

Ms Lesley Guy
Secretary to the Committee
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Adelaide 5001



By email: leslie.guy@parliament.sa.gov.au

30 June 2017

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Dear Ms Guy,

RE: Select Committee on the State-wide Electricity Blackout and Subsequent Power Outages

As the peak body for the health and community services sector in South Australia, the South Australian Council of Social Service (SACOSS) has an established history of interest, engagement and provision of proposed advice on the necessary market mechanisms and policy for essential services including electricity. We thank the Committee for the opportunity to make a submission to the Legislative Council Select Committee's Inquiry into the State-wide Electricity Blackout and Subsequent Power Outages (the Inquiry).

SACOSS research shows that the cost and supply of basic necessities like electricity have significant and disproportionately greater impacts on vulnerable people. SACOSS advocacy is informed by our members and direct consultations with consumers and other consumer organisations: organisations and individuals who witness and experience these impacts in our community. We encourage continued involvement from stakeholders who are willing to set aside self-interested commercial or ideological perspectives and develop practical and positive solutions to address the rapid energy market transitional issues South Australian consumers are facing and the economic and social interests of all South Australians.

SACOSS has been investing considerable time, effort and resources in the issues in the South Australian wholesale electricity market, commissioning consultant assessments on wholesale market design, configuration, physical characteristics and risks associated with the South Australian elements of the NEM since November 2015. We have produced a significant number of reports and submissions on the SA wholesale market, and attach a number of these as appendices to this submission.

At the outset, we note the complexity of the wholesale power market especially in SA, both around Australia and the world. In order to understand wholesale power markets, it is necessary to appreciate three key factors;

- a) Wholesale Market Fundamentals
- b) Power System mechanics and dynamics
- c) Market and Economic conditions leading to participant behaviour

As the political and financial environments have changed in recent years, it has been the last factor, market and economic conditions that has probably changed the most. The announcement of the closure of Alinta's Northern and Playford Power Stations in Port Augusta indicated the new, fundamental shift in the SA power system mechanics and dynamics, thereby resulting in a new 'normal' being reached in South Australia.

The wholesale electricity and gas systems are complex in nature. SACOSS notes that each generation fuel type, whether based in SA or beyond, has its own characteristics, limitations and constraints. SACOSS is technology agnostic when it comes to generator fuel supply challenges: we are neither for nor against wind and solar farms and see these types of discussions as non-productive.

SACOSS is cognisant of potential technological solutions for the system and energy security issues in SA and the resulting cost impacts, and we will continue to ask who is expected to pay for the solution and risks associated with any change. We recognise that nearly anything is technically feasible in an engineering sense, and it is often just a matter of how much it will cost (in both the short and long term) and who pays for such enhancements.

Causes of the Blackout

SACOSS acknowledges that a number of organisations and institutions have already conducted, or are in the process of conducting, reviews in to the causes of the state-wide electricity blackout and subsequent power outages. On March 28, the Australian Energy Market Operator (AEMO) released its final report into the Black System event. We note that among others, the Australian Energy Regulator and the Australian Energy Market Commission still have their own investigations underway. Hence, we believe there are still further important avenues to be explored.

Nevertheless, we observe that in its report, AEMO has stated that “the report illustrates the technical challenges of the changing generation mix and the need for these to be managed with the support of efficient and effective regulatory and market mechanisms that work together for the least cost and long-term interest of consumers.”¹ SACOSS agrees that the changing generation mix is at the heart of the causes of the Blackout and subsequent power outages. Whilst we recognise that for each outage there are particular system operational issues in play, we observe that it is the changing generation mix which is the constant in almost all cases in the recent period.

SACOSS understands that the system security issues which South Australia is now facing have been investigated by AEMO and other organisations for some time due to the rapidly increasing proportion of non-synchronous generation in South Australia. Conventional synchronous generation has been acknowledged as contributing to fault level for ride-through of power system disturbances, fast-acting voltage control, inertia, and fast-acting frequency control when connected. In October 2014, AEMO and ElectraNet reported on renewable energy integration in South Australia:

“In recent years wind and solar photovoltaic (PV) energy generation has increased as a proportion of the total generation mix across all National Electricity Market (NEM) regions. This has been driven largely by climate change policies aimed at reducing carbon emissions in Australia, and advances in technology making alternative-energy sources more cost-effective...While these developments benefit SA and the NEM, having a high proportion of wind and PV generation can present a risk for SA if the Heywood Interconnector link to Victoria is disconnected at a time when all local conventional synchronous generators are offline. This occurs as wind and PV generators, by themselves, are not able to provide the required controls to ensure system security.”²

Failures in federal climate policy

SACOSS believes that in the context of the state-wide blackout and subsequent power outages, the key causation can be traced back to the construction and management of the Renewable Energy Target (RET). The RET is a legislated target designed to ensure Australia uses more renewable energy and, as a consequence, reduces its emissions. The aim is for 23.5 per cent of Australia's energy (the equivalent of 33,000 gigawatt hours) to come from clean sources such as wind, solar and hydro-electric by 2020.

¹ AEMO (2017) Black System South Australia 28 September 2016 at http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf p.1

² AEMO (2014) Renewable Energy Integration in South Australia at <http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/FPSSP-Reports-and-Analysis> p.2

The RET scheme began on 1 April 2001 with the Commonwealth Government's Mandatory Renewable Energy Target (MRET). The MRET targeted the generation of 9500 GWh of extra renewable electricity per year by 2010. In 2009, the MRET was replaced by the RET which altered the target from 9500 GWh by 2010 to 45,000 GWh by 2020 and introduced the Solar Credits scheme. Since the passage of legislation in 2010, there are now two parts of the scheme:

- The Large-scale Renewable Energy Target (LRET) has a target of 41,000 gigawatt hours (GWh) by 2020 and only large-scale renewable energy projects are eligible;
- The Small-scale Renewable Energy Scheme (SRES) targets a theoretical 4000 GWh annually and is eligible only to small-scale or household installations.

The RET was reviewed in 2012 by the Climate Change Authority which did not recommend any major structural changes to the scheme. On 17 February 2014, the review of the RET scheme was jointly announced by the Hon Ian Macfarlane MP, the Minister for Industry, and the Hon Greg Hunt MP, the Minister for the Environment. The Australian Government appointed an Expert Panel to undertake the review. In 2015, the new target for large-scale generation of 33,000 GWh in 2020 proposed to double the amount of large-scale renewable energy being delivered by the scheme compared to current levels and was intended to lead to about 23.5 per cent of Australia's electricity generation in 2020 to be from renewable sources.

SACOSS notes that at the time of the MRET Review in 2009, the system security risks of increasing penetration of renewables were already known, as evidenced by a number of major reviews including by the Independent Market Operator Renewable Energy Generation Working Group between 2008-2010. Furthermore, since that time, the system security risks have been rapidly escalating in terms of severity while the design of the scheme has not been changed. SACOSS believes that a key failure of this arm of climate policy has been the way in which the RET has been constructed without any reference to state quotas. Also, given the known system security issues, SACOSS considers that it is highly inappropriate that the rollout of the RET has not been federally managed in any way to mitigate the system security risks.

Systemic issues within AEMO

While federal climate policy has largely driven the influx of renewables in to South Australia and thereby unbalanced the relationship between conventional synchronous and non-synchronous generation in the South Australian wholesale market, an over-focus by the Market Operator on transmission solutions to address the imbalance has compounded the frequency and voltage control issues.

In 2012, AEMO and ElectraNet published a RIT-T Project Assessment Draft Report (PADR) for expansion of the Heywood Interconnector to address voltage and thermal limits impacting on import and export capacity. At that time, SACOSS wrote that:

"SACOSS supports the consideration of options to expand the capacity of interconnection. The questions for us are in relation to ensuring the most cost-effective options are pursued... Based on the summarised costs and projected benefits (outlined in Table 6-1, pg. 41), SACOSS is drawn more to Option 4 than the PADR's preferred Option 1b. We note that Option 4 is largely a subset of the works of 1b but comes at a cost of \$40.6m (NPV of \$30.6m in Table 6-3) compared to the \$107m (NPV of \$79.8m in Table 6-3) of Option 1b. In this respect Option 4 could be seen as an early stage of the proposed preferred option... One of the main differences between Option 4 and 1b is the inclusion of a 3rd Transformer at Heywood (circa \$37m)."³

While the SACOSS preferred option was not endorsed by AEMO and ElectraNet and the more costly option was pursued, SACOSS notes that the upgrade of Heywood has now been found to be unnecessary as the Heywood Interconnector can only rarely operate at 650MW. Option 1a, which was supported by SACOSS as above, was minus the third 500/275kV transformer at Heywood

³ SACOSS (2012) SACOSS RIT-T Submission at <https://www.sacoss.org.au/submission-south-australia-%E2%80%93-victoria-heywood-interconnector-upgrade-%E2%80%93-regulatory-investment-test> p.2

SACOSS has broader concerns about AEMO’s decision making processes. While we understand that the technical issues are extremely complex in each load shedding situation that occurs, and that it takes considerable investigation to accurately determine the cause, SACOSS has strong concerns about what we perceive as systemic issues within AEMO. SACOSS questions whether there is an over-reliance on automated decision making as opposed to independent decision making. For instance, as the example from March 3 illustrates below, SACOSS believes there was sufficient evidence for AEMO to have been directing on generators at 15:04, rather than allowing the dispatch engine to run its course and effectively hope for the best.

Would Batteries Have Helped?

On the 3rd March 2017, at approximately 15:03 EST, a major CVT transformer failure in the ElectraNet switchyard at Torrens Island in South Australia caused a series of thermal unit trips in very quick succession, moving the SA region very close to the pre-conditions for another system black (namely the Heywood interconnector running above 900MW for any period of time). Figure 1 shows the 15-minute period between 15:00 and 15:15, at a 4-second data level.

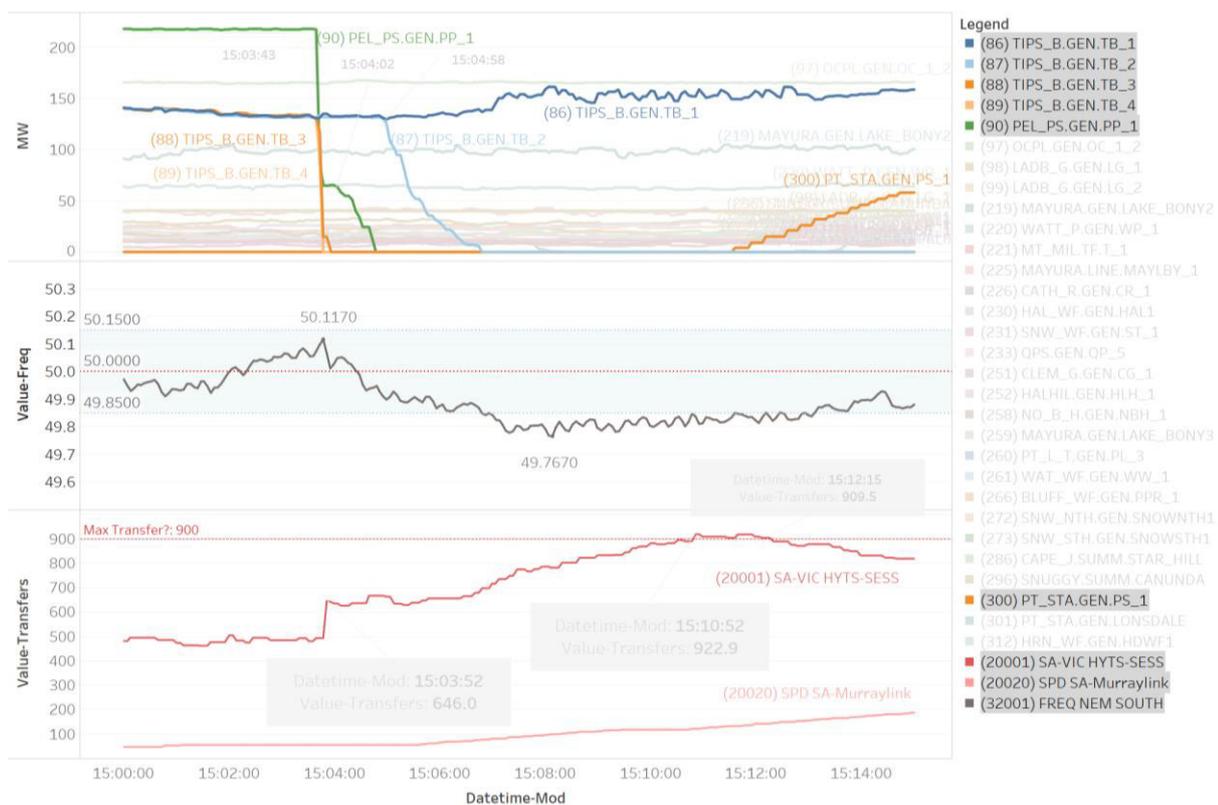


Figure 1: Actual Events 3 March 2017 ~15:04

Figure 1 shows:

- 3 x Torrens B units and 1 x Pelican Point unit tripping around 15:04
- At that time, frequency across SA/Vic/NSW was at 50.117
- The Heywood interconnector increased from approximately 500MW up to 650MW, progressively moving to 922MW by 15:12
- The start-up of the Port Stanvac units in the 15:15 dispatch interval, together with the Murraylink interconnector increasing from approx. 80MW at the time of the trip to nearly 200MW by 15:15, saved the Heywood interconnector from tripping from 900MW (which would almost certainly have resulted in a system black in SA)

Impact of Batteries

Although no load was intentionally shed (there was up to 250MW that tripped due to the voltage fluctuations), the proponents of battery technologies have stated that their technology would prevent these types of events.

A number of key points should be noted here:

- Batteries above 5MW will be classified by AEMO as both a scheduled generator and scheduled load. Given the timing of this event, the battery would not have received a 5-min dispatch target until the same time as the Port Stanvac units;
- In the event that the battery is enabled for FCAS, the frequency did not move outside the normal operating frequency band until nearly 15:07, 3 minutes after the event, and even then, the contingency FCAS services may not have been triggered; or
- As a final means to get the battery in service, AEMO could have directed the battery on should they have considered that necessary (although it could be argued they could have equally done this with other, existing generation – which they did not).

Therefore, would a 50MW or 100MW battery have changed the outcome? Unlikely.

Dispatch of Batteries

One of the most important considerations for any technology will be how it will be integrated with the existing generation and load solutions.

The NEM's 5-min energy and FCAS market is one of the most sophisticated designs in the world. In other global markets, the dispatch decision is generally a manual process following a call, in a large power system where the impact of the battery on frequency control or management is generally less significant. For the SA power system, with an average demand of 1500MW, 2-3 100MW batteries, being dispatched near instantaneously, will have a significant impact on the power system stability, subsequently resulting in AEMO taking a more conservative and linear approach to its dispatch.

Lessons Learnt from the Blackout

In terms of the immediate and long term system security issues currently impacting most severely in South Australia but of long term consequence for the NEM, SACOSS cautions against knee jerk responses to the issues emerging as a result of an energy market in transition. SACOSS believes there is sufficient evidence for a review of the RET and that it is time for an orderly transition from the RET to an Emissions Intensity Scheme. SACOSS also supports independent reviews of the actions of AEMO around recent power system outages. SACOSS cautions against an over-reliance on any one technology to resolve South Australia's system security issues at this stage of the energy market transition.

As a member of the Australian Energy Market Commission's (AEMC) Technical Working Group, SACOSS is deeply engaged in the AEMC's System Security Frameworks Review and we fully support the directions and processes of this Review in terms of identifying efficient solutions to deliver system security across the NEM. We have welcomed the State Government's Energy Plan with its focus on gas as a transitional fuel, providing for developments in battery storage and shoring up energy security.

We thank you in advance for consideration of our comments. If you have any questions relating to this submission, please contact Jo De Silva on jo@sacoss.org.au or 08 8305 4211.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'RWomersley', enclosed within a thin black rectangular border.

Ross Womersley
Chief Executive Officer

Appendices

Appendix A

SACOSS (2016) Looking Around the Corner: A Discussion on Current South Australian Power System Risks

Appendix B

SACOSS (2017) Emergency Frequency Control Submission to AEMC

Appendix C

SACOSS (2017) System Security Market Frameworks Review Submission to AEMC

Appendix D

SACOSS and St Vincent de Paul (2017) System Security, Low Emissions and Electricity Prices Submission to Climate Change Authority and AEMC

Appendix E

SACOSS and St Vincent de Paul (2017) Climate Change Review Submission to Australian Government

Appendix F

SACOSS (2017) Five Minute Settlement Submission to AEMC

Appendix G

SACOSS (2017) Energy Security Target Submission to DSD



SACOSS

*South Australian Council
of Social Service*

Looking Around the Corner

A discussion on Current South Australian Power System Risks

**SACOSS Report
February 2016**

Looking Around the Corner - A Discussion on Current South Australian Power System Risks
SACOSS Report February 2016

First published in February 2016 by the
South Australian Council of Social Service

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Executive Summary

The South Australian Council of Social Service (SACOSS) has been active in South Australian energy market matters for some time, especially in relation to consumer protection, retail pricing and network determinations, but has not generally commented on issues associated with NEM (National Energy Market) wholesale markets ... until now.

SACOSS commissioned an initial work piece to provide analysis and comment on the impact of recent wholesale market activities and decisions by NEM participants on future power station operating regimes, and to discuss the likely impact on the South Australian power system.

The objectives of the project were to:

- Develop SACOSS' understanding of the fundamental wholesale market design, configuration, physical characteristics and risks associated with the South Australian elements of the NEM;
- Explain the reasons behind recent market pricing outcomes; and
- Comment on the likely impacts of the impending shutdown of Alinta's Northern Power Station.

SACOSS note there are still a number of key issues that require further work:

- Northern Power Station will be shutting down around the end of March 2016 and although the SA power system has 'survived' in the past with both Northern units out of service for up to 3 months, the more enduring and consequential effects of this are not clear.
- Potential changes in operating regimes have been announced for two significant SA power stations:
 - AGL's Torrens A Power Station will potentially be mothballed by mid-2017;
 - Engie (formerly GDF Suez) have declared to the Australian Energy Market Operator potential changes in its running regime at Pelican Point across winter 2016.
- Even with Northern Power Station operating in recent months, there continues to be a high degree of ramp-rate limited and constrained plant in SA, thereby allowing the strategic rebids of any participant to be extremely sensitive to increasing wholesale market prices, for as little as 5 minutes, in South Australia.

Of particular concern, we note that South Australian volume weighted average spot prices for 2015/2016 year-to-date, is currently tracking to levels seen when the carbon price was in place for the 2 year period from July 2012 to June 2014, as highlighted below in the Table 1.

Period	\$/MWh
2011-12	32
2012-13	74
2013-14	68
2014-15	42
2015-16 (YTD to 1-Jan-2016)	64

Table 1: SA Annual volume weighted average spot prices

Source: AER data

Similarly, we noted recent increases in the SA contract price for Calendar Year 2016, a fact many business and industrial users have made clear to us. SACOSS will continue to monitor wholesale market pricing outcomes in conjunction with the regular analysis by AEMO and especially the AER.

The load shedding arrangements noted in this report to manage power system frequency have an immediate and consequential impact on SA consumers. In the event more load shedding events are required (or the size of events increases) in the future, SACOSS wanted to understand the impacts of more significant load shedding events – state-wide blackouts.

If the likelihood of an event was say 1 in 30 years, the economic impacts of a state-wide blackout would be somewhere between \$6m and \$28m annually using the data detailed in this report (see table 2 and 3). The Australian Energy Market Operator is currently procuring System Restart Ancillary Services (SRAS) in SA worth \$2.3m annually (which still includes Northern Power Station), which effectively implies a probability of an approx. 1 in 90 year event using Table 2's SA Res/Bus Value of Customer Reliability impact assessment: SACOSS strongly believes that this appears to be far too low a probability.

Recommendation:

SACOSS requests an independent investigation by the SA government into the events on 1 Nov 2015 when SA separated from the eastern states, including load flow 'what-if' analysis had Torrens A4 and Northern 2 not returned to service earlier in the day.

SACOSS will monitor events over summer 2015/16 and assess its response and actions in April 2016, as the impacts of the Northern Power Station shut down take effect, in order to respond constructively on behalf of South Australian consumers who are arguably at the forefront of a paradigm shift in power system operation; certainly within Australia, if not the world.

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About SACOSS

The South Australian Council of Social Service is the peak non-government representative body for health and community services in South Australia, and has a vision of Justice, Opportunity and Shared Wealth for all South Australians.

SACOSS does not accept poverty, inequity or injustice. Our mission is to be a powerful and representative voice that leads and supports our community to take actions that achieve our vision, and to hold to account governments, business, and communities for actions that disadvantage vulnerable South Australians.

SACOSS has a long-standing interest in the delivery of essential services. Our research shows that the cost of basic necessities like electricity impacts greatly and disproportionately on vulnerable and disadvantaged people.

SACOSS' purpose is to influence public policy in a way that promotes fair and just access to the goods and services required to live a decent life. We undertake policy and advocacy work in areas that specifically affect disadvantaged and low income consumers in South Australia.

SACOSS has a strong membership base of around 300 people and organisations from a broad cross-section of the social services arena. Members of our organisation span both small and large agencies, peak bodies, service providers, individuals, and some government departments.

SACOSS is part of a national network, consisting of ACOSS and other State and Territory Councils of Social Service.

Project Overview

The South Australian Council of Social Service (SACOSS) has been active in South Australian energy market matters for some time, especially in relation to consumer protection, retail pricing and distribution tariff reviews, but has not generally commented on issues associated with NEM (National Energy Market) wholesale markets ... until now.

SACOSS commissioned an initial work piece to provide analysis and comment on the impact of recent wholesale market activities and decisions by NEM participants on future power station operating regimes, and to discuss the likely impact on the South Australian power system.

The objectives of the project were to:

- Develop SACOSS' understanding of the fundamental wholesale market design, configuration, physical characteristics and risks associated with the South Australian elements of the NEM;
- Explain the reasons behind recent market pricing outcomes; and
- Comment on the likely impacts of the impending shutdown of Alinta's Northern Power Station.

The project explored the current and future landscape of South Australia from a wholesale market perspective in order for SACOSS to better understand potential impacts to residential, commercial and industrial consumers in SA for the coming years.

The project analysed some of the excellent work undertaken by the Australian Energy Market Operator (AEMO), ElectraNet (the South Australian Transmission Network Service Provider) and Australian Energy Market Commission (AEMC). We commend these organisations on their work to date and agree that there is a considerable amount yet to be completed. SACOSS commits to being involved as much as practicable.

SACOSS note there are still a number of key issues that require further work:

- Northern Power Station will be shutting down around the end of March 2016 and although the SA power system has 'survived' in the past with both Northern units out of service for up to 3 months, the more enduring and consequential effects of this are not clear.
- Potential changes in operating regimes have been announced for two significant SA power stations:
 - AGL's Torrens A Power Station will potentially be mothballed by mid-2017;
 - Engie (formerly GDF Suez) have declared to AEMO potential changes in its running regime at Pelican Point across winter 2016.
- Even with Northern Power Station operating in recent months, there continues to be a high degree of ramp-rate limited and constrained plant in SA, thereby allowing the strategic rebids of any participant to be extremely sensitive to increasing wholesale market prices, for as little as 5 minutes, in South Australia.

