



Clean Energy Council submission to the AER Issues Paper: SA electricity distribution determination, SA Power Networks 2020-2025

Executive Summary

The Clean Energy Council (CEC) welcomes the opportunity to provide feedback to the Australian Energy Regulator (AER) Issues Paper on the SA Power Networks 2020-2025 Draft Plan.

The CEC is the peak body for the clean energy industry in Australia. We represent and work with hundreds of leading businesses operating in solar, wind, hydro, bioenergy, marine and geothermal energy, energy storage and energy efficiency along with more than 6,200 solar installers. We are committed to accelerating the transformation of Australia's energy system to one that is smarter and cleaner.

In this submission we focus on the proposed expenditure for modernising the SA Power Networks grid, which will help to reduce costs and electricity prices for all customers. We support the proposed expenditure in the 2020-2025 regulatory control period to develop new operational systems and business processes to actively manage the integration of rooftop solar PV, battery storage and virtual power plants (VPPs) into the distribution network.

On 8 May 2019 the AER released a Consultation Paper on Information and Communication Technology (ICT) expenditure, which states that a paper on investments to enable better integration of distributed energy resources (DER) will be published in late 2019. The Consultation Paper indicates that the decisions arising from AER review of ICT expenditure assessment methodologies will be applied to the SA Power Networks 2020 to 2025 Proposal.

The very short time period of only six working days between the release of the ICT Consultation Paper and the due date for submissions to the SA Power Networks Issues Paper has materially constrained the CEC's ability to consult appropriately with its members. This is extremely disappointing, considering the significance of the issues at stake and in view of the significant amount of time the AER has had to consider these issues in comparison with the six working days it has allowed for stakeholders.

The key points made in this submission include the following:

- The CEC supports the SA Power Networks proposal to move toward dynamic export management of DER,
- There is a clear and demonstrated need for dynamic management so that DER can better support management of the grid and to enable more DER to be accommodated on distribution networks in South Australia (SA),
- Without ICT for DER integration zero export limitation is inevitable,

- A grid management strategy that relies on zero export limitation or repeated inverter tripping would be a retrograde step and would hasten grid defection,
- University studies have shown that dynamic management of DER is the most equitable approach to accommodating high DER penetration on distribution networks¹,
- Relying on repeated inverter tripping as a grid management strategy would have wider negative impacts – it would be inequitable, it could worsen over-voltage problems, it would undermine prospects for VPPs, it would degrade the value of DER investments, it would adversely affect network performance and it would do nothing to address problems arising from high DER penetration that are not restricted to voltage rise,
- Dynamic management strategies for DER offer net benefits to all customers, not just those who own DER, and
- The adoption of dynamic management strategies in the SA Power Networks grid cannot wait until after 2025.

We would be very happy to discuss these issues in further detail. We look forward to contributing further to this important area for policy development.

¹ Lusi P., Chakraborty S., Andrew L., Liebman A. and Tack G. (2019), *Reducing the Unfairness of Coordinated Inverter Dispatch in PV-Rich Distribution Networks*

The CEC supports the proposal to modernise the SA Power Networks grid

South Australians have embraced DER and this has contributed to lower electricity costs for all customers, not just those who have invested in their own system. Demand for electricity in SA peaked in 2009 and since then has remained flat or declined, largely due to the uptake of rooftop solar. Solar PV has been successful in reducing the need for additional network augmentation expenditure. SA Power Networks state that only \$18.6 million of the \$1.7 billion capital investment relates to investment to address forecast demand growth. Before the uptake of solar, increasing demand was a substantial driver of network expenditure. Solar PV also contributes a positive downward impact on wholesale energy prices.

The CEC supports the proposal for expenditure to modernise the SA Power Networks grid. Increased use of solar with battery storage has potential to further reduce network augmentation costs. The lack of monitoring capability on the low voltage network requires distribution businesses to take a more conservative position on distributed energy resource (DER) integration than would otherwise be the case. In the absence of their own monitoring capability distribution businesses can utilise data available from smart meters, and we note that a portion of SA Power Networks' proposed ICT expenditure is in systems to enable this in South Australia.

There is a demonstrated need for changes to accommodate more solar PV

Demand by customers for rooftop solar and batteries will continue to grow and penetration on the distribution network will continue to rise, as demonstrated in figure 1 (below). This is now unstoppable. Distribution networks are obliged to connect DER under an open access framework. Even if distribution networks could refuse solar PV connections, many customers would choose to go off-grid. CEC members are reporting a demand for off-grid systems by customers in fringe of grid areas that have the alternative of connecting to a single wire earth return (SWER) line.

