

12 April 2017

Ms. Leslie Guy
Secretary of the Committee
South Australian Legislative Council Select Committee on the State-Wide Electricity
Blackout and Subsequent Power Outages
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Adelaide, SA, 5000
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Dear Ms. Guy

South Australian Select Committee's State-Wide Electricity Blackout and Subsequent Power Outages Inquiry

Energy Networks Australia welcomes the opportunity to provide further evidence to the South Australian Select Committee's State-Wide Electricity Blackout and Subsequent Power Outages "Blackout" Inquiry. This is in response to direct correspondence sent by the Select Committee to Energy Networks Australia, dated 10 March 2017.

Energy Networks Australia is the national industry body representing businesses operating Australia's electricity transmission and distribution and gas distribution networks. Member businesses provide energy to virtually every household and business in Australia.

Energy Networks Australia recognises the significant disruption to the South Australian community, businesses and industry caused by the 'System Black' event, and subsequent outage incidents. This response briefly addresses the extended Terms of Reference (ToR), namely:

(f) Power outages subsequent to 28 September 2016 including on 27 and 28 December 2016 and 8 February 2017

(g) The role of power companies, state and national regulators and the State and Commonwealth Governments in the National Electricity Market(s) and

(h) Reforms that would improve electricity reliability and affordability in South Australia whilst reducing carbon emissions.

As in our previous submission to the Inquiry, some of the information contained in our evidence has been provided in consultation with our South Australian member businesses, ElectraNet (electricity transmission), SA Power Networks (electricity distribution), and Australian Gas Networks (gas distribution).

f) Power outages subsequent to 28 September 2016 including on 27 & 28 December 2016 and 8 February 2017

Energy Networks Australia observes that up until late January 2017, the supercell thunderstorms and four tornadoes, which led to the 'System Black' event of 28 September 2016, were part of an extended season of unusual weather. It is important to note that South Australia (SA) has suffered six extreme weather events and nine major weather event days since July 2016 with electricity infrastructure (see Table 1) repeatedly battered by strong winds, heavy rain and lightning strikes. A typical year would have perhaps three major weather event days.

27 & 28 December 2016

On Tuesday 27 and Wednesday 28 December 2016, severe and sustained storm activity caused some of the worst damage ever seen to the electricity network in the Adelaide Hills, impacting 183,000 customers. This was the largest power outage event ever recorded on the SA Power Networks system - in terms of average minutes of lost supply (SAIDI) and subsequent Guaranteed Service Level payments (totalling more than \$19 million). In fact, that single event resulted in more minutes of lost supply to customers than the SA Power Networks distribution network typically experiences in a whole year.

At the time, SA Power Networks¹ advised that its restoration efforts were delayed by the significant unsafe weather conditions. Its crews responded to more than 900 'wires-down' reports, and found significant damage to the network due to falling trees and tree limbs. The number of customers impacted by each event, and their SAIDI contributions, are summarised in Table 1 below.

Table 1: Extreme weather events impacting SA Power Networks

SA Power Networks Extreme Events since July		
Date	Customers impacted	Average minutes without supply (SAIDI)
11-12 July	120,000	50
28-29 September	90,000	37
11 November	27,000	15
23 December	17,000	10
27-28 December	183,000	187
19 January	69,000	35

¹ Refer to SA Power Networks media release of 28 December 2016.

Energy Networks Australia also notes that other parts of Australia suffered from similarly wild weather over the seven-month period to the end of January 2017. These include incidents that occurred in Tasmania² in July, New South Wales³ and Victoria⁴ in October, and the Australian Capital Territory⁵ during January 2017.

The severe weather events and storm damage, which impacted the reliability of electricity network supply to South Australian customers, are to be distinguished from the events on 8 February 2017, which are more accurately associated with the National Electricity Market (NEM) and power system security issues.

