S&C ELECTRIC COMPANY
Excellence Through Innovation

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Rowan McKeown
Senior Policy Officer
Essential Services Commission of South Australia
GPO Box 2605
Adelaide
South Australia 5001

Our Ref: JC 2017-049 31 January 2018

Dear Mr. McKeown,

S&C Electric Company submission to the Essential Services Commission of South Australia SA Power Networks 2020 Reliability Standards Review

S&C Electric Company welcomes the opportunity to provide a response to the review of the reliability standards that will apply to SA Power Networks beyond 2020.

S&C Electric Company has been supporting the operation of electricity utilities in Australia for over 60 years, while S&C Electric Company in the USA has been supporting the delivery of secure electricity systems for over 100 years. S&C Electric Company not only supports "wires and poles" activities but has delivered over 8 GW wind, 1 GW of solar globally and 45 MW of electricity storage globally, including projects in Australia.

We are particularly interested in facilitating the development of markets and standards that deliver secure, low carbon and low cost networks and would be very happy to provide further support to the Essential Services Commission of South Australia on innovative approaches to delivering reliable electricity services.

Yours Sincerely

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Introduction:

Australia's electricity system, in common with many other countries, is changing rapidly as intermittent generation connects at both the distribution and transmission level and as the fleet of large combustion plant reduces in response to both the need to mitigate climate change and changing market signals.

The operation of the distribution network is critical to delivering a secure supply of electricity to end consumers and the balance of delivering the innovation and replacement of network assets at lowest cost to these end consumers is a challenge. This is particularly the case for South Australia Power Networks (SAPN), where customer engagement reveals a desire for increased reliability, but a keenness to keep bills low. Balancing these competing desires is complex. Network standards are a critical part of ensuring that consumers receive the best possible service and it is appropriate that there is a scheme that provides an incentive for good performance and a penalty for under-performance.

Comments

A new version of the Electricity Distribution Code

The ESCOSA Reliability Standards Review was published before the currently available version of the Electricity Distribution Code EDC-12.1 and the Review refers to the previous version (EDC-12).

SA Power Network's Current Level of Performance

In the Executive Summary of the ESCOSA Reliability Standards Review states that "…customers expect the SA Power Networks to deliver at least current levels of reliability." And that the approach should reflect "…outcomes that are satisfactory…".

1. There is no definition in the Review that indicates what "satisfactory" reliability looks like. Is satisfactory performance the USAIDI and USAIFI defined in the Review and EDC-12.1? Or slightly less than those definitions?
2. SA Power Networks' own Distribution Annual Planning Report 2017/18 to 2021/22 indicates their normalised USAIDI in 2016/17 was below the defined standards for Central Business District Feeder and Rural Short Feeders.

Table 26: Feeder Category Normalised Reliability Performance for 2016/17

EDC Feeder Category	USAIDI			USAIFI		
	TARGET	2016/17		TARGET	2016/17	
Central Business District (CBD)	15	16	🔴	0.15	0.11	🟢
Urban	120	111	🟢	1.30	1.12	🟢
Rural Short (RS)	220	230	🔴	1.85	1.71	🟢
Rural Long (RL)	300	264	🟢	1.95	1.43	🟢
Overall Distribution System[12]	165	151	🟢	1.50	1.24	🟢

It should be noted that not all of the EDC's reliability targets will be achieved each and every year, as the targets are based on average performance over a 5-year period (ie 1 July 2009 to 30 June 2014, referred

Figure 1: Extracted Table from "Distribution Annual Planning Report 2017/18 to 2021/22"

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In the current ESCOSA Review (see below for the extracted figure) the underperformance has been upgraded to "met" against a "best endeavours assessment".

Table 3: SA Power Networks performance against interruption service standards

Feeder category	Duration of interruptions (minutes/customer/year)			Frequency of interruptions (number/customer/year)		
	Target	2016-17 result	Service standard met	Target	2016-17 result	Service standard met
CBD	15	16	● *	0.15	0.11	●
Urban	120	111	●	1.30	1.12	●
Rural short	220	230	● *	1.85	1.71	●
Rural long	300	264	●	1.95	1.43	●
Overall State (implied target)	165	151	●	1.50	1.24	●

*Service standard subject to best endeavours assessment. Refer to discussion in section 2 page 5.