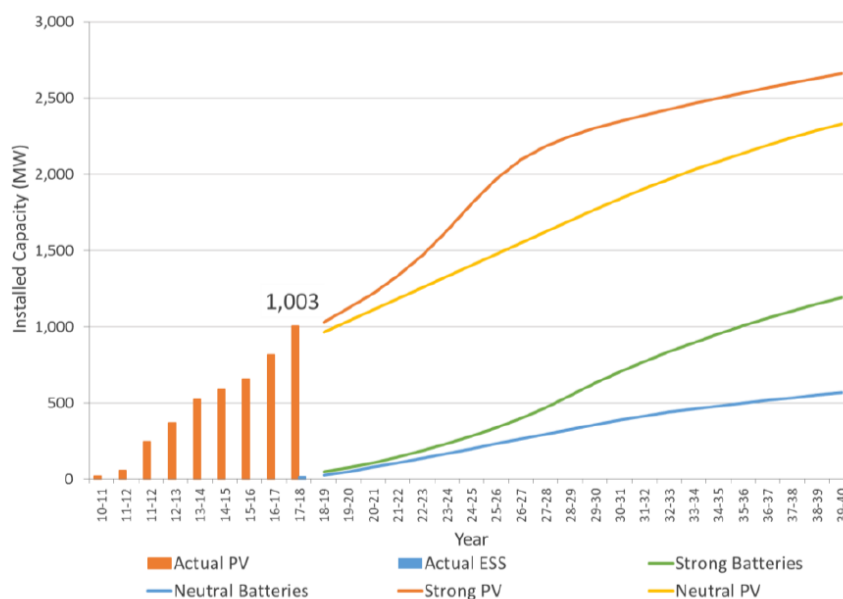


Figure 1 – South Australia PV and battery installed capacity, actual and forecast²

² SAPN, Supporting document 5.18—LV management business case, 25 January 2019

As evidenced by initiatives such as ‘Open Energy Networks’, customers, industry participants, policy makers, distribution networks and community representatives want and expect DER to play a role in supporting management of the grid and bringing down wholesale electricity prices for all customers. Rooftop solar PV, batteries and virtual power plants (VPPs) are expected to become an essential part of future energy systems.

Distribution networks would be turning back the clock if their approach was to impose zero export limitation or to simply allow the situation on congested parts of the network to worsen to a point where inverters repeatedly trip off due to grid conditions. Tripping due to high voltage is already an emerging issue for SA Power Networks, as demonstrated by figure 2 (below).