8 February 2017

On the 8 February 2017 South Australian involuntary load-shedding event, both SA Power Networks⁶ and the Australian Energy Market Operator (AEMO), published a media release and a System Event Report⁷ respectively, outlining their views of the day's events. AEMO explains that it directed ElectraNet, who in turn directed SA Power Networks, to shed 100 MW⁸ of customer load that evening, noting that the market circumstances, lack of available generation, and a sequence of events led it to determine that this mechanism was *"the only available option ... to restore system security"*⁹. In accordance with the National Electricity Rules, SA Power Networks was required to implement this load-shedding process.

Energy Networks Australia is aware that SA Power Networks has provided verbal evidence on an issue that resulted in additional customers being impacted by load shedding. The 100MW of load required to be shed would have been achieved by interrupting supply to around 30,000 customers. Unfortunately, due to a software issue in the load shedding system, which was not providing real time data on the amount of load actually shed, SA Power Networks interrupted around 90,000 customers.

The SA Power Networks' Operator detected this anomaly and checked with the ElectraNet operator who confirmed around 270MW of load had been shed. SA Power Networks requested approval to commence restoration, which was given and immediately

² <http://www.abc.net.au/news/2016-07-12/tasmania-weather-heavy-rain-strong-winds-roads-closed-power-cut/7589646>

³ <http://www.news.com.au/technology/environment/gusts-as-highs-as-107kmh-knockout-power-and-cause-damage-in-nsw-with-tasmania-next-in-the-firing-line/news-story/a0a8135856e2e3345b4bd114ae9a0e17>

⁴ <https://emergency.vic.gov.au/news-and-media/power-outages-across-victoria>

⁵ <http://www.canberratimes.com.au/environment/weather/freak-windstorm-takes-canberra-by-surprise-as-major-cleanup-gets-underway-20170113-qtteol.html>

⁶ Refer to SA Power Networks' media release published on 15 February 2017

⁷ https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/System-Event-Report-South-Australia-8-February-2017.pdf

⁸ *Ibid*, p.17

⁹ *Ibid*, p.5

commenced restoring supply to these customers. Customers were without power on average for 31 minutes. SA Power Networks is working with its software vendor to remedy this issue and, in the meantime, additional checks and processes have been established to ensure this will not re-occur.

g) The role of power companies, state and national regulators and the State and Commonwealth Governments in the National Electricity Market(s)

On 28 March 2017, the AEMO [released](#) its Final Report and 19 recommendations into the System Black event of 28 September 2016. During that event, Energy Networks Australia considers that the electricity network service providers acted promptly to achieve the safe and earliest possible recovery of supply to customers following the System Black event.

The Heywood Interconnector played a significant role in enabling System Restart, which was necessary to enable major power stations to come back online. The unavailability and inability of some SA-based generation units to support a system restart is discussed in the AEMO document entitled, “Black System South Australia: 28 September 2016 - Third Preliminary Report”¹⁰.

ElectraNet undertook extensive and complex switching to restore the power system between Victoria and Torrens Island in SA, while managing safety impacts of the event. SA Power Networks facilitated load restoration in a progressive manner under instruction from AEMO. AEMO has indicated that by 2030 hrs (four hours after the Black System), approximately 40% of the load that was available for restoration was restored. By midnight on 28 September 2016 (7.5 hours after the Black System), approximately 1,000 MW or 80–90% of load that could be restored had been restored¹¹.

In relation to this Terms of Reference request for information on the broader regulatory and legal framework for participating in the NEM, Energy Networks Australia would like to refer the Committee to both the Australian Energy Market Operator’s (AEMO) [registration process](#) and the [Australian Energy Market Agreement](#) (AEMA) to further examine these issues. On the role of power companies, AEMO and market or registered participants must adhere to the requirements set out in the [National Electricity Law](#), [National Electricity Rules \(NER\)](#), NEM procedures, and [National Gas Rules](#).

In relation to the AEMA, it should be regarded as the formalisation of an inter-governmental agreement signed by all state, territory and commonwealth government

¹⁰ [Released](#) December 2016.

¹¹ *Ibid.*

leaders on the overarching governance framework for national energy markets. The AEMA was last amended in 2013.