Of particular concern, we note that South Australian volume weighted average spot prices for 2015/2016 year-to-date, is currently tracking to levels seen when the carbon price was in place for the 2 year period from July 2012 to June 2014, as highlighted below in the Table 1.

Period	\$/MWh
2011-12	32
2012-13	74
2013-14	68
2014-15	42
2015-16 (YTD to 1-Jan-2016)	64

Table 2: SA Annual volume weighted average spot prices

Source: AER data

Similarly, we noted recent increases in the SA contract price for Calendar Year 2016, a fact many business and industrial users have made clear to us. SACOSS will continue to monitor wholesale market pricing outcomes in conjunction with the regular analysis by AEMO and especially the AER.

Continued Focus

SACOSS agree with a number of statements made by AEMO in recent time regarding SA power system challenges, and while SACOSS accepts that under normal conditions, system inertia is not an issue, we do regard a number of critical issues still require further risk mitigation:

- The lack of underlying inertia in the SA power system and frequency response capability when separated from Victoria, resulting in increased reliance on the Vic-SA interconnector, and the dependence of SA on frequency emergency management schemes.
- A number of additional market and system changes are likely to be required (and paid for by someone, possibly consumers!) in the foreseeable future to accommodate the rapidly changing wholesale market environment.

Inertia

Inertia refers to the rotational momentum of the synchronous generators connected to the power system and defines the degree to which the generating unit will resist the frequency change. The ‘heavier’ the physical generating unit, the larger the momentum it will have when in operation, and the more difficult it is to slow down.

Under normal conditions, when SA is connected to the NEM via Vic-SA, the frequency in SA will be the same as the frequency in the other eastern states and NEM inertia will slow down the frequency decay that may occur from a plant trip in the SA region. However, if SA is disconnected from Victoria (Murraylink can inject power but not presently regulate frequency), it is the inertia of the SA generators and network elements alone that will support frequency in SA.

Of particular interest has been SACOSS’s own analysis on Inertia¹. Although not an expert in this field, it is clear to us that the initial investigations conducted by AEMO in 2013² (Figure 2) and recently re-examined in AEMO’s Electricity Statement of Opportunities in October 2015, highlight a fundamental challenge with power system inertia in SA if/when the interconnector to Victoria is undergoing maintenance, partially available or trips.

¹ Inertia refers to the rotational momentum of the generators connected to the power system and defines the degree to which the generating unit will resist any power system frequency changes

² AEMO, Integrating Renewable Energy – Wind Integration Studies Report 2013, Figure 3.4

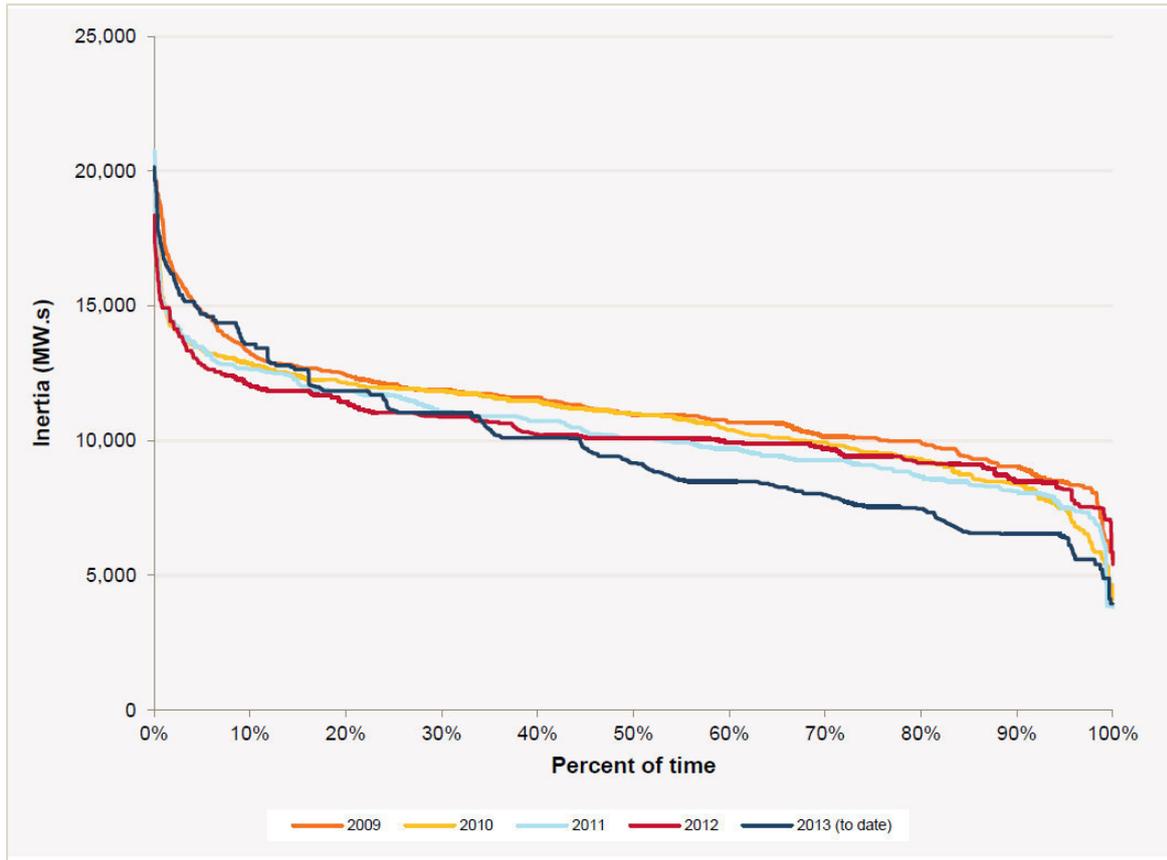


Figure 2: AEMO Chart (Figure 3.4) of SA System Inertia, 2013

Source: AEMO

SACOSS' consultants were able to create a proxy for AEMO's inertial calculations for SA using publicly available 5-minute generation data and static inertia figures from constraint equations³. The proxy, although extremely simplistic and not indicative of TNSP plant in service, showed generally similar trends for historical periods. When the 2015 actual data was modified to show the potential effects of both Northern units shutting down for 2016, from a percentage change point of view, the inertia impacts of Northern Power Station shutting down were clear (Figure 3).

³ It is only a proxy for inertia as it is missing key inertia data for ElectraNet assets that are not publically available.

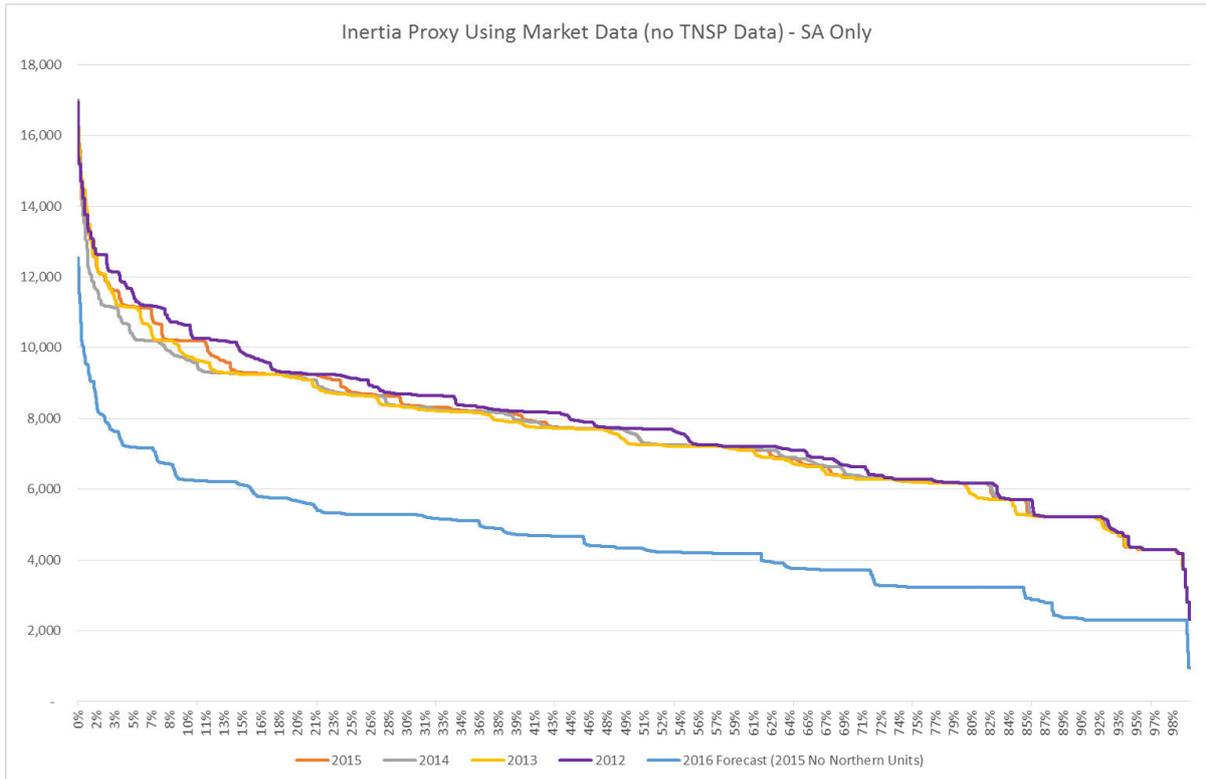


Figure 3: Inertia Proxy using Market Data (no TNSP Data) – SA Only

It should be noted that the shutdown of the Northern units is likely to see a response from other market participants and possibly network assets, which should see inertia levels increase for an SA islanded system, although this would only occur if the responding generators contribute inertia to the system (which does not currently occur with most wind and solar assets). SACOSS will work with relevant groups to improve the accuracy of this Inertia proxy in 2016 to ensure adequate public transparency on this complex, but very important issue for SA.

The consequence of low inertia for a separated SA power system is the heavy reliance on under-frequency load shedding (or generation tripping in the case of over over-frequency events), an outcome that is detrimental to SA consumers in many ways. The experiences of Victoria in 2007 when 2200MW of load shedding occurred, costing the Victorian economy an estimated \$600m (in 2015 dollars) have been used as a point-of-reference to understand the importance of solving some of these challenges correctly⁴. The events of 1 November 2015 in South Australia serve as a similar warning to ensure appropriate risk controls are in place for the benefit of SA consumers.

⁴ Victorian Government, Major Incident Report 16 Jan 2007
<http://www.energyandresources.vic.gov.au/energy/safety-and-emergencies/energy-supply-emergencies/january-supply-interruptions-executive-summary> [Accessed 20 November 2015].

Economic Impacts of State-wide Blackout

The load shedding arrangements noted above to manage power system frequency have an immediate and consequential impact on SA consumers. In the event more load shedding events are required (or the size of events increases) in the future, SACOSS wanted to understand the impacts of more significant load shedding events – state-wide blackouts.

SACOSS has considered two methods for assessment: Value of Customer Reliability (VCR) and a recent example from Victoria that resulted in load shedding levels that were approximately the same size as typical SA demand profiles.

VCR represents, in dollar terms, the willingness of customers to pay for the reliable supply of electricity. The values produced are used as a proxy and can be applied for use in revenue regulation, planning and operational purposes in the NEM. SACOSS has been an active supporter of this method. It is important the VCR figures accurately reflect the value of reliability across a range of customers, with the assessment below capturing the benefit for both business and residential customers⁵.

The next method for assessment came from assessment made in Victoria from a January 2007⁶ major electricity supply interruption. In that case, consultants were able to assess the direct AND indirect economic impacts at a value of \$600m in today's dollars for a partial impact to the Victorian system (herein referred to as the 'Vic Event').