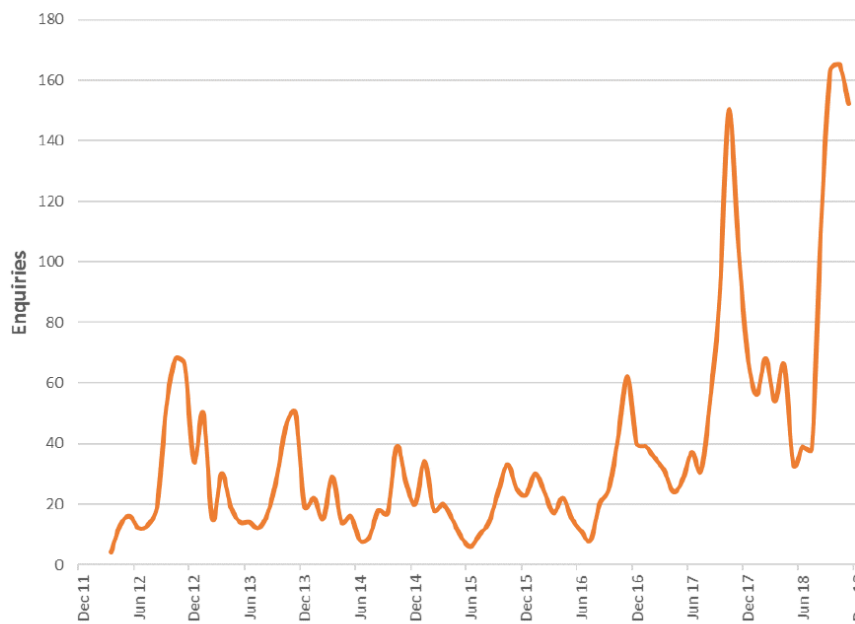


Figure 2 – SAPN Customer high-voltage enquiries³

There would be serious reputational issues for SA Power Networks if it allows a situation where customers are constrained to zero export, refused connection or find that their inverters constantly trip off due to grid conditions. This would likely hasten the pace of grid defection in South Australia and elsewhere. Customers expect their solar PV system to ‘work’. If it becomes widely known that many systems are not working and the fault lies with conditions on the distribution network, customers will direct their anger at SA Power Networks and their political representatives. Those who can afford to will consider alternatives to remaining on the grid.

Distribution networks are expected to deliver their services in a way that is equitable, non-discriminatory, aligned with community views, that maximises benefits to all customers, promotes efficient investment and is consistent with the National Energy Laws and Regulations. The CEC is of the view that SA Power Networks’ analysis has demonstrated that its proposal to enable dynamic management is the best way to meet these expectations. As the AER has acknowledged in its recently published Consultation Paper on ICT expenditure, ICT is increasingly becoming a more integral component of delivering energy services.

³ *ibid.*

Without ICT for DER integration zero export limitation is inevitable

Export limits in the SA Power Network area have reduced from 10kW per customer in 2017 to 5kW today. According to analysis published by SA Power Networks, continued connection of new 5kW PV systems will reach or exceed network capacity across many areas of its network in the 2020-25 period. At high levels of PV penetration, over-voltage becomes a serious issue. This is being ameliorated to some extent by the introduction of requirements for inverter capabilities such as Volt-VAr and Volt-Watt response. The CEC has supported the introduction of these new requirements. In the long term these are necessary, but not sufficient, to enable higher DER penetration on the network. We are also actively supporting further improvements to inverter standards, including moves toward dynamic management capabilities such as those used in California and drawing on international standards such as IEEE 2030.5. SA Power Networks has taken a leading role in that work. However, it is not enough to simply demand that inverters must be more intelligent. The capability will be wasted if networks are unable to take advantage of it because they fail to make the necessary investments in ICT systems and open standards in a timely manner.

We support SA Power Networks' proposed expenditure to enable automatic electronic registration. This will assist with the implementation of AEMO's proposed DER Register and it would make it possible to determine inverter settings remotely, rather than SA Power Networks having to rely on manual inspection or, more likely, not undertaking on-site inspections. This will improve compliance with grid connection requirements, which will deliver benefits for grid management and to all customers.

The CEC supports use of dynamic strategies to manage grid constraints

We agree with the view expressed in the 'Open Energy Networks' consultation paper⁴ by the Australian Energy Market Operator (AEMO) and the Energy Networks Association (ENA) that customers will suffer if they are constrained regarding the amount of electricity they can take from or feed back into the grid or if they do not get permission to connect a new rooftop PV system because their local area is saturated.

Relying on crude approaches to constraint of systems risks loss of customer confidence and may drive consumer sentiment toward grid disconnection. Dynamic strategies, which may include using and limiting exports in certain locations at certain times, are preferred to crude constraints, such as zero export requirements and other blanket limits on grid export. We therefore support the SA Power Networks proposal for a more dynamic DER management regime.

Dynamic management is more equitable

Enabling dynamic management strategies will deliver equity benefits for all customers on the grid including, but not limited to, owners of grid-connected DER. A recently published study has shown that dynamic management of DER is the most equitable approach to accommodating high DER penetration on distribution networks⁵. Drawing on data from Australia and the European Union, the authors demonstrate that solar PV curtailment in low voltage areas can be reduced and fairly distributed among PV owners by centrally coordinating

⁴ AEMO and Energy Networks Australia 2018, *Open Energy Networks*, consultation paper

⁵ Lusia P., Chakraborty S., Andrew L., Liebman A. and Tack G. (2019), *Reducing the Unfairness of Coordinated Inverter Dispatch in PV-Rich Distribution Networks*

the operation of PV inverters. Visibility and control of PV inverters allows the operator to change the distribution on energy curtailment while maintaining voltage within limits.

Relying entirely on local inverter over-voltage protections is not a viable approach

The CEC understands that a question raised in the AER's public forum on SA Power Networks' determination was whether simply relying on inverter over-voltage protections, e.g. tripping off, could be considered as an alternative to the three alternatives considered by SA Power Networks (i.e. zero export limitation, dynamic management or network augmentation). This approach would be inadequate, inequitable, economically inefficient and could worsen the problem it purports to address.

