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Distributed Generation Inquiry

Essential Services Commission
Level 37, 2 Lonsdale St

Melbourne, Victoria 3000

Dear Sir/Madam

Re: The Network Value of Distributed Generation – draft report

Thank you for the opportunity to comment on the draft report on the network value of distributed generation, and for the leadership role that the Victorian Government is taking in seeking to proactively assess the value of distributed generation (DG) in our electricity sector, in order for that value to be reflected in the framework of network payments and charges.

We support many of the key conclusions of the work, in particular the finding that DG can and does create network value, and that the current framework is not oriented towards efficient participation of small scale DG, and does not require either calculation or recompense for the benefit. There are also particular findings we disagree with, for example the conclusion that it is inappropriate to use tariffs to value DG exports in the context of the current framework for network charges.

We note that the ESC largely concentrated on the calculation of network value from small scale solar systems. However, our research suggests that it is important to consider dispatchable systems, such as cogeneration, bioenergy or solar with batteries in any discussion of potential value or design of payments, as these are more able to provide higher value services and respond to price signals.

We consider a thorough and urgent redesign of the frameworks to both charge for and value network services is required to ensure the coming transition to distributed energy proceeds both efficiently and in a way which includes all consumers. We would therefore support any move towards a more inclusive process to reform the structure of network tariffs, building on the work started by Energy Networks Australia and CSIRO and published in the *Electricity Network Transformation Roadmap*[1]. The New York State's *Reforming the Energy Vision* (REV) process provides a good model, in which multiple stakeholders consider what would be an equitable and efficient system.

The pace of technology change is such, we suggest, that without urgent attention we run the risk of consumers voting with their storage systems, and leaving those who cannot do so paying the legacy costs of an underutilised network. Once systems have been installed, it is too late – at that point utilisation has already dropped, and consumers who have removed their load will expect to get the payback on their systems.

We believe that many of the differences in ISF and the ESC's conclusions relate to how the value of DG is *framed*.

Framing: *rewarding* the value of DG, or *correcting* a centralised generation market bias?

We have a network charging system that was established for a centralised electricity network of large generators and passive consumers. As such, network charges are paid by consumers rather than generators, and ingore how much network infrastructure is required to deliver that generator's electricity to consumers. The energy market then trades that generation 'at the power station gate' and customers pick up the 'smeared' network bill.

However, in a much more distributed energy future it is likely that we will have a large proportion of embedded generation, complemented by centralised generation. The grid archicture required to support this will be similarly connected at the local distribution level, but be less infrastructure intensive than our current grid at higher voltage levels of the network, ultimately with a proportionately lower reliance on large transmission infrastructure.

If we were to structure network charging around this future, it would not look like our current model, which carries no price signal to either consumers or generators to recognise the cost savings associated with generation closer to the point of consumption. Without this price signal we will be unable to unlock this less infrastructure intensive future for the long term.

A network charging model that suits this distinction in generator location relative to consumers could take three possible forms:

1. Some proportion of overall network costs could be recovered by generators paying for network delivery, based on some calculation of the average distance required to deliver their electricity to consumers.
2. Customers paying network charges proportional to the distance their electricity has travelled from the generator(s) contracted to supply their energy.
3. Customers paying smeared network charges as per the current model, but embedded generators being 'credited back' the reduced consumer costs they bring relating to smaller the average distance required to deliver their electricity to consumers.

Option 1 has seldom been discussed as it represents a substantial change to payment relationships. If pursued, this could be combined with consumers paying a fixed charge for their maximum capacity requirement, perhaps discounted if there is a degree of third party control (either demand response or storage).

Option 2 is not currently possible, as there is no direct contractual connection between a consumer and a generator, however in a future of Local Electricity Trading this may become possible, albeit while substantially increasing complexity.

Option 3 is where attention has focussed through the LGNC Rule Change and the ESC Inquiry, as this could achieve the desired outcome with only a limited change to current market arrangements. However, a sole focus on determining where the value of DG lies has led these efforts down a pathway of *short to medium term* valuation of DG.[1] We suggest a broader view is needed to both correct the legacy network charging bias which favours centralised generation, and the value of maintaining network utilisation.