The NEM's current governance arrangements involve four key institutions, namely the:

1. **Council of Australian Governments Energy Council** – provides national oversight and coordination of energy policy development
2. **Australian Energy Market Commission (AEMC)** – is the independent rule maker, with responsibility for national rule making and market development
3. **AEMO** - the independent market and system operator, with responsibility for operating wholesale energy markets and delivering planning advice, and
4. **Australian Energy Regulator** – the AER is the independent national regulator, with responsibility for economic regulation of energy networks and ensuring that market participants comply with market rules and laws.

Jurisdictional regulators continue to have, but are not limited to, some licensing, economic, generator and network businesses' performance-monitoring, and advisory responsibilities in some states, such as the [Essential Services Commission of South Australia \(ESCOSA\)](#).

Energy Networks Australia is aware that the SA Government has had discussions with ElectraNet and SA Power Networks to investigate ways to mitigate future reliability and power systems security issues.

In March 2017, the SA Government announced a number of measures, which may mitigate future power system security issues. These measures include:

- » Contracting for a new 250MW gas-fired power station in SA
- » Contracting 100MW of new grid-side battery in SA and
- » Contracting 200MW of temporary diesel generation to be installed by 1 December 2017.

ElectraNet and SA Power Networks are actively working to procure/connect the installation of this new plant on behalf of the SA Government.

These actions are designed to address short-term market issues in SA. In the longer term, a number of market reforms should also be considered.

h) Reforms that would improve electricity reliability and affordability in South Australia whilst reducing carbon emissions

Energy Networks Australia considers the greatest single risk to an efficient and secure transition to a decentralised, low carbon, energy system is *“conflicting government policy*

*frameworks in a national market and a lack of regulatory cohesion*¹². In our submission¹³ to the Independent Review into the Future Security of the National Electricity Market's – Preliminary Report, we also clearly recognised the *“co-dependent relationship between electricity and gas systems in Australia”*.

Energy Networks Australia welcomes the integrated approach in the SA Government's March 2017 Power Plan that *“encourages new gas supplies which help to support system security, allows a competitive process for large scale storage and enables gas-fired generation to support a stable and reliable grid”*¹⁴. However, a national plan is still required.

Following the 9 March 2017 release of AEMO's Gas Statement of Opportunities¹⁵ that foreshadowed gas shortfalls in Australia's southern states within two years, Energy Networks Australia¹⁶ highlighted that state government intervention is undermining Australia's energy security and carbon abatement goals. Such intervention reduces the amount of gas available for Australian use, and damages the potential of gas to act as a low emissions fuel.

We consider that *“Without a national, technology neutral carbon policy and with continued State bans on gas, Australian customers face a less reliable, higher cost and higher emissions future, [and] urge governments to adopt an evidence-based national approach to gas exploration and production, as recommended by the Academy of Technological Science and Engineering”*¹⁷.

We also note the recent release of Gas Vision 2050¹⁸, which provides a conceptual outline of how the gas sector can work collaboratively with the electricity sector to provide Australian homes and businesses with reliable base load energy, whilst ensuring Australia can reach the Renewable Energy Target by 2020. Energy Networks Australia considers this document to be particularly relevant to the ToR of this Inquiry and as such, encourage the Committee to review and consider the document in its on-going deliberations.

Other reforms which should be considered are discussed below:

(i) Interconnectors

Energy Networks Australia highlights that the COAG Energy Council Meeting of 19 August 2016 [noted](#) the *“important role interconnectors play in a transitioning energy sector and*

¹² See page 4 of Energy Networks Australia's March 2017 [submission](#) to the Independent Review into the Future Security of the National Electricity Market (the “Finkel Review”).

¹³ http://www.energynetworks.com.au/sites/default/files/20170303_submission_finkel_final.pdf

¹⁴ Refer to [Energy Network Australia's media release of 14 March 2017](#)

¹⁵ <https://www.aemo.com.au/Gas/National-planning-and-forecasting/Gas-Statement-of-Opportunities>

¹⁶ Refer to Energy Networks Australia's [9 March 2017](#) media release.

