South Australian Chamber of Mines and Energy

REL0066: Annual Market Performance Review 2017

Submission to

Australian Energy Market Commission

September 2017

South Australian Chamber of Mines and Energy
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Representing, promoting and protecting the resources industry of South Australia

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Executive Summary

South Australian Chamber of Mines and Energy (SACOME) is pleased to make a submission to the Australian Energy Market Commission on the Annual Performance Review 2017.

Over the past 18 months, five major system security events have resulted in hundreds of millions of dollars in lost production and plant damage for SACOME's large energy user members. These events have been the result of over-reliance on a single interconnector, withdrawal of thermal generation and misunderstood generator settings.

The South Australian energy market is undergoing a significant change in the deliverability and reliability of energy. South Australia has the highest penetration of non-synchronous generation (42.2%; 2016) and is presently experiencing greater volatility and higher prices.

The retirement of baseload generation in South Australia due to changing market conditions has prompted a reduction of synchronous generation traditionally responsible for frequency control and inertial services critical to the stability and reliability of the network.

As such, it is becoming increasingly difficult to contract for affordable electricity prices or access hedges in the market. The reduction in baseload thermal generation has resulted in the concentration of market power in a couple of large vertically integrated retailers.

Events over the past 12 months in South Australia, such as the network characteristics at the time of the 28 September 2016 system black, have been well documented in prior assessments. While these events have forced changes to policy and energy market settings, continued reactive approaches will not address the pressing economic, policy and supply challenges created by a rapidly changing national energy market.

The impacts of these events are discussed in this submission. While system outages can be measured by means of duration, this often hides the actual impact to SACOME members and the wider resources sector. SACOME submits that the 2017 Market review should examine and acknowledge these causes and their operational implications.

SACOME recommends AEMC acknowledge the operational impacts system outage events cause and input this into official analyses with other energy market bodies, such as AER, to wholly comprehend the economic impacts of constrained markets and those with low system security.

SACOME

The South Australian Chamber of Mines and Energy (SACOME) is the peak industry association for all companies with business interests in the resources industry in South Australia, including those with business, vocational or professional interests in minerals exploration, mining and processing, oil and gas exploration, extraction and processing, power generation, transmission and distribution, logistics, transport, infrastructure, and those with clients in these sectors.

Context

The South Australian Energy market is undergoing a significant transition in electricity generation and energy use where large proportions of wind and solar PV generation are integrating into the network.

Over the last decade there has been 1,881 MW of wind and solar PV generation added into the South Australian region of the National Electricity Market (NEM). This has been facilitated by the Commonwealth Renewable Energy Target that requires 33,000GWh of large scale renewable generation in addition to State Renewable Energy targets.