For the purposes of this assessment, we have used the following assumptions:

- Median SA Operational demand⁷ for the last 4 years is approx. 1500MW;
- Northern Power Station is not available for generation or SRAS (as will be the case from April 2016);
- Torrens Island has 3 B units and 1 A unit that are warm enough for immediate generation;
- Pelican Point is only capable of half-load as indicated through recent running profiles and in recent AEMO announcements⁸;
- System Restart Ancillary Services (SRAS) sources (Dry Creek and Quarantine⁹) work as expected and all SA synchronous generation (except Snuggery, Port Lincoln and

⁵ AEMO VCR Review, Nov 2015, [Accessed 10 December 2014]

<http://www.aemo.com.au/Electricity/Planning/Value-of-Customer-Reliability-review>

⁶ In this event, 2300MW was shed (2200 initially and 100MW of smelter load shortly thereafter) and was not fully restored until over 4 hours later (unserved energy was 7100MWh), with the economic effect estimated at approx. \$500m (\$600m in today's terms) with indirect costs as much as the direct costs <http://www.energyandresources.vic.gov.au/energy/safety-and-emergencies/energy-supply-emergencies/january-supply-interruptions-executive-summary>

⁷ Operational Demand is used (as opposed to total demand) as AEMO has stated it will not allow wind generation to be used until the system rebuild is greater than approx. 40% or the Heywood interconnector is available.

⁸ AEMO ESSO Update, October 2015.

⁹ The 2015 Independent Review of SRAS Process Improvements by DGA Consulting identified Quarantine and Northern Power Station as the 2015/16 SRAS sources (p 27). It is assumed when Northern Power Station shuts down in April 2016, Dry Creek units will be enabled for SRAS but this is yet to be confirmed.

Ladbroke Grove – all due to remote location) are supplied power for safe shut-down, auxiliary loads (approx. 100MW) and commenced export of energy within 4 hours with 600MW of load restored; and,

- All demand is restored within 8 hours¹⁰ at an eventual rate of 200MW/hr given the load blocks that would be able to be handled by the smaller sized generating units in SA.

Table 2 shows the possible economic impacts using both methodologies with the length of the event shown at various points.

Time (in hrs)	Demand (MW)	Unserviced Energy (MWh)	Accumulated Impact to SA Economy (\$m)	
			SA Residential/ Business VCR: \$35.8k/MWh	Vic Event: \$84.5k/MWh
Just prior to event	1500	0	0	0
End 1 st Hour	0	1,500	53.7	126.8
End 2 nd Hour	250	2,750	98.5	232.4
End 4 th Hour	700	4,550	162.9	384.5
End 6 th Hour	1100	5,550	198.7	469.0
End 8 th Hour	1500	5,750	205.9	485.9

Table 2: Economic Impact to SA using a Desired Scenario

If the above scenario is delayed by just 4 hours with a slower than expected restoration rate, the impacts are even more significant.

Time (in hrs)	Demand (MW)	Unserviced Energy (MWh)	Accumulated Impact to SA Economy (\$m)	
			SA Residential/ Business VCR: \$35.8k/MWh	Vic Event: \$84.5k/MWh
Just prior to event	1500	0	0	0
End 1 st Hour	0	1,500	53.7	126.8
End 2 nd Hour	50	2,950	105.6	249.3
End 4 th Hour	250	5,550	198.7	469.0
End 6 th Hour	450	7,750	277.5	654.9
End 8 th Hour	850	9,250	331.2	781.6
End 10 th Hour	1250	9,950	356.2	840.8
End 12 th Hour	1500	10,000	358.0	845.0

Table 3: Economic Impact to SA using a 4-hour Delay Scenario

If the likelihood of an event was say 1 in 30 years, the economic impacts of a state-wide blackout would be somewhere between \$6m and \$28m annually using the above two table's outcomes. AEMO is currently procuring SRAS in SA worth \$2.3m annually (which still includes Northern Power Station), which effectively implies a probability of an approx. 1 in 90 year event using Table 2's SA Res/Bus VCR impact assessment: this appears too low a probability!

¹⁰ Most demand in the March 2015 blackout in Turkey was able to be restored within 8-10 hours although Turkey have a high level of hydro generation capability (which had effectively pushed thermal-gas generation offline) during high running periods.

Moving Forward

SACOSS has taken on board a number of matters for further consideration and involvement with the relevant State and National bodies, including:

1. Maintaining a 'Watching Brief' on a number key items over the next 2-6 months.
2. Ensure SACOSS' involvement in the following key market issues, reviews and consultations:
 - The imminent release by AEMO/ ElectraNet Report on SA Power System issues, ensuring involvement in possible working groups and forums to better represent the needs of SA consumers;
 - Formation of a working party to bring AEMO/ElectraNet/SA State Government and interested participants together on SA power system implications BEFORE potential system incidents occur.
 - Follow the potential developments of an inertia market through 2016 given recent AEMO comments and internal SACOSS analysis.
3. SACOSS requests an independent investigation by the SA government into the events on 1 Nov 2015 when SA separated from the eastern states, including load flow 'what-if' analysis had Torrens A4 and Northern 2 not returned to service earlier in the day.

Given the amount of focus and interest on the South Australian power system, as well as the expert advice indicating particular challenges in SA, this project has highlighted the need for SACOSS to continue to be involved in wholesale market matters. SACOSS will monitor events over summer 2015/16 and assess its response and actions in April 2016, as the impacts of the Northern Power Station shut down take effect, in order to respond constructively on behalf of South Australian consumers who are arguably at the forefront of a paradigm shift in power system operation; certainly within Australia, if not the world.

Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235



Lodged online

8 February 2017

Dear Mr Pierce,

Marjorie Black House
47 King William Road
Unley SA 5061

P. 08 8305 4222
F. 08 8272 9500
E. sacoss@sacoss.org.au
www.sacoss.org.au

ABN 93 197 662 296

RE: ERC0212 - Draft Rule Determination - National Electricity Amendment (Emergency Frequency Control Schemes) Rule 2017

Thank you for the opportunity to comment on the *Draft National Electricity Amendment (Emergency frequency control schemes) Rule 2017*. As the peak body for the health and community services sector in South Australia, the South Australian Council of Social Service (SACOSS) has an established history of interest, engagement and provision of proposed advice on the necessary market mechanisms and policy for essential services. Our research shows that the cost of basic necessities like electricity impacts greatly and disproportionately on vulnerable people. Our advocacy is informed by our members and direct consultations with consumers and other consumer organisations: organisations and individuals who witness and experience these impacts in our community.

SACOSS supports the Australian Energy Market Commission's Draft Rule to enhance the framework for emergency frequency control in the National Electricity Market. SACOSS warmly welcomes the intent of the Draft Rule, to deliver emergency frequency control efficiently and keeping costs as low as possible. SACOSS also welcomes the Draft Rule's provision for clear governance arrangements, including robust cost benefit processes. Considering the system security issues in the South Australian context, SACOSS is firmly of the belief that strong governance is essential to the efficient operation of the market in the long term interests of consumers. SACOSS considers that given the issues emerging in the NEM as a result of the continual process of aligning climate and energy policy, the strengthening of the existing energy market governance framework is a paramount issue. In this context, SACOSS believes that the AEMC Draft Rule is in line with the 2015 Vertigan, Yarrow and Morton Review of Governance Arrangements for Australian Energy Markets and notes that SACOSS continues to remain hopeful that the recommendations of the Vertigan, Yarrow and Morton Review will be fully implemented as a matter of high priority.

SACOSS wishes to draw the Commission's attention to SACOSS' extensive consideration of the provision of a new category of contingency event, the protected contingency event. SACOSS believes that provision of a protected contingency event is an essential measure to address the system security issues we are experiencing in South Australia as a result of the issues surrounding alignment of climate and energy policy. Through the SACOSS participation in the AEMC's System Security Technical Working Group and as a result of more extensive consultations and research, SACOSS believes the proposed governance measures are correct, namely (to quote from the Commission):

- AEMO will decide when an event should be classified as a protected event;
- The Reliability Panel will determine a post-contingency operating state for the protected event. This may include specific bands for frequency following the event, times for frequency restoration, or maximum amounts of load that can be shed, and

- AEMO will then operate the power system so that it will be in a configuration that matches the post-contingency operating state, if the protected event were to occur.¹

In particular, SACOSS notes that the Reliability Panel is the appropriate body to determine a post-contingency operating state for the protected event, given the scale of the costs involved and the long term interests of consumers. SACOSS considers that it is appropriate for this decision to be outside of the market operators decision making parameters, as per the intent of the recommendations of the Vertigan, Yarrow and Morton Review.

We thank you in advance for consideration of our comments. If you have any questions relating to the above, please contact SACOSS Senior Policy Officer, Jo De Silva on (08) 8305 4211 or via jo@sacoss.org.au.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'RWomersley', with a large, sweeping flourish underneath.

Ross Womersley
Chief Executive Officer

¹ <http://www.aemc.gov.au/getattachment/039f10d5-39a6-4a6f-9d69-7683b6070582/Information-sheet.aspx>

Mr Sebastien Henry
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235



21 April 2017

Lodged online

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www.sacoss.org.au

ABN 93 197 662 296

Dear Mr Henry,

RE: EPR0053 - System Security Market Frameworks Review - Directions Paper

SACOSS is the peak body for the non-government community services and health sectors in South Australia, with a long-standing interest in the efficient delivery of essential services. We thank the AEMC for their Directions Paper on the critical electricity market developments related to the System Security Market Frameworks Review.

SACOSS appreciates the significant work already conducted by the AEMC, the Technical Working Group of which we have been a member, the Interim Report and opportunity to meet with the Review team this week: we greatly value this type of engagement and are very appreciative of the AEMC openness and willingness to engage. SACOSS has been investing considerable time, effort and resources in this area of the market, commissioning consultant assessments on SA inertia since November 2015, to ensure we are across many of the issues raised in this Directions Paper. We encourage continued involvement from the consumer-side of the industry.

Whilst we accept that the widespread deployment of new, non-synchronous generating technologies, such as wind farms and solar panels, is having an impact on the power system, there are several other areas we wish to see explored in parallel with the matters raised in the Directions Paper. It is our contention that the Directions Paper has very quickly focussed in on TNSP's providing many of the required solutions, a position we are not convinced will be the most cost effective in the short or long term.

We thank you in advance for consideration of our comments. If you have any questions relating to the following material, please contact Jo De Silva on jo@sacoss.org.au or 08 8305 4211.

Yours sincerely,

Ross Womersley
Chief Executive Officer

SACOSS Comments

1. Jumping to TNSP solution provision

SACOSS recognises the identified frequency management options the AEMC has developed, but has some concern with the way these options have been distilled into the 'two staged packages' for further stakeholder feedback. These conclusions, whilst appearing sound and reasonable, concentrate too heavily on TNSP/DNSP provision of the solutions, which at this stage are still technically nebulous and therefore, would appear a poor fit for the current TNSP expenditure models.

Given frequency response is currently the domain of the generation fleet (albeit requiring far more significant tuning and model development as per recent ESCOSA submissions¹), and FFR by its nature is a form of frequency control, it appears inefficient from the outside to be now suggesting TNSP develop and implement solutions in an area they currently mainly observe. The recent high FCAS price events in SA over the last 18 months (see Figure 1), which should be starting to incentivise FCAS provision in the market which would lower the prices faced by consumers, would be far less effective if the TNSP's were now providing the service. SACOSS acknowledges that cross-utilisation between some network equipment, voltage management and inertia services may occur, but would like to see greater identification of these requirements, in much the same way as NSCAS services are identified before solutions are implemented. As noted in the report, AEMO's NTNDP in December 2016 has only just started to consider NSCAS assessments for some of the system strength issues that were identified in SA.

SACOSS acknowledge and recognise TNSP's will be involved (as should the generation and demand-response communities where possible): all will need to be involved to achieve the most efficient and cost-effective solution for the consumer.