This is precisely why ISF has focussed on a *long term* approach to the valuation of DG in reducing network costs, and an *alignment* of any DG crediting mechanism with existing network charging calculations. If we take a long term (LRMC) approach to network charging, and then as the ESC and AEMC suggest, take a short term (SRMC) approach to the valuation of DG, in the vast majority

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[1] This is not to downplay the vital consideration of the locational and temportal variation in the value of DG in reducing impending network costs. In fact, this is exactly why ISF created and supports the Network Opportunity Maps to identify constraint areas as opportunities for investment in distributed energy resources. Suggestions for the interplay between short and long term value of DG are conained in the section on 'broad based tariffs' below.

of locations this still leaves customers with an incentive to go 'behind the meter' or duplicate infrastructure.

Therefore we urge the ESC to consider the valuation of DG in the context of:

- reimagining network charging for a more distributed future,
- considering the customer's perspective when making financial decisions regarding embedded generation, and therefore maintaining network utilisation by ensuring the network remains an attractive alternative compared to behind the meter solutions, and
- creating a market environment that is a genuinely level playing field for generators located closer to the point of consumption.

These factors point to the need to not only value the reduction of upcoming network infrastructure investments, but also to consider how the network is used in the long term (network utilisation), and what this means for consumer costs. It may also change the perspective one takes towards the appropriatenesss of a broad based tariff, and tariffs as a delivery mechanism more generally. These points are elaborated below.

Assessment of network value should include maintaining utilisation

We note a key omission of the work is consideration of the implications of the pricing of DG network services on the future utilisation of the electricity network, and equity considerations surrounding the associated repayment of sunk capital costs of this infrastructure. The advent of significantly cheaper PV and battery storage systems into the current framework is likely to lead to perverse effects under the current framework, as what is cost effective for the individual consumer may not be efficient for the system as a whole.

There are a number of drivers towards load defection in the current framework, with a large imbalance between the value of DG used behind the meter and exported. Individual consumers will increasingly have the option to take large elements of their load behind the meter by utilising storage, and the use of embedded networks in new developments and potentially in parallel to existing infrastructure extends this to a greater proportion of load.

The importance of maintaining utilisation is as follows. If consumers stop paying charges for the proportion of their load which is removed – and it would be difficult to envisage a system where they continue to pay the same share regardless – and network costs remain the same, the consumers who do not reduce their load pay proportionately more. This may be the case in locations where the network has plenty of spare capacity, and has been used to suggest that rewarding DG in such situations will increase consumer costs. However, it is precisely those locations where load removal would leave consumers who do not reduce their load worse off.

The intense interest in Local Electricity Trading or 'Peer-to-Peer' trading demonstrates the importance of getting the framework right. Under present conditions, network charges do not vary according to *how much* of the electricity network is used. Thus the value of trading is restricted to the energy element alone, and there is a strong driver to achieve trading via embedded networks. This may lead to inefficient installation of either storage or duplication of network infrastructure.

Put another way, the framework for network charges should offer a sufficiently attractive alternative to going behind the meter, in order to maintain utilisation and avoid driving up costs for consumers who do not reduce their load. This was demonstrated in the outcomes three of the virtual trials of a Local Network Credit, in which the payment of a network credit to local generators was a better outcome for all parties than the installation of a private wire[2].

This importance of maintaining utilisation is reflected in the ENA / CSIRO roadmap[1] outcomes, which show approximately $100 billion savings in the Roadmap relative to the business as usual scenario. The savings occur because of the combined reductions in behind the meter technology and network augmentation costs. Reductions are achieved primarily because DER owners are given incentives to allow for some remote control of storage systems, which are available throughout the network.

Broad based tariffs

The ESC report draws a draft conclusion that a broad based tariff is inappropriate as a mechanism to pay for network services because it does not take account of locational aspects, and developing locationally specific tariffs would be extremely costly. On the other hand, broad based tariffs have the advantage of simplicity, both for development, and for consumer understanding.

There may be good reasons to include a broad based tariff, at least as an interim mechanism. Firstly, the imbalance between network charges and incentives to export is a key driver to load defection. This occurs both because of the economic incentive of avoided network charges, and the perceived inequity of paying the same to use the network, regardless of whether generation is sourced from hundreds of kilometres away or from across the street. Secondly, there is a good economic case to incentivise consumers with DG to allow some remote control of their systems[3]. The suggested mechanism was a discount on fixed network charges, which in effect is a broad based tariff specifically aimed at solar generators with batteries. The same may well apply to solar customers who allow their inverter to be accessed to provide network services.

