propose that a baseload energy system can be such a commons and that there are precedents for this which I am confident can and should be applied in urban areas. Contrary to the idea that a shared resource will be over-used because of self-interest, a very large body of work culminating in the 2009 Nobel Prize in Economics has described how managed commons are resilient, efficient and can remain stable for hundreds of years. This was the work of Elinor Ostrom (Ostrom et al. 1994) and many others. Ostrom's Design Principles envisage groups of people who know each other working together to manage their demand of some limited resource. Because of the critical nature of the resource and the social fabric of the group, excessive demand is curtailed and intransigence is stopped with mild (but graduated) sanctions.

A later review (Cox et al. 2010) identified that commons participants are *mutually vulnerable*. This is because when one participant uses too much of the shared resources, the others are likely negatively impacted. Since it is also difficult to opt-out of the commons, it can be seen that the possibility of an energy commons is a more critical and more strict arrangement than, say, a community energy group.

Will commons work for energy? The principles are certainly less likely to work where participants are not mutually vulnerable, can opt-out, and where there is no real reciprocity for resource overuse. I think this is more likely the case in 'virtual private networks'. These networks balance supply and demand over the T&D system using automatic controllers for home solar and batteries. While I know that VPPs do make better use of excess solar and excess battery than leaving prosumers uncoordinated, it should be seen that VPPs among strangers are going to be less likely to cause group effects, let alone self-management of demand from within groups. Any VPP member who wants more electricity than is available from the VPP can simply get it from the retailer. For VPPs there is also the larger problem of reverse flows for high penetration electricity zones because the scope of trades is potentially the entire NEM.

Local energy commons may also contribute to the reduction of energy poverty rather than allowing 'wealthy people to exit the NEM' or 'leaving certain energy consumers to subsidise solar owners'. These are popular assertions that have dogged high urban solar penetration. Local energy commons can provide pooled roof space for solar. If energy can be harvested across titles, a large energy user is incentivised to deal with a neighbour who has large roof

space. In one of the sites I studied, an elderly couple who were low energy users were modelled to share their roof for a solar array that was then used to power a high energy user home in the group. In return, the low energy user could obtain almost all of their electricity from the group system.

While it seems like neighbours fall into conflict very easily, my own work finds that careful messaging about shared resource use does not allow high energy users in the group to be targeted. Instead, the system I designed handles messaging via *anonymisation* and *plausible deniability*. These techniques are borrowed from the information security field, in which I have had a previous career. The same system also issues signals about conservation and load shifting so that group participants can issue reinforcement to each other via the system.

There have been other group-oriented approaches to utility demand management that have been highly effective. One of them was water demand management in Melbourne. The supply utility, Yarra Water, deployed a programme using conventional elements such as restrictions, but it also (perhaps inadvertently) brought about commons effects in activating neighbours to respond together (Liubinas & Harrison 2012). The Target 155 (T155, after 155 litres per person per day) campaign specifically treated the 'community as the consumer' rather than the household. There is a large literature base about the effectiveness of group activation for environmental challenges which finds individuals feel they have greater agency against a much larger problem when they face it as a group. In individual streets, water overuse in gardens and car washing was noticed and negatively reinforced by neighbours. T155 was successful in bringing down an already greatly-reduced water demand in Melbourne and the effects are still present; demand has not yet reached the 2002 peaks despite Melbourne having an additional 1.5 million more people in its population.

Commons effects emerge out of group dynamics. To test this, commons must be organised among actual consumers and actual resources. Group effects cannot be simulated or modelled with software as many changed supply systems can. Sharing energy between separate titles for grid-connected homes (or businesses) is presently forbidden by the NEL. The intention of this framework is to guarantee the monopoly of the supplier. However, the sharing arrangements envisaged are 'network neutral' and intended to improve consumer resilience. Also, the energy that is being exchanged between group participants did not originate from the NEM. The NEL could not have anticipated the current penetration of urban solar and our new needs to make use of this resource. Finally, electricity control systems envisaged for these arrangements provide many safe, versatile systems not envisaged by the NEL or the exemption framework. To help make a case for changed regulations, sandboxes are critical for testing and demonstration.

The changes I envisage through a sandbox arrangement might consider allowing cross-title energy flow; or re-classifying islanded homes as off-grid so that cross-title energy flows can take place. Even elaborations to the NEL or confirmation of the position of the NEL and Victorian Exemptions framework regarding "off-grid" and "cross title energy flow" would be rather helpful.

A bigger picture

It is desirable to find solutions to balancing supply and demand within the distribution zone. Transmission energy should still be provided of course, but I envisage it will be delivered to ‘the node’, not to ‘the home’. This way, residential areas would use the T&D system for charging and storing energy when large scale renewable power was available. It may be the case the T&D system can deliver lower quality power than at present. Resilient nodes with balanced storage would make the best of it. In turn, the NEM would be able to accept renewable generators with less firming. This is of course only one grand picture of possibly many. However, having renewable supply ‘catch up and overtake’ electricity demand will happen a lot sooner and may only be possible with a new approach to demand management.