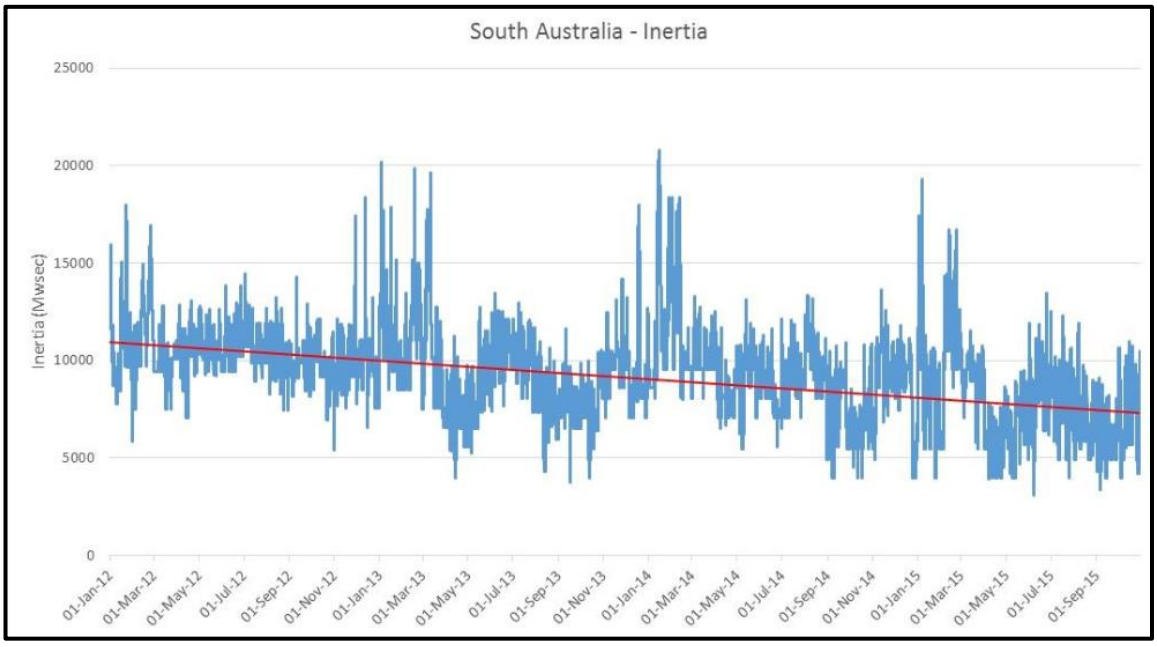
Integrating large volumes of non-synchronous renewable generation of low marginal operating cost, able to bid into the market at low or negative prices, has resulted in large thermal generation plants operating infrequently in a load follow mode or retiring from the market entirely. The closure of Northern Power Plant in May 2016 is a clear example and has decreased total thermal generation in the State by 786MW.

The retirement of both the Northern and Playford power stations combined with lower utilisation rates from other thermal generation has reduced capacity reserves. This is placing a higher reliance on the Heywood interconnector when wind and solar conditions are low. It has also decreased market competition in South Australia with the withdrawal of Alinta as a hedge option in the wholesale market.

The high volume and intermittent nature of wind and solar generation has produced a system that is characterised by synchronous generation operating infrequently or at high cost. This synchronous generation would normally be low cost in a consistent output mode but is now very high cost operation to match the variable output from asynchronous generation.

The change in the dynamics of the generation system has also resulted in a gradual decrease in the levels of inertia in the system (Figure 1). Inertia is usually provided by synchronous plant, however with the high penetration of wind and solar in the system, and their inability to facilitate this service without modification, South Australia has become more reliant on the interconnector to Victoria.

Figure 1 South Australia region inertia



The system black event that occurred in South Australia on 28 September 2016 demonstrated the consequences of a sudden loss of generation in a system characterised by very low inertia. The combined effect was a sudden and significant rate of change of frequency (RoCoF) event of 6.25Hz[1] causing a complete shutdown of the electricity network in South Australia.