We suggest that a 'two-tiered' or an 'upper tier only' approach to tariff setting for DG exports may avoid many of the concerns voiced by the ESC. That is, the 'upper tier' of the tariff might include either:

- **Long run value:** Long term (LRMC) value of distribution and transmission network levels not utilised by the generator, or
- **A rebate of transmission charges:** small (<5 MW) generators are not able to access avoided TUoS payments, and this would be a relatively easy tariff to introduce for DG. In general, distributed generation does not use the transmission network, and will tend to ameliorate congestion in the transmission network. Economic modelling of the introduction of an LGNC in NSW showed that most of the economic benefit occurred in the transmission levels of the network[4], and locational variation between is also likely to be lower. We would recommend the inclusion of 'locational' and 'non-locational' charges in such a rebate, as per Section 7.1 of our methodology paper[5].

The lower tier might include the **short run value** (SRMC) value of distribution and transmission network levels not utilised by the generator, which only applies in constrained locations. Alternatively, another market mechanism could be used to increase small generator participation in network support if tariff calculation was considered too complex.

Customer empowerment and facilitating local electricity trading

ESC has taken the view that the customer empowerment that occurs from consumers being able to generate their own electricity, and/ or have control of which generators they purchase from, is outside the remit of regulators. We consider that enabling this type of consumer choice through Local Electricity Trading (LET) to occur *while using the network* is within the regulator's remit, as the status quo effectively incentivises behind the meter development of these options.

Effective development of LET systems may also allow consumers who are currently excluded from ownership of renewable energy systems to participate in and share the benefits of distributed energy[6].

Difficulty of small scale access to access payments for network services

ISF supports the finding that it is difficult for small scale generators to access payments for network services under the current frameworks because of the highly asymmetric nature of the players. However, this is not just due to lack of information. For example, the current model of network support payment model requires contracting on a case by case basis, which is inherently unsuitable for smaller players with relatively small generators.

Exclusion of ancillary services

We note that the report has excluded the value of ancillary services from distributed generation, as the value at present is relatively small and services are provided by large generators. We suggest that this will be very different going forward, and ensuring that markets for both frequency control and voltage control services are open to small scale DG, probably through aggregators, is important for efficient operation of the electricity market. There may, for example, be scope for a transition phase which includes an incentive to enrol small systems with aggregators. A present example is occurring within the Networks Renewed project[7] in which Reposit Power is providing trading opportunities to customers who choose to purchase batteries and participate in the demonstration on Essential Energy's NSW network. Multiple sources of trading revenues are accessible, including Frequency Control Ancillary Services (FCAS) contracted through AEMO's competitive FCAS markets, and voltage regulation services that are the main topic of investigation for this project. Ensuring access to markets encourages these highly responsive energy systems to be used to their full potential.

Conclusion

We commend the ESC for its open approach to addressing this complex question , and would welcome the opportunity to further participate in the process of developing a low cost and equitable electricity system for all Victorian consumers. We believe that a successful process will need to include a wide range of industry and community stakeholders, and openly debate the opportunities and tradeoffs inherent in different approaches.

We hope that this can provide the opportunity to consider the valuation of DG in the context of reimagining network charging for a more distributed future, and ensuring that real customer decision points are taken into consideration. We believe this will optimise our electricity system for the future and ensure our electricity networks are financially viable.

Regards

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[1] Energy Networks Australia & CSIRO. (2016). *Electricity Network Transformation Roadmap: Key Concepts Report*.

[2] Rutovitz, J., Langham, E., Teske, S., Atherton, A., & McIntosh, L. (2016). *Virtual trials of Local Network Charges and Local Electricity Trading: Summary Report. Institute for Sustainable Futures, UTS*.

[3] Energeia. (2016). *Unlocking value for customers. Electricity Network Transformation Roadmap.*

[4] Kelly, S., Rutovitz, J., Langham, E., & McIntosh, L. (2016). *Economic Impact Analysis of Local Generation Network Credits in NSW. Institute for Sustainable Futures.*

[5] McIntosh, L., Langham, E., Rutovitz, J. & Atherton, A. (2016) *Methodology for calculating a local network credit.* Institute for Sustainable Futures, UTS.

[6] Rutovitz, J., McIntosh, L., Langham, E., & Atherton, A. (2016). *Virtual trial of Local Electricity Trading and Local Network Credits: a community solar farm. Prepared for Moira Shire Council and Swan Hill Rural City Council. Institute for Sustainable Futures.*

[7] Alexander D., Wyndham J., James G., McIntosh L. (2016), *Networks Renewed: Technical Analysis*. Prepared by the Institute for Sustainable Futures, University of Technology Sydney.