¹⁷ *Ibid.*

¹⁸ Refer to http://www.energynetworks.com.au/sites/default/files/gasvision2050_march2017.pdf

agreed to review the regulatory test for investment for new transmission assets to ensure it is effective in the current market environment”.

The review, subsequently broadly found, the Regulatory Investment Test for Transmission (RIT-T) *“in its current form remains the appropriate mechanism to ensure that new transmission infrastructure in the National Electricity Market (NEM) is built in the long term interests of consumers. Consistent with its findings, the review made recommendations to improve existing arrangements, including to ensure that:-*

- » *system security and emission reduction goals are adequately considered*
- » *low probability but high impact events like the South Australian system black event in September are appropriately taken into account*
- » *information about transmission networks is more accessible to support more effective engagement by non-network providers”.*

ElectraNet is currently conducting a RIT-T, which is the established NER obligated regulatory tool to determine the best network or non-network solution to an identified energy supply need, as part of its [South Australian Energy transformation](#) project. One potential solution is a new high-voltage electricity interconnector between South Australia and the eastern states, but other non-network options may also exist. The preferred option could assist in improving system security and to help lower electricity prices.

(ii) Generator connection and retirement

More broadly:

- » New generator connections could include an obligation on these generators to provide inertia and system strength to the NEM, as well as technical capabilities, or enter into an agreement with another provider of these services through market or commercial arrangements. This appears to be the direction outlined in AEMO’s interim advice (March 2017) to ESCOSA as part of the current Electricity generation licence conditions Inquiry. This [advice](#) identifies that:

“... the high proportion of non-synchronous intermittent generation in South Australia justifies having additional or tighter technical standards than those that currently apply under the National Electricity Rules. AEMO therefore recommends that, effective immediately, all new generation licences be subject to additional conditions, in order to give regard to the technical changes affecting the South Australian power system. These conditions are additional to the Commission’s existing set of licence conditions for new generators, and include frequency control capabilities; ramp rate controls; voltage and frequency disturbance ride-through capabilities; and other capabilities”.
- » Retirement or disconnection of existing generator assets should be subject to some form of regulation to ensure adequate notice is provided to ensure that the NEM is able to appropriately respond.

(iii) Role of Transmission Network Service Providers to support System Security

- » TNSPs could provide additional system security services enabled by ‘fit-for purpose’ regulatory frameworks.

- » TNSPs have the knowledge, information and requisite skills to undertake modelling and analysis of the power system to evaluate and potentially provide and/or procure optimal solutions for security and stability of the power system in the medium and longer-term.
- » Energy Networks Australia notes the recent AEMC Directions Paper as part of its System Security Market Frameworks Review released on 23 March 2017, proposed:
 - In the Immediate Package (next 3 years) TNSPs are to provide inertia in accordance with the AEMO determined level
 - In the Subsequent Package (3+ years) TNSPs are to be incentivised to achieve inertia above the required level based on market benefits
 - In relation to Fast Frequency Response (FFR) services the AEMC's Immediate Package, would see TNSPs contract for FFR services where it can assist in meeting the required inertia level as the FFR markets mature.

(iv) National network transmission planning

Energy Networks Australia agrees with AEMO¹⁹ that the evolution of the sector is resulting in a new era of transmission planning. This will require closer interaction between AEMO and the TNSPs to identify NEM priority planning issues. Planning processes can be enhanced through:

- **Earlier identification of potential lead times for constraints** (e.g. the SA brown-out over the summer with limits on the Heywood interconnector being reached and limits in Western Victoria exceeded)
- **Consistency in forced outage recognition** (e.g. a forced outage on a single Heywood circuit is not currently taken into account by AEMO in the NTNDP and can result in a larger loss of supply, than any single generator outage in SA.
- **Anticipating Tipping Points** AEMO and network service providers will require increased analytical capacity to prospectively anticipate emerging issues in system stability and loss of system strength in relevant locations. Other than SA, there has been limited detailed power system assessment of the implications of increasing levels of non-synchronous generation on system security.
- **Support new role for AEMO's six monthly report to the COAG Energy Council in relation to NEM Security** (e.g. reserve shortfalls are now more likely in the nearer term due to the closure of Hazelwood, as recently indicated in AEMO's medium term outlook for the Victorian and SA regions.