2. Non-Synchronous Generation FFR Capability Requirement

The inclusion in the immediate package of requiring only non-synchronous generation to provide FFR capability seems inefficient: it should be all generation or none. Inertia will remain an issue whether there is high or low wind or solar plant in service given the likely displacement of the high inertia, synchronous generation. Without claiming to be proficient in power systems engineering, SACOSS would contend this generator obligation should be extended to all new entrant generation, irrespective of their fuel or dispatch nature. Similarly, mandating a FFR service for the generation fleet but without a means to recover costs, whilst at the same time leaving the development to the TNSP's (who will undoubtedly spend significant capital acquiring and developing inertia/FFR capability for the immediate term, but potentially paid for by customers for the long term), again seems contrary to good electricity practise. If a market signal is desired in the long term (and SACOSS agree this is generally more desirable than not), then use of short duration, audited contracts for the short-term (say 1-4 year in tenure) for the provision of the required inertia or FFR services while the technical envelopes for the market are developed, would seem far more efficient than the current direction.

¹ <http://www.escosa.sa.gov.au/ArticleDocuments/1047/20170208-Inquiry-LicensingInverterConnectedGeneratorsIssuesPaperSubmission-KSummers.pdf.aspx?Embed=Y>

3. Technical Considerations of FFR

Much of the discussion by AEMO and the AEMC on FFR has been based around the excellent report completed by GE Consulting. SACOSS draws the AEMC’s attention to the inclusion and assessment of the risks associated with implementation of an FFR scheme given the current state of the technology developments (Section 4 of the GE report, p 107 onward). The risks identified in the GE Consulting report should continue to form part of the cost benefit analysis for the implementation of FFR or synthetic inertia mechanisms, especially given the current confusion associated with the levels of primary frequency control the power system has enabled (see footnote 1).

4. Other Comments

SACOSS disagrees that works resulting from generator exit should be undertaken by the NSP as a prescribed service (i.e. funded by consumers): entry and exit should be managed by the generation sector-as-a-whole.

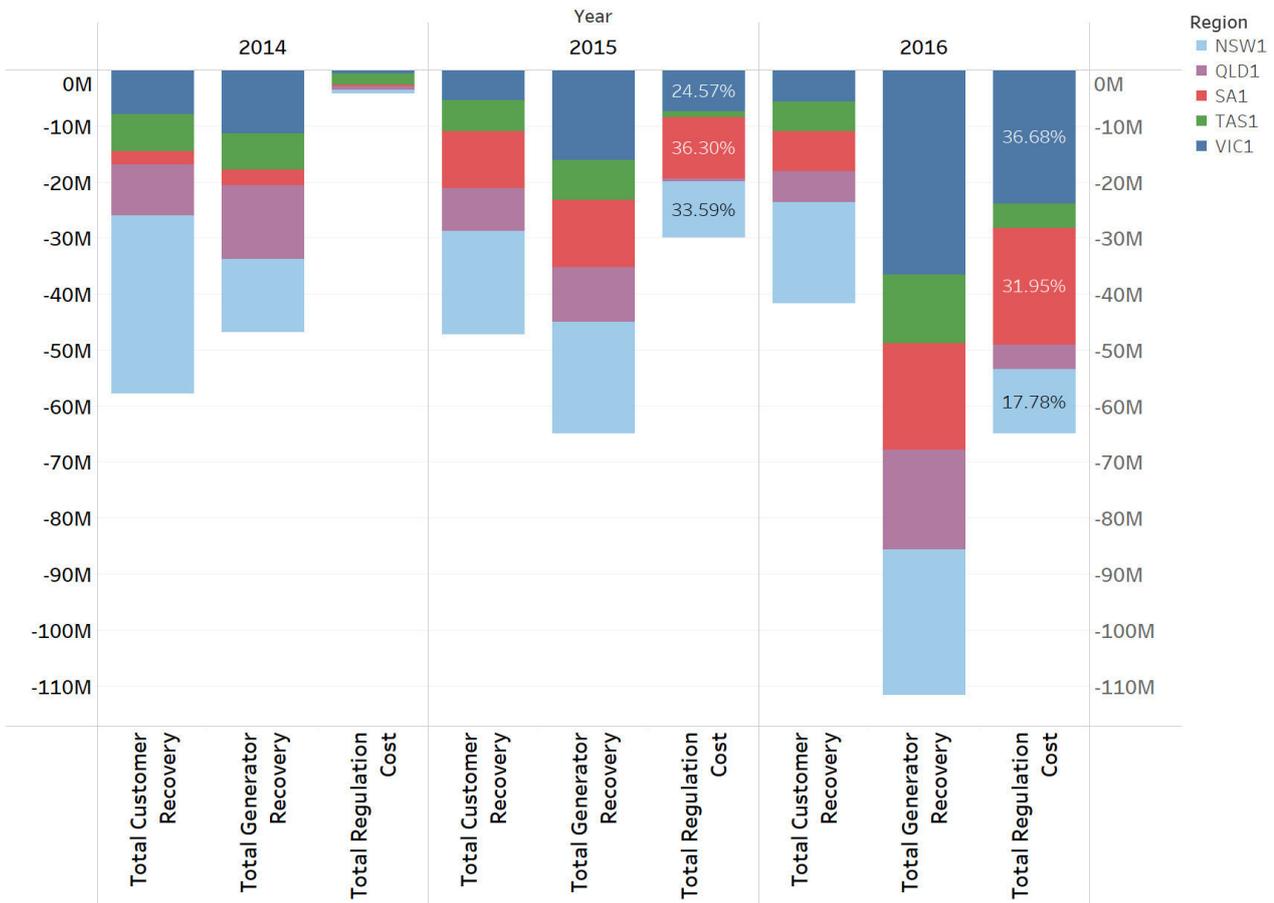


Figure 1: Total Regulation FCAS by Region

Figure 1 illustrates the total generator and customer recovery for all FCAS services across 2014-2016 using publicly available AEMO data. The total regulation FCAS component makes up a disproportionate amount, based on AEMO’s use of the 35MW local requirement in SA and subsequent market outcomes.



Climate Change Authority
GPO Box 787
Canberra ACT 2600

1 May 2017

Re: Joint advice on power system security, electricity prices and emission reductions

We thank the Commission and the Climate Change Authority for the opportunity to provide a submission on power system security, electricity prices and emission reductions. Our organisations have published a large volume of research related to these issues and in particular, we refer you to the reports we have attached as an Appendix to this submission.

We have extensively considered the nexus between energy and climate policy and we firmly believe that an emissions intensity target is an essential mechanism for the most efficient outcomes in accordance with the National Electricity Objective (NEO). In this context, we support the recommendations of the Commission in its Final Report on Integration of Energy and Emissions Reduction Policy.

In relation to the NEO, we strongly maintain that it is not appropriate to add emission reductions in to the objective **without vastly impacting negatively on electricity prices**. Including emissions in the NEO would necessitate the inclusion of social policy objectives as a matter of course. We believe this would make the functioning of the energy market overcomplicated and add unnecessary costs. Complementary energy policy and other objectives such as emission reductions and social benefits can just as easily, and with more transparency, be achieved through traditional arrangements underpinned by functioning governance arrangements such as COAG Energy Council

Our preference for addressing the governance issues associated with the current system is to fully implement the recommendations of the 2015 Vertigan, Yarrow and Morton Review of Market

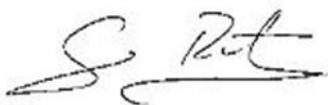
Governance Arrangements and in particular, providing for the Commission to have an enhanced strategic capacity in concert with COAG Energy Council.

In terms of the immediate and long term system security issues currently impacting most severely in South Australia but of long term consequence for the NEM, we caution against knee jerk responses to the issues emerging as a result of an energy market in transition. In our various capacities, we are deeply engaged in the AEMC's System Security Frameworks Review and we fully support the directions and processes of this Review in terms of identifying the most efficient solutions to deliver system security across the NEM.

Further, we believe there is an urgent issue that must be addressed when considering the above trilemma, which is cost allocation of system security and emission reduction measures. In this context, we draw attention to the recent St Vincent de Paul Society and Oakley Greenwood reports¹, which clearly demonstrate the inequities in the current cost allocation arrangements. We believe that as a matter of priority, 6.1.4 of the NER needs to be amended to ensure that injections in to the NEM are appropriately charged as per the ongoing recommendation of St Vincent de Paul.

We thank you for consideration of our comments. If you have any questions, please contact Mr Gavin Dufty, Manager Policy and Research, St Vincent de Paul via gavind@svdp-org.au or Ms Jo De Silva, Senior Policy Officer, SACOSS via jo@sacoss.org.au.

Yours Sincerely,



Gavin Dufty
Manager Policy and Research (St Vincent de Paul)



Ross Womersley
CEO (SACOSS)

¹ Oakley Greenwood (2017) *Causes of residential electricity bill changes in Victoria, 1995 to 2017*; St Vincent de Paul (2017) *Victorian Energy Prices January 2017*

Appendices

Appendix A

St Vincent de Paul (2017) *Victorian Energy Prices January 2017* at

https://drive.google.com/file/d/0B_DuyG_B91AATTNoNGxLYTliWDA/view

Appendix B

South Australian Council of Social Service (2017) *Looking Around the Corner: A Discussion on Current*

South Australia Power System Risks at <https://www.sacoss.org.au/looking-around-corner-discussion-current-south-australian-power-system-risks>



Climate Change Policies Review - Discussion Paper submissions

2017 Review Branch

Department of the Environment and Energy

GPO Box 787

Canberra ACT 2601

1 May 2017

Re: Climate Change Policies Review 2017

We thank the Department of the Environment and Energy for the opportunity to provide a submission on Climate Change Policies Review. Our organisations have published a large volume of research related to these issues and in particular, we refer you to the reports we have attached as an Appendix to this submission.

We have extensively considered the nexus between energy and climate policy and we firmly believe that an emissions intensity target is an essential mechanism for the most efficient outcomes in accordance with the National Electricity Objective (NEO). In this context, we support the recommendations of the Australian Energy Market Commission in its Final Report on Integration of Energy and Emissions Reduction Policy.

In relation to the NEO, we strongly maintain that it is not appropriate to add emission reductions in to the objective **without vastly impacting negatively on electricity prices**. Including emissions in the NEO would necessitate the inclusion of social policy objectives as a matter of course. We believe this would make the functioning of the energy market overcomplicated and add unnecessary costs. Complementary energy policy and other objectives such as emission reductions and social benefits can just as easily, and with more transparency, be achieved through traditional arrangements underpinned by functioning governance arrangements such as COAG Energy Council

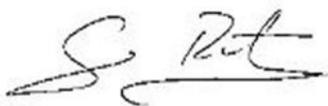
Our preference for addressing the governance issues associated with the current system is to fully implement the recommendations of the 2015 Vertigan, Yarrow and Morton Review of Market Governance Arrangements and in particular, providing for the Commission to have an enhanced strategic capacity in concert with COAG Energy Council.

In terms of the immediate and long term system security issues currently impacting most severely in South Australia but of long term consequence for the NEM, we caution against knee jerk responses to the issues emerging as a result of an energy market in transition. In our various capacities, we are deeply engaged in the AEMC's System Security Frameworks Review and we fully support the directions and processes of this Review in terms of identifying the most efficient solutions to deliver system security across the NEM.

Further, we believe there is an urgent issue that must be addressed when considering the above trilemma, which is cost allocation of system security and emission reduction measures. In this context, we draw attention to the recent St Vincent de Paul Society and Oakley Greenwood reports¹, which clearly demonstrate the inequities in the current cost allocation arrangements. We believe that as a matter of priority, 6.1.4 of the NER needs to be amended to ensure that injections in to the NEM are appropriately charged as per the ongoing recommendation of St Vincent de Paul.