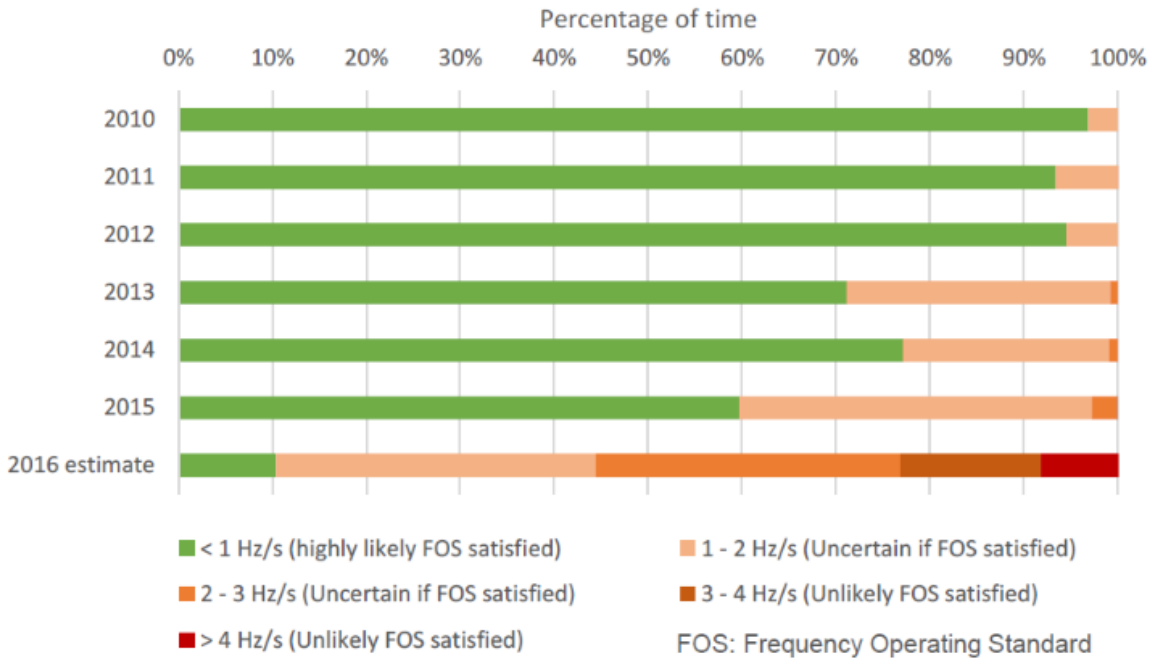
The State-wide industrial impact was estimated to be at least $367 million[2].

SACOME, in discussions with members, has estimated the impact of the system black and other supply interruptions to the resources sector across the past 12 months to be approximately $230 million[3].

Rapid changes in frequency is an issue that ElectraNet has noted in its "South Australian Energy Transformation" regulatory investment test for transmission (RIT-T) report as an area of concern. Figure 2 demonstrates the increasing percentage of larger RoCoF events in South Australia[4].

ElectraNet emphasized that *"where the RoCoF exceeds 3 Hz/s, it becomes highly unlikely that the Frequency Operating Standard will be met, with a consequent high risk of a 'system black' event"*.[5] Since 2010, RoCoF events exceeding 3Hz/s have increased to greater than 20%.

Figure 2 - Increasing exposure to RoCoF in South Australia for separation



Source: AEMO Future Power System Security Program, Progress Report, August 2016

The above notification of a decline in system strength was reported earlier in 2016 and prior to that in 2014. In 2016 AEMO and ElectraNet provided an update to a study on Wind generation integration to report on the

[1] AEMO, *Black System South Australia – 28 September 2016: Third Preliminary Report*, December 2016, p 58.
[2] The Australian, *Today in SA: blackout cost $367m but could have been worse*, 9 December 2016
[3] *Sourced from SACOME members and reported figures from ASX and Media releases.*
[4] ElectraNet, *South Australian Energy Transformation: RIT-T Project Specification Consultation Report*, 7 November 2016, p 26.
[5] *Ibid*, p 27.

actions in the original 2014 report and detail further steps required. These studies identified the critical components of the system to ensure stability and security, namely:

1) The Heywood interconnector linking SA and Victoria is operational;
2) Power system frequency control in SA, particularly under conditions when the SA power system is, or could become, separated from the remainder of the National Electricity Market; and,
3) Sufficient Synchronous generation is connected and operating in the SA power system.

These two studies[6] identified the issues that were a part of the 28 September 2016 system black in South Australia. This event was the result of a severe storm causing phase to ground faults (downed lines) along three transmission lines that resulted in the loss of 445MW of wind generation due to low fault ride through constraints. The loss of generation resulted in flows across the Heywood interconnector increasing to 900MW causing the interconnector to trip to prevent damage. At the time of the storm, inertia in the South Australian grid was low due to the large level of intermittent non-synchronous generation online.