Figure 2: Extracted Table from "ESCOSA SA Power Networks 2020 Reliability Standards Review"

In the current Australian Energy Regulator's (AER) Proposed amendment: Service Target Performance Incentive Scheme (STPIS) (December 2017) a comparison of Distribution Network Service Provider (DNSP) performance, using Customer Average Interruption Duration Index (CAIDI), in the current regulatory determination period indicates that SA Power Networks has:

- Improved reliability for CBD feeders
- Worse reliability for Urban Feeder
- Worse reliability for Short Rural Feeders
- Worse reliability for Long Rural Feeders

(see figure 3 on the next page)

While the AER indicates in a footnote that overall reliability for all DNSPs, using SAIDI, has improved, it is not clear what ESCOSA means by "…at least **current levels** of reliability.". Is it the reported figures from SA Power Networks? The modified data reported by ESCOSA or the AER data, which suggests that overall, on some measures, SA Power Network's performance has deteriorated?

SA Power Networks should be striving to meet and exceed target standards, rather than meet **current levels**, otherwise improvements in reliability will never materialise. Modifying actual performance data to show compliant performance is a concern, because again, this will not result in improvements to reliability.

ESCOSA needs to be clear on whether "current levels" is the forecast target or actual performance.

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Table B1: Percentage change in ratio of SAIFI/SAIDI targets (CAIDI) from the previous period to the current period

Distributor	CBD feeders	Urban feeders	short rural feeders	long rural feeders
CitiPower	17% worse	36% worse	na	na
Jemena	na	4% better	25% worse	na
Powercor	na	22% worse	14% worse	25% worse
AusNet Services	na	5% worse	3% worse	7% worse
United Energy	na	12% worse	32% worse	na
Ergon Energy	na	10% worse	9% worse	11% worse
Energex	7% worse	0%	2% worse	na
SA Power Networks	8% better	11% worse	13% worse	20% worse

Source: AER analysis.
Note: Overall reliability outcomes for consumers (SAIDI) have improved for all distributors with the exception of United Energy;
na represents not applicable, the distributor does not have this feeder type.

Figure 3: Extracted Table from "Proposed amendment: Service Target Performance Incentive Scheme (STPIS)"

Stand-alone Power Systems and Microgrids

The recent Rule Change application by Western Power, subsequent Determination by the Australian Energy Market Commission (AEMC) and work of the Council of Australian Governments (COAG) Energy Council indicate that Stand-alone Power Systems (SPSs, isolated non-interconnected microgrids) are likely to become a DNSP activity.

In their Determination the AEMC indicated that performance / reliability standards for SPSs were one area of regulation that needed to be urgently developed. The Western Power trails at Ravensthorpe indicate very significant improvements in reliability for customers in a SPS. At the very least the reliability for customers in a SPS should be no worse than that for a Long Rural Feeder.

Since a SPS is likely to replace an existing feeder, the reliability of the SPS should be no worse that the category of feeder it replaces.

Given the rapid evolution of the electricity system and the likely emergence of SPSs in the next regulatory determination period, it would be appropriate for ESCOSA and SA Power Networks to consider what an appropriate reliability standard for a SPS should be and if there are any other regulatory issues, such as retail completion, that should be addressed.

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Momentary Outage Definition is Changing

We note that ESCOSA still defines a momentary outage as less than one minute in the EDC-12.1 (page 9), specifically excluding outages of less than one minutes from the payments arising out of the Guaranteed Service Standards.

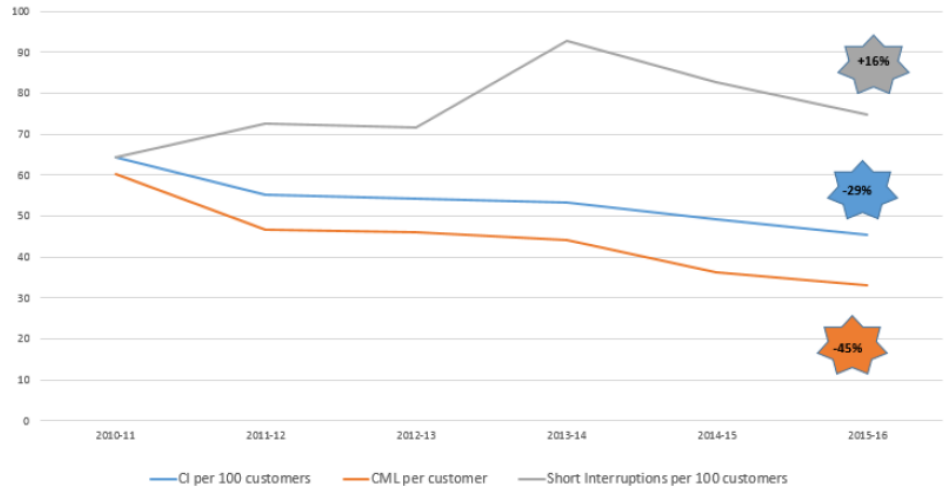
The AER in the "Proposed amendment: Service Target Performance Incentive Scheme (STPIS)" (page 10) accepted the earlier AEMC recommendation to change the definition of a momentary interruption from "less than one minute" to "less than 3 minutes".