If repeated tripping were to become a routine part of network management, customers connected to the same local network would be affected differently depending on where they connect to the feeder. Some customers' systems will always trip before others and these customers would suffer disproportionately and inequitably from this approach.

Relying on local inverter protections won't address issues and could exacerbate them

Voltage rise is not the only problem that SA Power Networks and others are seeking to address through the proposed use of dynamic management strategies. In some situations, local thermal limits will need to be addressed before voltage management becomes problematic. Dynamic management strategies can address management of thermal limits. Relying on local inverter protections cannot.

Most PV systems with batteries will be compliant with the newer inverter standard (AS 4777.2:2015). Most systems installed prior to 2016 are likely to be compliant with the 2005 version of AS 4777.2 and are less likely to have a battery connected. Relying on repeated inverter tripping as a network management strategy would disproportionately penalise owners of battery systems. This would have the perverse outcome of making the problem worse. Batteries are part of the solution. Batteries can address over-voltage issues by reducing exports, importing power and/or importing reactive power when the grid needs those forms of support. Relying on repeated inverter tripping would be counterproductive.

Reliance on inverter tripping would undermine prospects for VPPs and reduce customer value

If the network management approach was to allow inverter over-voltage protection settings to operate more and more often, VPPs could not operate effectively. VPPs could have a very important role to play in network support and reducing wholesale electricity prices. Such an approach would seriously set back the development of VPPs in Australia.

A network management strategy that relies on inverter protections would also seriously degrade the value of investments made by customers in solar and energy storage. Under the AS 4777.2 inverter standard, voltage rise on distribution networks affects the inverter's performance and power output, not just the output seen by the network. Increasingly frequent tripping would seriously undermine financial returns on investment in DER. This approach would tilt the cost-benefit equation for customers away for grid-connected DER and toward off-grid DER. In a high-tripping network environment, customers with grid-connected DER would have very little predictability regarding their system's performance whereas those that go off-grid will have a much greater degree of certainty, independence, a well-performing

system and much less frustration with SA Power Networks. This would not be a positive outcome.

Dynamic management offers net benefits to all customers

SA Power Networks has developed a business case⁶, which the CEC and many other stakeholders consider to be credible and well-founded. The economic modelling indicates that implementing a dynamic export limit scheme in SA is likely to deliver the greatest value to consumers in the long-term from a whole-of-market perspective. The business case clearly demonstrates that zero export limitation delivers a worse economic outcome for the community than enabling more DER exports through smarter and more flexible management of capacity.

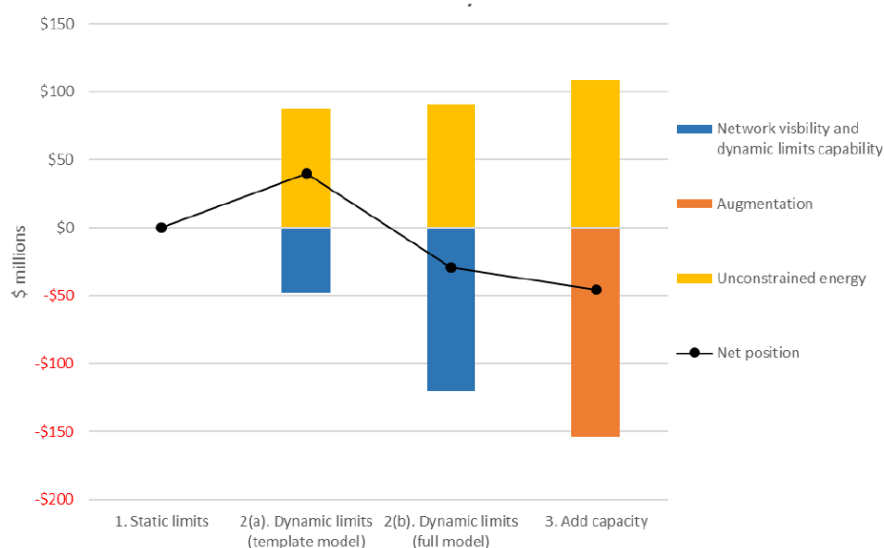


Figure 3 – Cost-benefit analysis: base case

The proposed ICT expenditure to enable dynamic export limitation is in the long-term interests of consumers in SA.