We thank you for consideration of our comments. If you have any questions, please contact Mr Gavin Dufty, Manager Policy and Research, St Vincent de Paul via gavind@svdp-org.au or Ms Jo De Silva, Senior Policy Officer, SACOSS via jo@sacoss.org.au.

Yours Sincerely,



Gavin Dufty
Manager Policy and Research (St Vincent de Paul)



Ross Womersley
CEO (SACOSS)

¹ Oakley Greenwood (2017) *Causes of residential electricity bill changes in Victoria, 1995 to 2017*; St Vincent de Paul (2017) *Victorian Energy Prices January 2017*

Appendices

Appendix A

St Vincent de Paul (2017) *Victorian Energy Prices January 2017* at

https://drive.google.com/file/d/0B_DuyG_B91AATTNoNGxLYTliWDA/view

Appendix B

South Australian Council of Social Service (2017) *Looking Around the Corner: A Discussion on Current*

South Australia Power System Risks at <https://www.sacoss.org.au/looking-around-corner-discussion-current-south-australian-power-system-risks>

Mr Kris Funston
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235



19 May 2017

Lodged online

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ABN 93 197 662 296

Dear Mr Funston,

RE: Five Minute Settlement Direction Paper

SACOSS is the peak body for the non-government community services and health sectors in South Australia, with a long-standing interest in the efficient delivery of essential services. We thank the AEMC for their Directions Paper on the critical electricity market developments related to Five Minute Settlement.

SACOSS appreciates the need for appropriate NEM market design to provide the right price signals including for flexible generation. However, we are very concerned about the potential wider changes that a 5-5 might bring on, particularly with regards to system security.

We thank the Commission for their engagement with us on this issue. We note that we have met with the Commission twice to explore this issue in depth and we are grateful for the consultation efforts. We have attached below as part of our submission our recent presentation to the Commission, which highlights our concerns with this rule change proposal.

We thank you in advance for consideration of our comments. If you have any questions relating to this submission, please contact Jo De Silva on jo@sacoss.org.au or 08 8305 4211.

Yours sincerely,

Ross Womersley
Chief Executive Officer

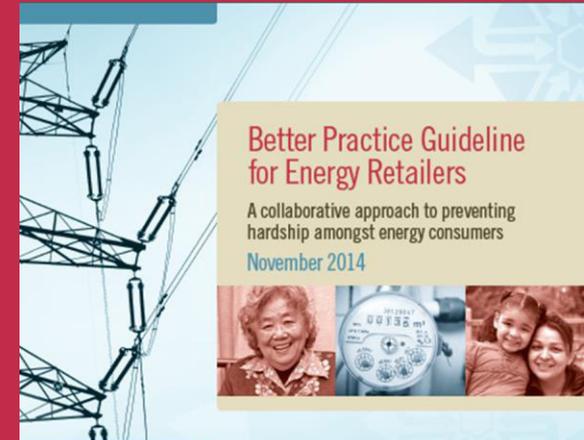
AEMC 5/30 Directions Paper SACOSS Response to Consultation

18 May 2018

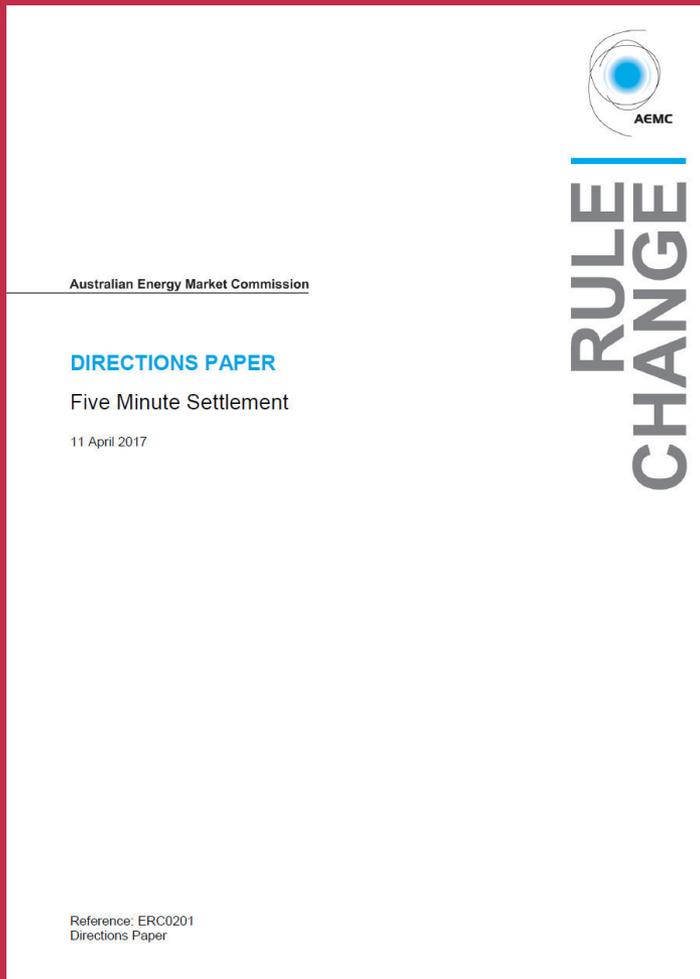


SACOSS Background

- Protecting Consumer Interests
- Significant time/resources in the energy space
 - Traditionally centred in Retail and Distribution
 - Increasingly in Wholesale Markets (gas & elec)
- A consumer voice in areas such as ...
 - AER TNSP regulatory reset hearing
 - AEMC Power System Security TWG
 - ESCOSA Technical Discussions



Directions Paper – Current SACOSS Position



- Historically, provided lukewarm support for 5 min Settlement
- Our current analysis
 - some concern around pricing outcomes over the long term
 - some concern on cost-benefit
- Publicly support batteries
- Seek further information from the AEMC

Presentation Overview

- 5/30 minute challenges
 - Acknowledge it will stop late Trading Interval (TI) rebidding, thereby dis-incentivising late TI rebidding (~\$1-2/MWh decrease in annual benefit)
 - Assert it may create additional new behaviours that may be far more significant (~1-4/MWh increase in annual RRP's)
- AEMC Paper
 - Good discussion, but appeared to be lacking significant detail at the dispatch modelling and sub-dispatch timeframe (system security)
 - High-level economic discussion valuable
 - Some discussion on market behaviour challenges
- SACOSS Submission
 - Will cover some elements of AEMC Questions
 - Q4 (bidding behav) & Q9 (contract market)



CURRENT CONTEXT



From a non-participant point of view ..

- Argument put forward by 'spot exposed' entities – is this a financial management issue?
- Supported by battery proponents (who require volatility for business cases value streams)
 - Only two ways to reduce NEMDE price spikes!
 - more generation available or
 - less demand to be met!
 - Very little recognition of role of demand bidding to stop the escalation to high dispatch prices
 - Very little discussion on system security implications
- Political Pressure from the Senate
- Technologist Pressure from 'New Energy' Sector



Since the rule change was suggested ...

- System Reliability
 - SA Blackout Reviews (x4)
 - Finkel Review
 - NSW Review (10-Feb-17)
- AEMO Future Power System Security Project
- ESCOSA/AEMO Inverter (Technical Standards) Review
- Good Faith Rebidding
- AEMC System Security Framework
 - PSS-TAG
 - Inertia/FFR Market
- Gas Market Intervention
- ASTAG and Regulation Market Issues
 - AEMO 35MW local requirement
 - System Oscillation



5 MIN DISPATCH ... INTO THE WEEDS

Economic theory to actual dispatch conditions



Examples from the Paper

- Table 3.1: 30 min Settlement

Period	Price (\$/MWh)	Gen 1 MW - Battery	Gen 2 - OCGT
D11	600	100	0
D12	600	100	0
D13	300	0	100
D14	300	0	100
D15	300	0	100
D16	300	0	100
TI Avg	\$400/MWh	33.33	66.67
	Gross Rev	\$6,667	\$13,333

- 5 min Settlement (with additions)

Period	Price (\$/MWh)	Gen 1 MWh - Battery	Gen 1 - Spot Rev	Gen 2 MWh - OCGT	Gen 2 - Spot Rev	Gen 2 - Gas Use
D11	600	50	2500	0	0	0.0
D12	600	100	5000	0	0	0.0
D13	300	0	0	50	1250	45.8
D14	300	0	0	100	2500	91.7
D15	300	0	0	100	2500	91.7
D16	300	0	0	100	2500	91.7
	\$400/MWh	Gross Rev	\$7,500		\$8,750	\$3,208

Details around the Stylised Example

From the example (and general theme of the paper)

- Appears fairer?
- Appears to address an inequality?
- Sends clearer dispatch signal?

In reality ..

- Economic Impacts → Market changes → Physical Changes
- Markets change the Physical (and vice versa)
- Decisions being made at dispatch affect the next dispatch interval



Changes in Participant Behaviour

- Scenario 1: OCGT unlikely to sell cap contracts
 - Unlikely to be able to ‘protect’ against spikes
 - Increase in premiums – Table 2 (Energy Edge)
 - Reduce Volumes – Section 4.6 (Energy Edge)
 - If less contracted, incentive to turn on becomes pure spot revenue assessment
 - The accuracy of 5min Predispatch will be paramount
 - Assuming actual (in previous example) was showing predispatch, OCGT would likely bid unavailable at DI2. Why?
 - Commitment cost = SRMC plus start costs, ~ \$8,700
 - 100MW at 11GJ/MW Heat Rate, 370GJ gas for 30min @ \$10/GJ = ~\$3700/TI
 - Conservative Start Costs: Annual Fixed Costs (ACIL) / Annual Starts (\$400k/80) = ~\$5000/start (very conservative → up to \$14k)
 - No cap contract premium (100MW x \$5/MW) = ~\$500



Scenario 1: In Practise

- It will cost OCGT ~\$9k to start for a half hour ... it will avoid that cost until there is more certainty. Therefore, more likely outcome at 30 min is ..

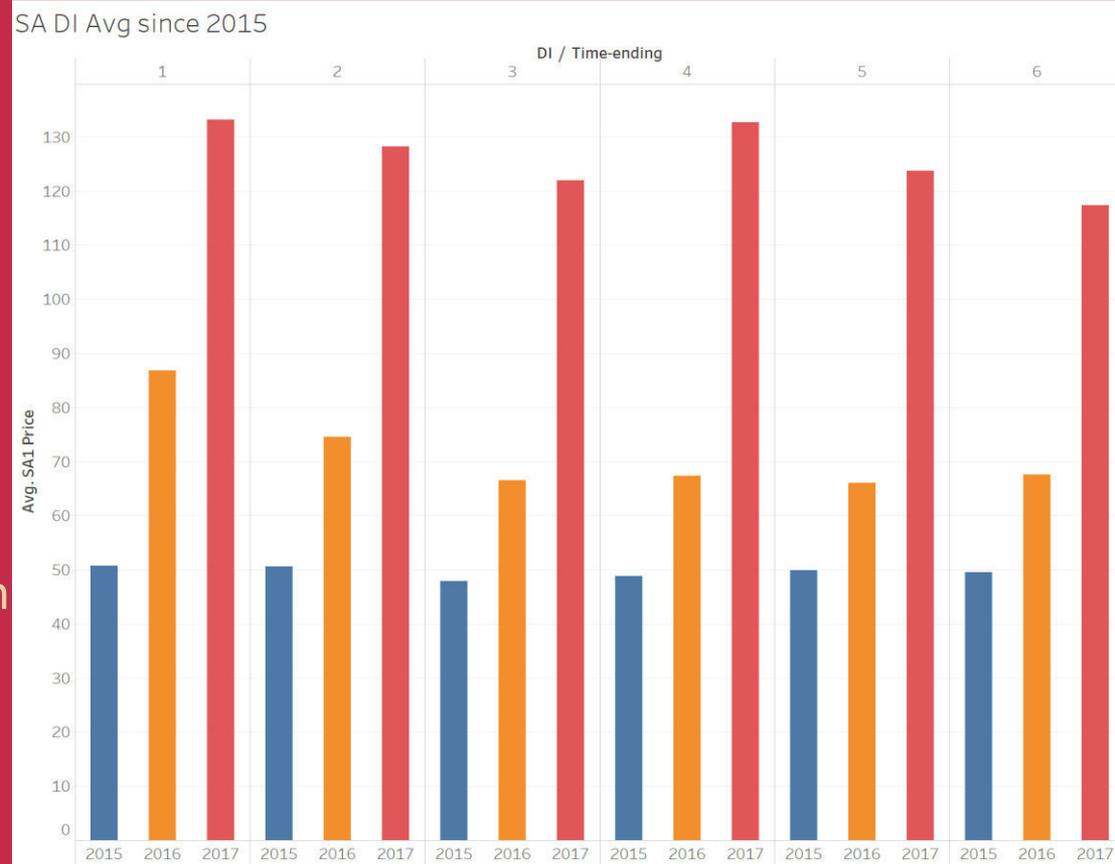
Period	Price (\$/MWh)	Gen 1 MW - Battery	Gen 2 - OCGT	Comments
DI1	600	50	0	
DI2	600	100	0	Bids Unavailable
DI3	600	100	0	
DI4	600	100	0	
DI5	600	100	0	
DI6	600	100	0	
TI Avg	\$600/MWh	91.67	0.00	
	Gross Rev	\$27,500	\$0	