ESCOSA need to be mindful of this change and how it will need to be incorporated into the EDC-12.1. It will also mean that SAIDI/SAIFI data will change since outages between 1-3 minutes will fall into the momentary outage category (contributing to MAIFI instead). Standard for SAIDI and SAIFI that applies to SA Power Networks for the next regulatory period, July 2020-June 2025, will need to take this change in the definition of momentary outages into account.

It is particularly troubling that by moving from a 1 to 3-minute definition for a momentary interruption, the performance of all networks is likely to be immediately improved purely on the basis of mathematics, rather than any investment or change in approach by a DNSP. It will also make comparisons between the performance in this regulatory period and the next complex.

SAIDI and SAIFI improve, but MAIFI does not – UK example

Data from the UK indicates that while incentive schemes have successfully resulted in improvements in SAIDI and SAIFI, transient outages have increased. Momentary outages in the GB system are defined as outages of 3 minutes or less.



Note: CI is Customer Interruptions which is equivalent to SAIFI x 100 and CML is Customer Minute Lost, which is equivalent to SAIDI.

Figure 4: Trends in reliability performance for GB DNSPs from 2010.

This increase in momentary outages arises because the technical approach to improve SAIDI and SAIFI typically results in an increase of transient outages.

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Approximately 70 to 80% of faults affecting overhead lines are transient in nature. A key part of the way in which interruptions in GB system have been tackled for transient faults is to replace fuses on tee or spur lines with auto-sectionalisers. This meets the objectives of improving reliability in terms of longer duration interruptions because you no longer have transient faults blowing fuses which requires the line crews to go to the field searching for a problem that is no longer there. However, when you take fuses out and use sectionalisers together with up-line breakers or reclosers, short interruptions increase significantly, because all customers on the main feeders are now affected. Such technologies worked well in the conventional energy system, but aren't well suited to the modern grid.

Unacknowledged impact of Momentary Outages

Impact on Demand customers

We do not support the AER's decision to increase the definition of a momentary outage to an outage lasting 3 minutes or less. The argument that for most customers and outage of 3 minutes is no more annoying than an outage of 1 minutes, ignores the impact that momentary outages have on industrial processes and electronic equipment. There is also an unacknowledged issue with the impact of momentary outages on Distributed Energy Resources (DERs), particularly small-scale generation, which is likely to disconnect as a result of even outages of less than a minute.

While the cost to the average domestic customer of moving from 1 to 3 minutes appears to justify this decision, the cost of managing momentary interruptions (including those that result from poor power quality) will move from the network, who levies to cost on the customer, direct to the customer who will then have to make their own arrangements for ensuring a secure supply. This is particularly the case for industrial and commercial customers. So the cost is still borne by the customer, but removed from the network and becomes another hidden cost, like the cost of all outages of any definition, that is borne by the end user.

Any outage of any duration is likely to drive customers towards a solution that is less network reliant and more self-determined and independent. This may reduce the size of the cost base and is not helpful to the continued operation of our networks. It also penalises those less able to invest in appropriate solutions.

Impact on DERS

Even a short duration interruption of, say, 30 seconds can trip generation on the distribution feeders and lead to this being off for at least 5 minutes.

This has several consequences:

- the renewable resource is unable to export;
- a proportion of demand on the distribution network which was previously met by distributed generation now needs to be met through additional spinning reserve from conventional generators;

Short interruptions have a major impact when large amounts of DG are connected to distribution feeders as they will knock the DG offline. Generation connections have a direct financial loss associated with such outages. Further, when all the DG is knocked offline on a feeder, typically they are off for 5 minutes or more before they can restart. For this approximately 5-minute window, the DNO needs to fully support power to that feeder, which previously had a lower apparent load because the DG was offsetting some

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demand. This means the DNO still needs to provide capacity for peak demand with no DG support, even though that capacity is only called on for minutes at a time, which is in clearly inefficient.

The tolerance for such short interruptions as increasing volumes of DG penetrate the distribution feeders will become less and less over time.

Financial incentives for short interruptions have already been implemented in several locations, including in Victoria where the AER STPIS incentive scheme is applied to Momentary Annual Interruption Frequency Index (MAIFI), through the AER, to Victorian DNSPs, although a move to Momentary Average Interruption Frequency Index Event (MAIFIe) is likely via the current STPIS review. Note that for both MAIFI and MAIFIe, reclosing events are incorporated into a single momentary event.