The combination of islanding, low inertial response and low levels of synchronous generation online resulted in the large RoCoF event that led to the system black. The elements in this event were all reported in the October 2014 and February 2016 reports by AEMO and ElectraNet[7].

SACOME submits that the combination of the decision to retire Northern, the market operating Heywood at near capacity (78%), and high levels of non-synchronous generation should have triggered urgent action from Governments to implement network changes to ensure system security. At each gateway, a watch and act message should have been conveyed.

Since the release of the Finkel Review Final Report and associated recommendations the studies that identify system security issues have been acknowledged and majority of the recommendations have been accepted by the Commonwealth Government.

One of these is an Energy Security Board will act as a bridge between Energy Ministers on COAG and the three energy market bodies (AEMO, AER, AEMC) to report on the Health of the NEM. Furthermore, AEMO has introduced new network rules for the Heywood interconnector and Wind generation when there are low levels of synchronous generation operational[8].

These measures will act to reduce the impact of future events and provide government and relevant institutions the reporting tools necessary to define when a component of the NEM has reduced system strength.

Overall Power System Performance

During the 2017 financial year there have been five significant system events that have resulted in loss of revenue, production and plant equipment for SACOME members. The 7 July 2016 volatile pricing event, 28 September system black, and 1 November 2015, 1 December 2016 and 8 February 2017 load shedding events have all impacted negatively on SACOME members.

Financial impact to SACOME members over this period is estimated to be $230 million, with a bulk of the impact due to the State-wide outage. This includes cost of lost production, plant maintenance and repairs. A wider

[6] See: Australian Energy Market Operator, *Update to Renewable Energy Integration in South Australia*, February 2016
[7] *ibid*
[8] See AEMO National Transmission Network Development Plan (NTNDP) 2017

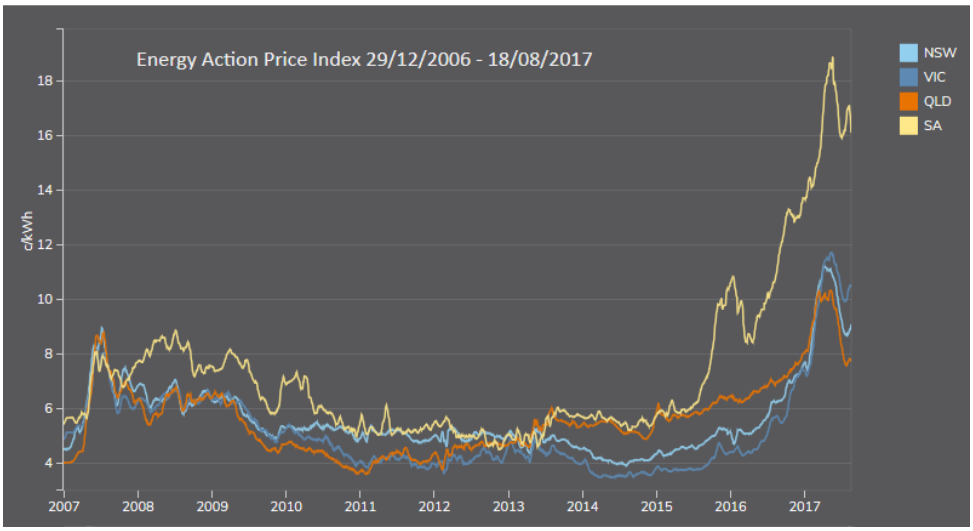
impact to the South Australian economy was estimated to be at least $367 million[9]. While these figures are unofficial it is recommended that an official analysis of the wider economic impacts is assessed and reported to fully comprehend the impact of these events.

The decreased level of thermal generation in South Australia has also reduced market competition in the wholesale market for electricity. This has created an illiquid market where participants cannot contract affordable levels of electricity.