Yours faithfully,

Craig Burton
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Discussion paper questions

Question 1 OTHER SANDBOX EXAMPLES: Are there other examples of regulatory sandbox arrangements that are relevant when considering these arrangements for the NEM?

I am aware of at least one other sandbox. It is a retail arrangement in Byron Bay where excess solar energy is allowed to be used to power a sewage plant in a form of "parity net metering". That is, the consumer does not pay the electricity retail rate while it imports power at parity with the feed in at the renewable source. Please see http://reneweconomy.com.au/byron-shire-to-be-first-in-australia-to-pilot-virtual-net-metering-745

QUESTION 2: OTHER RELEVANT TRIALS: What other proof-of-concept trials are relevant when considering formal regulatory sandbox arrangements for the NEM?

I can only answer this question from the point of view that potentially many trials of electrical infrastructure changes would benefit from more room to move within the NEL. It is likely that the requirements of the NEL and difficulties in reading it and applying it have impeded potential research.

QUESTION 3: BARRIERS TO PROOF-OF-CONCEPT TRIALS:
(a) Are proof-of-concept trials being inhibited by current market regulations or processes?

I think that they are. I know that Michael Mobbs required a law firm to read of the NEL in order to go ahead with his plans for living off-grid in Sydney and Mr. Mobbs is a lawyer himself. Please see http://www.streetcoolers.com.au/s/Street-Coolers-Regulatory-Roadmap.PDF but note that this is offline and has not been crawled by the Internet Archive. If you would like a copy of this document please let me know as I have permission of its author.

(b) If so, what are the potential barriers to proof-of-concept trials that might be addressed by a regulatory sandbox initiative?

It will be easier to obtain professional services and insurance for an infrastructure experiment if the experiment can be demonstrated to be clearly legal, or clearly protected by sandbox arrangements for a period.

QUESTION 4: ACCESS TO GUIDANCE ON THE REGULATORY FRAMEWORK
(a) Is there a lack of access to guidance for innovative new entrants on navigating the energy regulatory framework?

I personally have found it difficult to know which organisation to approach. I have approached all of the organisations listed below. It is not clear if responses from them are legally binding and likely that those responses are no form of protection where new electricity technologies fall

into ‘grey areas’ in the NEL. I sought quotes to have the NEL read to answer my questions and the starting cost was in excess of AUD20,000.

(b) If so:
• What type of guidance is needed?

Certainly advice and answers to questions that ideally are themselves legally binding. Guidance should be impartial and should not favour incumbent systems or providers. For example, my studies of private wires have been described as perverse, illegal, and the death knell for the electricity distribution system. This does not make my work any less valuable than T&D improvements for volt-var stabilisation, for example.

• Who should provide it?

Persons or organisations with an understanding of the entire framework and an appreciation of emerging technologies. Potentially these providers may have to provide advice under an NDO for example if this involves provisionally patented inventions. Alternatively, it may be desirable for all questions and all answers regarding elaborations on the NEL be made public in a similar manner to questions and answers in a tendering process.

• Should guidance be coordinated across the AER, AEMO and AEMC?

For questions and answer or other guidance of benefit to the general public I would suggest a wiki. This is the approach taken at some organisations where legal advice and support is often requested for many of the same kinds of inquiries.

• How should the provision of guidance be funded?

It seems reasonable if a new resource is created to effectively help the transition to renewables that the CEFC fund it. It is also reasonable that the user should pay since I believe many applicants would be organisations that can afford to pay. In my case, I could not afford to pay legal firm rates to get answers and so the cost burden on the customer should be perhaps tiered in some way.

• Should an application be required in order to gain access to detailed guidance? If so, what criteria should apply?

To prevent a new guidance service being overwhelmed by people asking about planning or other local jurisdictional issues to do with energy, it may be necessary for people to apply. I suggest an important qualifying item would be that the applicant can frame the questions they want answered succinctly and that those questions require an expert comprehension of the NEL and the frameworks. Perhaps the service might route other applicants to FAQs and clearing houses elsewhere.

(c) Is there a role for binding advice from market bodies on certain aspects of the regulatory framework to support proof-of-concept trials?

Yes, I think there is. Beneficial changes to the energy and market system really should be led by conceptual work and not impeded by problems with access to information, especially if access to that information is in the public interest.

QUESTION 5: TRIALS UNDER AER ENFORCEMENT DISCRETION
(a) Is the AER's ability to issue no action letters, provide waivers and exemptions, and use its enforcement discretion sufficient to facilitate proof-of-concept trials in the NEM? If not, why?

I am not sure. I have interacted with the AER but it has never been very clear how to frame a potential energy trial and what process might be followed to do this. It has not been clear what would happen if the NEL or Victorian exemptions framework was disobeyed.

(b) Is there a need for a more formal process for proponents of proof-of-concept trials to seek a no action letter?

I'm sorry I am not sure.

(c) Should no action letters that facilitate innovation or proof-of-concept trials be made public?