- And at 5 min ... Average RRP higher as battery continues to set price, OCGT doesn't commit to generate

Period	Price (\$/MWh)	Gen 1 MW - Battery	Gen 1 MW - Spot Rev	Gen 2 MW - OCGT	Gen 2 MW - Spot Rev
DI1	600	50	2500	0	0
DI2	600	100	5000	0	0
DI3	600	100	5000	0	0
DI4	600	100	5000	0	0
DI5	600	100	5000	0	0
DI6	600	100	5000	0	0
	\$600/MWh	Gross Rev	\$27,500		\$0

Changes in Participant Behaviour (cont)

- Scenario 2: Post-price jump decreases wont occur!
 - SA Dispatch Prices since 2015 by DI
 - Clear decreasing trend post DI1
 - Increases in local generation after spike as half hour continues (rebids lower RRP)
- The behaviour driving this changes the outcome ..
- Initial estimates .. \$1-\$4/MWh



Other observations in SA ..

			DI					
			1	2	3	4	5	6
Some Generation Response	2015	Avg. SA1 Price	9,137	8,914	8,010	5,788	5,241	3,671
		Avg. SA1 Generation	1,618	1,408	1,527	1,635	1,392	1,559
		Count	10	12	7	10	4	9
	2016	Avg. SA1 Price	7,714	7,746	5,338	7,136	5,352	5,571
		Avg. SA1 Generation	1,358	1,310	1,343	1,339	1,355	1,235
		Count	48	30	42	30	35	25
	2017	Avg. SA1 Price	10,549	7,348	6,996	9,300	5,552	4,950
		Avg. SA1 Generation	1,881	1,981	2,025	1,888	1,882	1,888
		Count	11	11	9	7	8	9
No Generation Response	2015	Avg. SA1 Price	4,899	4,578	5,671	7,671	6,164	6,496
		Avg. SA1 Generation	1,728	1,537	1,406	1,287	1,521	1,721
		Count	10	7	8	8	20	16
	2016	Avg. SA1 Price	6,012	4,694	2,482	3,104	5,674	7,181
		Avg. SA1 Generation	1,506	1,372	1,609	1,484	1,392	1,371
		Count	42	36	22	32	23	28
	2017	Avg. SA1 Price	5,551	8,941	6,146	9,026	7,580	8,104
		Avg. SA1 Generation	1,994	2,244	1,899	2,062	1,980	2,158
		Count	11	7	7	13	11	5

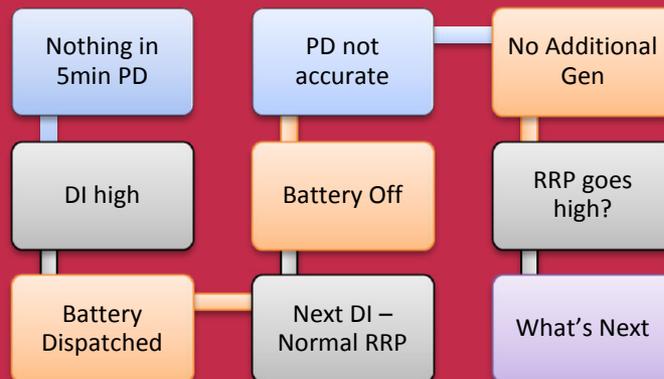
← When generation increased in the subsequent interval, DI prices were lower by DI6 compared to when a response had not occurred

→ When the RRP stayed above \$500 for more than 1 DI, significantly more generation by DI6 (“the response”).

			DI					
			1	2	3	4	5	6
Generation Response When RRP above \$500 For 2+ DI's	2015	Avg. SA1 Generation	1,813	1,779	1,715	1,606	1,292	1,616
		Avg. SA1 Price	3,301	545	7,045	6,359	589	7,013
		Count	5	2	2	4	1	8
	2016	Avg. SA1 Generation	1,152	1,412	1,346	1,437	1,382	1,304
		Avg. SA1 Price	8,024	5,930	4,525	4,341	4,976	5,774
		Count	23	38	33	35	32	36
	2017	Avg. SA1 Generation	2,159	2,085	2,164	2,117	2,024	2,047
		Avg. SA1 Price	9,863	8,497	8,611	11,755	13,374	5,682
		Count	7	11	10	12	7	10

Changes in Participant Behaviour (cont)

- Scenario 3: Batteries will be ‘played’ due to short duration energy limits
 - It is claimed that this will enable batteries to compete: would contend they already can!
 - More likely to create greater uncertainty (which in turn generally adds to prices!)



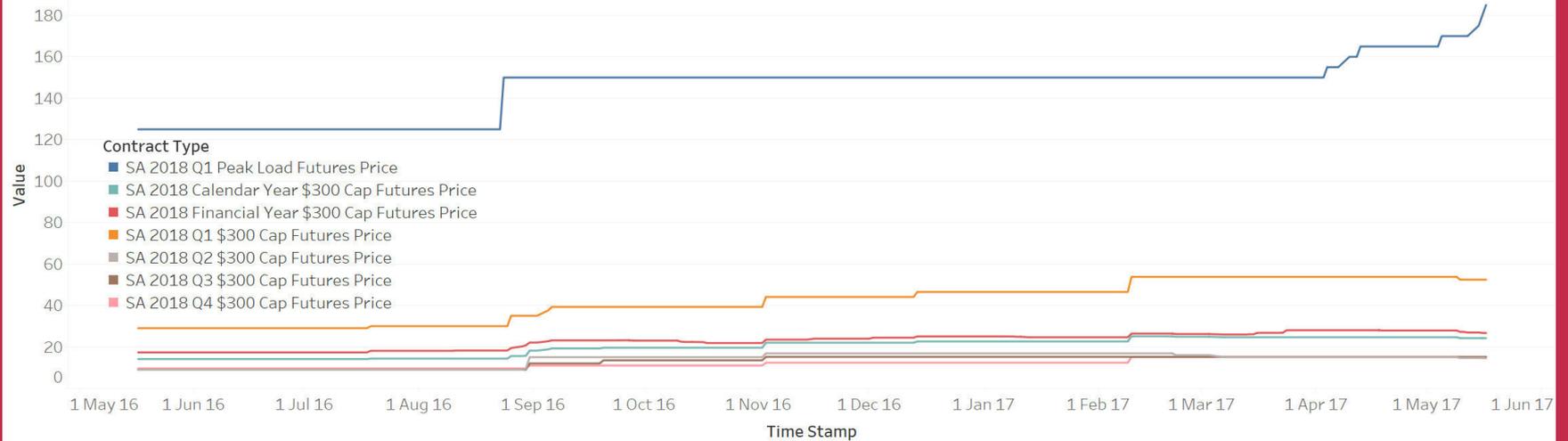
Our Issue with all this ...

- And what we are seeking further information from the AEMC on (Section 4.4.3):
 - Appears more than just ‘transitional’ issues?
 - Higher spot market outcomes result in higher underlying contract prices PLUS
 - Already have liquidity issues in SA across all product types; would the contract market evaporate completely?
 - Battery providers unlikely to supply caps?
 - As noted by the AEMC: Uncertain impact!
 - How will this be better for SA consumers?

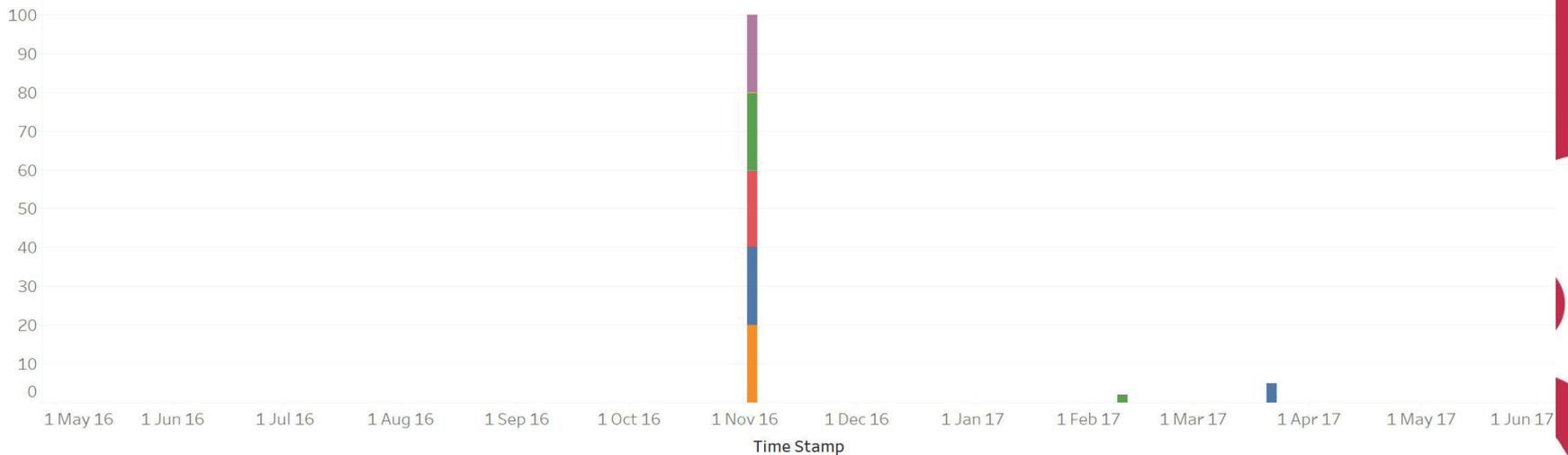


Futures Market - Caps: Already Scant

SA Cap Price



SA Cap Volume



What are the implications?