The SA Power Networks ICT expenditure proposal is modest (\$31.8 million in capital expenditure and \$3.8 million operating expenditure over five years) in the context of the overall proposal, representing less than 2% of total capital expenditure and around \$3 per annum of an average customer’s bill.

The AER Consultation Paper on ICT expenditure states, “For our assessment of non-recurrent ICT we will undertake a business case review of each individual project. We expect that DNSPs will provide detailed business cases and NPV analysis in support of each project. In particular, we will review how the benefits were quantified and assess if the relevant assumptions are supported by evidence.” To our knowledge, the AER’s promised review of the SA Power Networks business case either does not exist or has not been made available despite the fact that submissions to the AER Issues Paper on the SA Power Networks 2020-2025 Draft Plan are due by 16 May 2019.

⁶ SAPN, *Supporting document 5.18—LV management business case*, 25 January 2019

The proposed ICT investments cannot wait until after 2025

As shown in figure 4 (below), SA Power Networks is already reaching the limits of its DER hosting capacity on certain feeder types and by 2025 it will have reached or exceeded the hosting capacity on most feeder types.

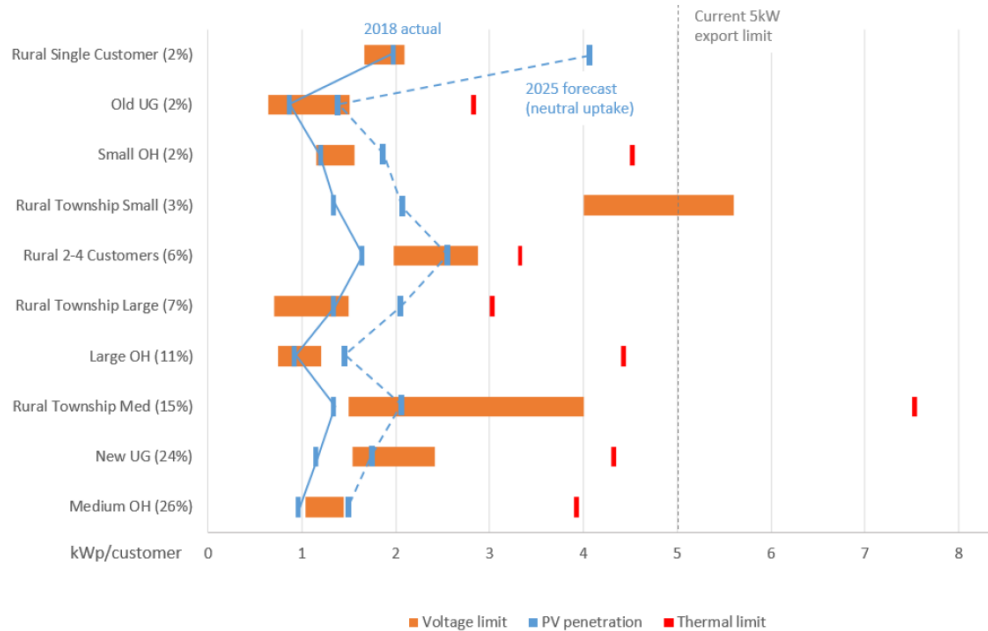


Figure 4 – SA Power Networks hosting capacity modelling outputs⁷

The SA Power Networks distribution network and the DER connecting to it will reach a ‘fork in the road’ in the 2020-2025 period.

One path leads to exceedance of DER hosting capacity, zero export limitation, repeated inverter tripping, grid instability, higher electricity prices, customer dissatisfaction, reputational damage to the AER and SA Power Networks and, in all likelihood, an unstoppable move towards unmanaged, economically inefficient grid defection by angry DER owners.

The other path, supported by the SA Power Networks proposal, leads to dynamic export limitation, use of batteries to support the network, innovations such as VPPs, better grid management, lower electricity prices and efficient utilisation of grid-connected DER to the financial benefit of all SA consumers. CEC supports this second path.

Zero-export limitations will deliver a worse economic outcome for customers than the proposed flexible export option. It would not be credible for SA Power Networks to continue with current practice, which will involve zero export limitation and repeated inverter tripping, until 2025. Delaying the use of new technology would exacerbate inequity between customers and lead to a worse economic outcome for all SA customers.

⁷ ibid.