I am not sure. Can you provide some examples?

QUESTION 6: THE NEED FOR A FORMAL REGULATORY SANDBOX
(a) Would formal regulatory sandbox arrangements, where some regulatory requirements are relaxed on a time-limited basis whilst appropriate safeguards remain in place, serve to better facilitate proof-of-concept trials in the NEM?

Certainly. For the reasons I give in my initial paragraphs, there are many aspects of my field alone could only be studied and trialled with changed infrastructure or changed rules. The changes should of course be safe and the changes should enjoy the oversight of authorities. There are energy field problems that are too complicated to model or explore in the lab.

(b) What other regulatory tools are needed to facilitate proof-of-concept trials?

I suspect there may need to be some kind of amnesty created for any projects that are currently running that are determined to be in conflict with the framework once a guidance service is made available.

I would be desirable that if proof-of-concept projects require cooperation from T&D providers that there a regulation compels those providers to take part since innovative projects may be

disruptive. An instrument of this kind may compel a T&D provider to reasonably provide access to equipment and expertise in support of the trial. As an example, the instrument may require AEMO to make access to MSATS free or available under tiered pricing for smaller applicants.

QUESTION 7: DESIGN OF A FORMAL REGULATORY SANDBOX ARRANGEMENTS, IF REQUIRED

(a) If required, should the objective of the formal regulatory sandbox arrangements be to facilitate further proof-of-concept trials in the NEM? If not, what should the objective be?

I think the objective should be to support design and implementation of future energy systems anywhere that could benefit consumers or the energy transition, or both.

The design and implementation should not be restricted to energy incumbents and the regulations should facilitate access to legal interpretation, law changes, people, expertise, data and systems.

(b) If required, what metrics should be used to measure the success of a formal regulatory sandbox arrangement?

How often these are sought, for what reasons, how often granted, how often contested, extended, by whom and to what qualified advantage to consumers or the energy system or both.

More naively I would suggest the success of the system is evidenced by the rate of innovation in certain fields and by the absence of trouble!

(c) If required, what should be the high-level criteria for accessing a regulatory sandbox Arrangement?

It should be possible for applicants to explain what the costs and benefits are. However, in my work in particular there are possible overflow benefits and there are externalities not relevant to the energy regulatory framework. Proposed innovation should be assessed using a systems approach, a long term outlook and potential deferment to other experts or research peers. The involvement of peers in the research field will at least reduce redundant work.

(d) How could fairness be addressed in the case where proponents of similar trials apply to access sandbox arrangements but only a limited number of trials can be accepted?

As above, redundant work should be carefully identified and handled. However, the energy system is highly complex and as such repeated trials in different environments could be allowed because they ultimately arrive at different insights.

Perhaps more to the point, the sandbox system should be wary of misuse for gaming. By this I mean the use of exclusive sandboxes to block innovation or to seek windfall profits where proponents could benefit from law changes or suspensions in other ways.

(e) If required, what should be the key features of a formal regulatory sandbox arrangement for the NEM?

• What regulatory arrangements should be within scope to consider for relaxation?

With some qualifications, potentially all of them. But AEMC or the responsible body should be able to refuse some applicants given reasonable analysis and open process.

• What should be the safeguards for consumers?

Anything that is trialled needs to be insured. This at least better assesses consumer risks.

If a sandbox diminished participating consumer rights (such as consumer rights to switch retailers) then participants need to be made aware of this and for what period the sandbox runs. It may be necessary for consumers to sign some sort of agreement such as an access license for trial operators to gain access to installed systems on private property.
As with most research, any participant consumers should be able to opt out at any time with no obligations.

• What obligations should be placed on the participants (e.g. knowledge sharing requirements)

Anyone who wants to dedicate time to research in the energy field should be able to access the suggested guidance service described above. For the purposes of gaining support for new research, it may be necessary to make sandbox applications possible without a lot of other documentation in place. It may be necessary for a sole applicant to be auspiced to reduce the risk of the sandbox application process being swamped. Applicants should agree to the obligations:

Participants should certainly document and publish their work to a certain standard. Perhaps this might include risk registers or other common project documents. They may need help to do this such as with templates and a clearing house for documentation.

By the same token, the creation of intellectual property should be encouraged so long as this does not impede or stall the overall stated benefits for consumers or the energy transition. New inventions coming from sandbox arrangements still need to be documented and their potential qualified somehow.

QUESTION 8: TRIALLING INNOVATIVE REGULATORY PROCESSES
How could formal regulatory sandbox arrangements be used to trial changes to regulatory arrangements to guide adoption of reforms across the market?

Possibly be anticipating the impact of successful trials on existing regulations and market functions. For example, if regulations allowed the successful test of 'power to the node' as I imagine above, then it would be possible from early in the sandbox period to estimate that a new kind of customer might emerge. I suspect that the potential for very large changes out of sandboxes might be agenda items for COAG or a government entity charged with overseeing the energy transition. That is, I imagine the potential for large changes must be anticipated and managed top-down.

References

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