- Under both 5/30 min, battery can compete with lower SRMC and start costs, however ..
- Under 5 minute settlement, system security implications are completely different
 - Gas fired generators will not commit therefore:
 - Inertia of the system will be completely different
 - Voltage response will be different
 - Ramping potential will be different
 - SA becomes SUPER reliant on AEMO 5min pre-dispatch producing very accurate results but ...
 - As volatility increases, DR becomes more difficult to forecast



Working with Batteries

- SACOSS on the public record supporting introduction of batteries ... nothing against the technology!
 - Quick installation time
 - Can be integrated into existing frameworks (even without 5 min settlement rule change)
- Battery will drop MW capacity as it discharges
 - State of Charge becomes an important variable in dispatch
 - Energy AND Capacity are equally important
- Most vendors have very little understanding of dispatch and dispatch security
 - Operating in US markets in big systems different to energy-only, FCAS optimised small systems
 - Little understanding of FSIP and FCAS

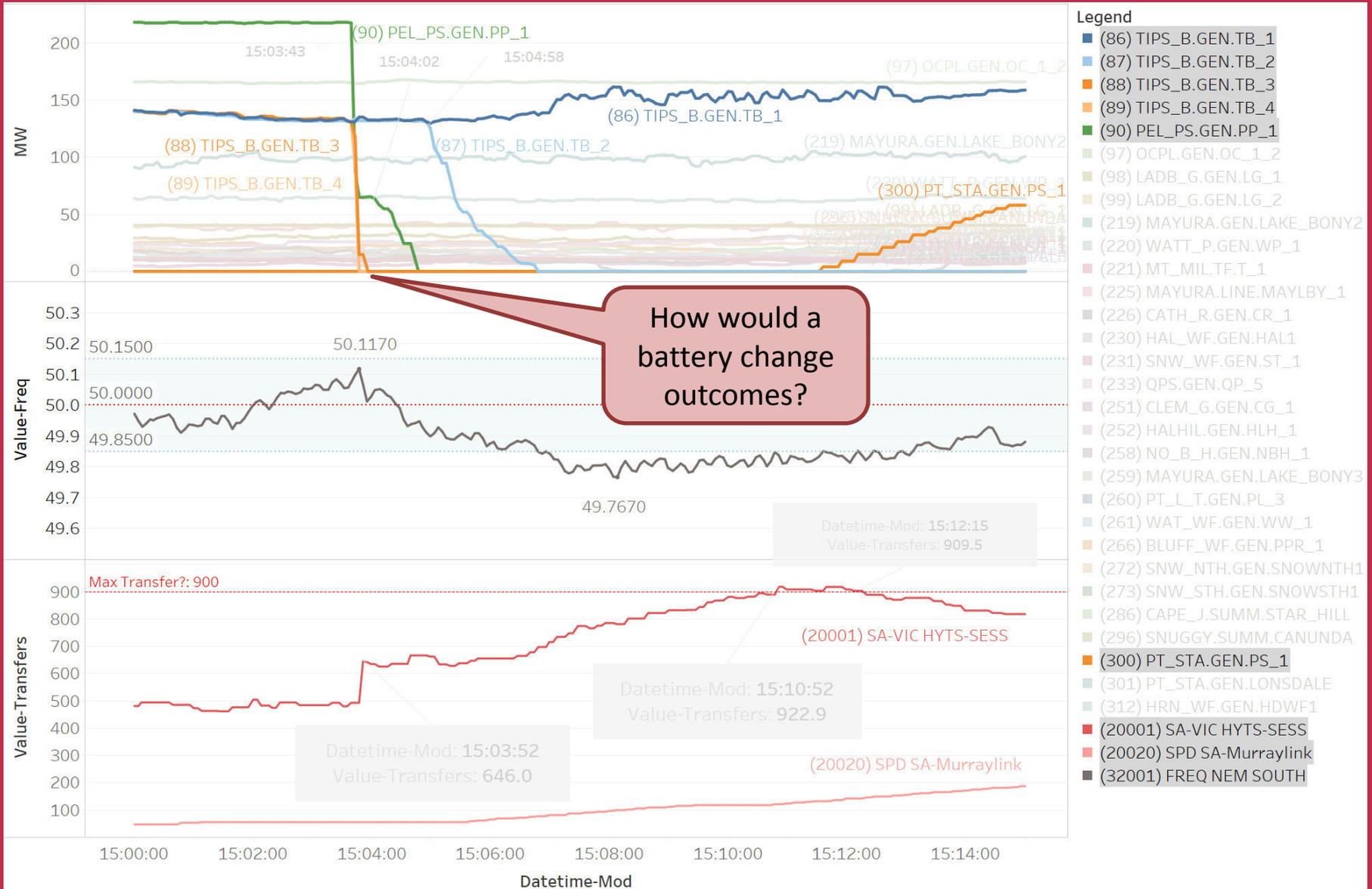


Working with Batteries (cont)

- Battery ramp rate profiles likely to be high EVEN IF they can't get full output in 100ms
- NEMDE will include them in the next DI ... resulting in less 'random' spikes due ramp rates and constraint binding → this will result in lower average RRP's!
- Fast Start Inflexibility Profiles (FSIP's) include
 - Minimum load (0MW for battery vs GT)
 - time to synchronise (T1) – <1 min
 - time to ramp to minimum load (T2) – 1 min
 - minimum time above minimum load (T3) – ? min
 - time to ramp down (T4) – 0 min



System Security: 3-Mar-17 at 4 sec



SACOSS POSITION



At present, SACOSS view is..

- Haven't seen the clear case presented
 - Technology will be installed irrespective of 5/30
 - Unclear whether change in best interests of SA consumers; certainly not if RRP increased and reduced potential for contracting
- Would like to see further discussion on:
 - System security implications in finer details
 - Clearer cost-benefit analysis
 - See all the current market and technical reviews 'settle' before making a such a significant change
- Focussed on SA here, but all regions affected ... national implications
- Suggest continuing discussion, but doesn't appear as clear-cut as perceived



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Ms Rebecca Knights
Director, Energy Policy and Projects
Department of State Development
Level 8, 11 Waymouth Street
Adelaide SA 5000

By email: DPC.ESTRegulations@sa.gov.au

26 May 2017

Dear Ms Knights,

RE: Energy Security Target Consultation

SACOSS welcomes the opportunity to comment on the Energy Security Target (EST). SACOSS appreciates the significant work already conducted by the South Australian Government to develop solutions to address the system and energy security issues arising in South Australia as a result of federal climate change policies.

As the peak body for the non-government community services and health sectors in South Australia, with a long-standing interest in the efficient delivery of essential services, SACOSS has been investing considerable time, effort and resources in this area of the market. We encourage continued involvement from stakeholders who are willing to set aside self-interested commercial or ideological perspectives and develop practical and positive solutions to address the rapid energy market transitional issues South Australian consumers are facing and the economic and social interests of all South Australians.

SACOSS recognises that the contemplated scheme is designed to increase the amount of gas-fired generation within SA to assist the state to deal with conditions when the wind is not blowing and sun not shining. We acknowledge and recognise this as a desired outcome. SACOSS shares the same desire and goal of the energy security target to increase competition, put downward pressure on prices and provide more energy system stability. We believe that gas is a necessary fuel in the energy market transition process.

SACOSS notes the concern of some stakeholders that at a high level, this scheme will act as a wealth transfer from South Australian consumers to South Australian gas fired generation (within SA) and their gas suppliers (increasingly not within SA) whilst possibly doing very little to guarantee the gas generators will be 'there' when needed. However, we recognise that South Australian consumers do value system and energy security, and that gas is a necessary transition fuel, and hence, we have not taken an approach of opposing this scheme based on the above assumptions.

SACOSS believes that addressing energy and system security in SA is an extremely challenging task and many levers will need to be pulled in order to comprehensively address the issues. Not only is there no silver bullet to adequately address all of the issues, but the technology is at an early stage in terms of its ability to deliver the required protections. For example, the Australian Energy Market Operator has recently cautioned against immediately committing to prescriptive or long-term procurement options for Fast Frequency Response, stating that "It would be preferable to start out with a series of trials to demonstrate the technical capabilities and potential benefits of FFR delivery for real-world frequency control".¹

¹ AEMO (2017) Recommended Technical Standards for Generator Licensing in South Australia at <http://www.escosa.sa.gov.au/projects-and-publications/projects/inquiries/inquiry-into-licensing-arrangements-under-the-electricity-act-1996-for-inverter-connected-generators/inquiry-into-licensing-arrangements-under-the-electricity-act-1996-for-inverter-connected-generators>



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More importantly in the context of the current review, AEMO has stated that a minimum quantity of synchronous inertia will continue to be required in the short to medium term:

“In an electrical power system, inertia can be thought of as a measure of the mass of all the rotating generating units synchronously connected to the power system...The management of power system frequency within the limits in the Frequency Operating Standards will be an increasing challenge in operating a low inertia power system. To help address this challenge, new technologies are capable of providing a very rapid active power response to rapidly changing power system frequency conditions, referred to as fast frequency response (FFR)...Synchronous inertia and FFR are technically distinct services, due to the timescales over which they act, and the different effect they have on power system frequency control. The two services therefore are not fully interchangeable, and a minimum quantity of synchronous inertia will continue to be required in the short to medium term, to allow adequate control of power system frequency.”²

Therefore, it is in the context of needing a minimum quantity of synchronous inertia in SA that we offer the following considerations as constructive comments, intended to further refine the EST to maximise the system and energy security outcomes:

- That diesel generators should be included in the scheme;
- That the certificate target be adjusted as a percentage of the prevailing scheduled demand;
- Additional measures should be implemented to allow the scheme to be adjusted if demand continues to decrease, otherwise SA households will be paying for generation to meet demand that is not present;
- That provision for a dispute resolution mechanism be made;
- That consideration be given to scheme implementation being delayed 6 or 12 months and the reporting framework adjusted from 1 month to 3-6 months, to allow accurate and timely reporting to minimise estimates by the retailers and generators;
- That consideration be given to a trial/prototyping exercise for electricity security certificate creation and acquittal to enable enhanced design and evaluation;
- That further understanding be developed of other similar schemes around the world (and how they differ from the current suggested outcomes), including the Queensland Gas Scheme³.

Some additional options which SACOSS suggest should be explored as a further package of work associated with energy security targets and trying to keep the wholesale market price at levels that are sustainable for consumers:

- Modifications to Murraylink to ensure it can achieve very fast response and frequency control signals (including provision of AGC thereby decreasing the overall cost of FCAS services for SA consumers and non-synchronous generators);
- Ensure SAPN continue finish the randomisation of the hot-water peak load timers, thereby removing the induced SA price spikes that occur just before midnight;
- In the interests of trying to ensure some gas fired generation remains in the SA system over the next 13 years, explore a form of inertia/capacity mechanism.

In addition to the above constructive suggestions, SACOSS believes there are some notable questions which remain unanswered and are worth consideration by the South Australian Government:

- Will the scheme targets be adjusted to changing market conditions such as continued demand decreases?

² AEMO (2017)

³ OBPR (2013) “Technical Report : Queensland Gas Scheme Case Study – Discussion of Findings, Methodology, Inputs and Assumptions”, <http://www.qca.org.au/getattachment/a9551ea0-d951-4486-a9ca-8727268497b2/Queensland-Gas-Scheme-Case-Study-Discussion-of-Fin.aspx>

- Will the scheme be adjusted if a carbon price is implemented?
- Will the scheme remain in place if an inertia market is implemented?
- How will the market price be determined? Will it be a daily, weekly or monthly pricing mechanism and how will it be made public.
- There are also a few administrative aspects to the scheme that need further consideration:
 - The legislation at present contemplates a final report 1 month after the end of Financial Year, yet AEMO interim/initial settlements do not occur until 20 business days following a trading weeks end, therefore compounding the estimations for liabilities on the supply side, but locking in definitive costs to retailers (hence households); and
 - The 10% estimation factor appears excessive and may add to price ambiguity.
- What are the current and future gas price assumptions on gas-fired plant (both existing and new)?
- What changes in historically observed generator and TNSP behaviour have been modelled, hence what decrease in wholesale prices can be expected?
- What impact will the scheme have on the contracting market?
- What assumptions have been made for current business consumers moving to market contracts together with the large industrial consumers, thereby leaving fewer consumers (namely) households to pay for the scheme?

We thank you in advance for consideration of our comments. If you have any questions relating to the following material, please contact me on jo@sacoss.org.au or 08 8305 4211.

Yours sincerely,



Ross Womersley
Executive Director