Price and affordability

Since 2015 the price of electricity for a standard retail contract (2 ½ years) has increased from $60/MWh in 2015 to $160/MWh today[10] (Figure 3). While large users can attract prices closer to wholesale price swap contracts these have also increased from $50/MWh (Q4 2015) to $115/MWh (Q4 2017). Generally, the wholesale spot price over the same period has increased from $40/MWh to $108/MWh. Volatility and an uncompetitive market in South Australia have fed into the higher premiums paid on retail electricity for customers.

Figure 3 - Retail standard contract index



The present lack of market liquidity in the South Australian market at present can be demonstrated by assessing the Herfindahl-Hirschman Index of market competitiveness (HHI). The estimates of the HHI for South Australia are in the range of 3300 to 3400[11]. A pure monopoly in any market is denoted by a HHI value of 10,000 and the higher the HHI the more constrained and less competitive a market is. For comparison, the HHI values for NSW, Victoria, and Queensland are all lower than SA by 250 to 500 in 2016-17[12].

Further compounding the lack of competitiveness is the reduced certainty in supply and demand in a tight gas market.

Generators operating in a load following variable mode cannot contract known annual contracted quantities (ACQ) of gas and cannot provide upstream suppliers with certain maximum daily quantities (MDQ) of gas. This

[9] The Australian, *Today in SA: blackout cost $367m but could have been worse*, 9 December 2016
[10] http://www.energyaction.com.au/energy-procurement/aex-reverse-auction/energy-action-price-index
[11] Melbourne Energy Institute, *Winds of Change: An analysis of recent changes in the South Australian electricity market*, August, 2016, p.30-31
[12] Australian Energy Regulator, *State of the Energy Market*, May 2017

flows into the retail market where contractual negotiations on price can vary from day to day resulting in short term, take or leave offers at high prices.

Participants that traded on the STTM during July 2017 bought gas in a tight market above $15/GJ. In efficient gas plant with heat rates of 8-9GJ/MWh this results in a short run marginal cost of $120 to 135/MWh. With operating and maintenance (O&M), retailers' margins and risk premiums on top of this price, industrial consumers can expect to pay upwards of $150/MWh.

Major disruption events

While load shedding events may last a single hour or less the impact to industrial plant may require hours of restart procedures. Unexpected power disruptions have the potential to cause significant damage to infrastructure.

Load shedding events while short in relative duration can cause lasting impacts to operations where metals refining and processing are involved. The load shedding events on the 1 November 2015, 1 December 2016 and 8 February 2017 have impacted SACOME members negatively, with one member required to shed 60% of their load.

These events can be mitigated through agreements between the local network service providers to shed non-sensitive processes in the first instance. This has the advantage of minimising the impact on plant equipment, but does not remove the risk of damage to facilities.

SACOME members have noted that a loss of offsite power will cause their facilities to enter a care and maintenance mode, require the evacuation of personnel from ventilated areas, and once offsite power is restored require a three to twelve-hour restart to full production.

With an identified reduction in system strength and generation capacity, there is a real risk that further load shedding events will occur in South Australia. The Australian Energy Market Operator (AEMO) has modelled future reserve shortfalls in South Australia for the upcoming 2017-2018 summer[13]. While these are predicated on future demand scenarios and available generation on the day, there is a material risk to resource operations in South Australia.

The System Black that occurred on 28 September 2016 resulted in major damage to plant equipment in SACOME members that had operations north of the transmission line damage. The estimated damage cost was approximately $230 million with additional costs still being calculated. One facility had damage to their processing equipment and all had material decrease in production of 15 to 18%.

These operations are in varying stages of upgrades and redevelopment. Significant outages such as the System Black have impacted on the decision to invest in future upgrades or limited the capability to upgrade due to the necessity of investing in reinforcement to mitigate outages.

Recommendation

SACOME recommends AEMC acknowledge the above operational impacts system outage events cause and input this into official analyses with other energy market bodies, such as AER, to wholly comprehend the economic impacts of constrained markets and those with low system security.

[13] See AEMO Medium term PASA reports, http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Data-dashboard#medium-term-outlook