Networks that are not configured to monitor MAIFIe, will be required to report MAIFI. Regardless, automated reclosers are available that are fully configurable via management software that would complete a full reclosing sequence in less than 20 seconds (although this could be set for much longer periods, if desired by the network, to address bushfire mitigation for instance) and certainly in less than a minute.

It is our view that momentary outages should remain defined as outages of a minute or less, since outages of a few seconds will have negative impacts on customers, large and small, and distributed generation, large and small, with consequential negative impacts on network operation.

Basing Investment on Demand

In the Context section of the report, ESCOSA states “Peak and minimum demand, as well as electricity consumption, are forecast to decline in South Australia. Falling demand means distribution network expenditure will necessarily focus more on maintenance, repair, replacement, and in places localised network reinforcement, than on expanding network capacity.”. The current approach to basing Determinations on demand forecast does not truly represent the cost of running a network. Generation, particularly export, has serious impacts on network infrastructure and approaches to funding network investment need to move away from demand-only forecasts to assessments of the true cost of delivering networks that will support the integration of Distributed Energy Resources.

Therefore, ESCOSA and SAPN should give consideration to Determination requests that use broader assessments of technical requirements than just meeting demand. This is a difficult issue that is not well addressed currently, in Australia or globally, but if we truly want a two-way flow power system, then all users, including exporters, need to contribute to the cost of operating and maintaining that modern system.

Major Event Days

It sometimes appears that DNSPs struggle to meet and improve reliability on a routine “good” day and this should surely be the minimum outcome from any STPIS scheme.

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We would agree that Major Event Days should be removed from the routine STPIS, but not *ignored*. Maintaining supply is becoming increasingly challenging in Australia and will only become more so as climate change continues to impact on weather and bushfires.

Climate change has resulted in more energetic storms, stronger winds, high intensity rain events that lead to flash flooding and more persistent floods, increases in storms involving hail and increases lightning strikes. A drier environment has led to higher bushfire risk. These types of event will become more frequent and our networks need to be able to develop to withstand such events. If significant events are excluded, more and more events that damage networks will be excluded from the STPIS. So performance on major event days needs to be monitored and understood, since the ultimate goal should be resilient and reliable networks for the future and the new climate.

For instance, the recent outages in Victoria on 28 January 2018, were the result of record increases in demand to power air conditioners on the 3 day of a series of 4 days with temperatures in excess of 30°C. Prior to this Sunday, increases in record demand were small increments, the event on Sunday was a "spike", approximately 20 % higher than the previous record demand. Was this a major event? The networks coped on the preceding 2 and following days, so how can this Sunday evening be classified as a major event?

There appears to be no mechanism to incentivise distributors to create the resilient and robust networks we need in the future and while it is appropriate to exclude major events days from STPIS to ensure data isn't skewed by a single event, there does need to be an incentive approach to ensure that networks aren't just addressing reliability today, but in the future.

An additional approach would be use the readily available data from national agencies, such as the Bureau of Meteorology, to determine if an event, typically weather related, was statistically "unusual". The Bureau of Meteorology could also be asked to provide an assessment of whether a particular event was statistically outside normal conditions. In some circumstances, such as a cyclone, it is obvious through warnings from the Bureau of Meteorology that weather conditions were far from normal.

For instance, in the analysis of the winter storms of 2013 in the UK, the UK Meteorological Office was able to confirm that the 2 months of December 2013 and January 2014 were the wettest since 1915 and December was the windiest month since 1993. Meteorological data would be helpful in confirming that a particular event was outside the statistical norms.

It should be noted that the GB equivalent of the Guaranteed Service Level scheme was updated following storms in 2002 to provide a range of categories of event and was again updated in 2015 following the 2013 storms. This resulted in increased payments to customers based on the event categories.

Feeder Classification

The AER has explored different approaches to classifying the four types of feeder in its current review of STPIS (December 2017). The requirement for SAPN to report against regional feeder definitions is helpful to customers, but may impose extra work (costs) on SAPN as they will still need to report against AER classifications.

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Bushfire mitigation

Australia's networks start bushfires and while the total number of fires caused by networks is low at 1% of all fires, the impact of those few fires is often significant with networks being over-represented as ignition sources on extreme fire weather days. While it is relatively easy to assess the networks' impact in Victoria, due to the AER F-factor incentive scheme and required annual reporting to Energy Safe Victoria (ESV), it is less easy to find the data for non-Victorian networks. Bushfires are an issue in all regions of the National Electricity Market and changing climate will only increase the potential for networks to be the source of a fire event and we would welcome other states following the example set by Victoria. The ESV requirement to report network fire starts and the resulting public data would be a welcome, even if the F-factor, or a similar incentive scheme, is not applied to SAPN.