¹⁹ Refer to AEMO's [2016](#) National Transmission Network Development Plan (12 December).

(v) System Restart

There is widespread recognition that the System Restart Ancillary Services (SRAS) available in SA have been problematic, as exemplified by the events of 28 September 2016. One SRAS source failed and a circuit breaker failed to close for the second source.

AEMO's Final Report clearly identifies and recommends improvements to the performance of the system restart process. Recommendations 12, 13 and 14 appear very practical. They state:

12 - AEMO, together with the South Australian System Restart Working Group, to review the system restart process in detail to determine efficiencies and to implement relevant recommendations from the Reliability Panel. These learnings will be shared across all Australian jurisdictions

13 - Any differences between SRAS test plans and the restart process set out in a system restart plan and associated local black system procedures to be identified and explained by AEMO, to ensure the test simulates, as far as practicable, the conditions that will be encountered in a real restart situation

14 - Similarly, where the restart procedure depends initially on starting a low voltage generator, the start of this generator alone to be tested on a regular basis, in addition to the annual test of the entire SRAS source.

Energy Networks Australia also suggests that the System Restart Standard should require a technical evaluation occur in parallel with the commercial evaluation during SRAS procurement and assessments. Currently, AEMO undertakes both these processes, and it may be appropriate for jurisdictional TNSPs to advise and comment on these assessments.

(vi) Proposed rule changes

Energy Networks Australia also notes that the following rule change proposals are currently being considered by the AEMC.

- » [Generating System Model Guidelines](#) - proposed by AEMO - consultation initiated March 2017
- » [Inertia Ancillary Service Market](#) - proposed by AGL - consultation initiated September 2016
- » [Managing the rate of change of power system frequency](#) - proposed by South Australian Minister for Mineral Resources and Energy - consultation initiated September 2016
- » [Managing power system fault levels](#) - proposed by South Australian Minister for Mineral Resources and Energy - consultation initiated September 2016, and
- » [Transmission Connection and Planning Arrangements](#) - proposed by COAG Energy Council - consultation initiated November 2015.

These changes demonstrate the evolutionary nature of the NEM arrangements and the majority of these proposals and reforms should improve power system security outcomes.

(vii) Distributed Energy Resources

Historically, the power system has been characterised by power flowing ‘one-way’ from a relatively few large centralised generators connected to extra high voltage transmission networks which transport bulk power to the high and low voltage distribution networks who then reticulate supply to customers.

However, electricity networks in Australia and around the world are increasingly seeing more generation connected behind the meter. South Australia and Queensland now have the highest penetration of domestic rooftop PV installations per capita in the NEM. Increased rooftop PV installations result in less electricity being required by customers from the grid and excess capacity exported into the grid.

Since the start of this decade, SA Power Networks has connected more than 800MW of solar-photovoltaic roof-top generation to its network in SA.

More recently, other new technologies such as battery technology and electric vehicles are expected to increasingly connect to the grid. Companies are developing energy management systems, which will enable customers to optimise their consumption and generation of electricity. New proponents and aggregators are emerging in the NEM, which were never envisaged under the original market design.

(viii) Gas Options

The SA Government should, amongst other matters:

- » Actively examine the future role of gas in the state’s energy mix;
- » Avoid energy frameworks which are technology specific but rather support effective innovation;
- » Support gas exploration, with a view to increase gas supply options.

(ix) Electricity Network Transformation Roadmap

As outlined in our earlier submission to the Inquiry, Energy Networks previously recognised these emerging changes, and jointly embarked with the CSIRO on the development of an Electricity Network Transformation Roadmap²⁰. The two-year analysis produced a comprehensive transition plan to 2050 for Australia’s electricity system to keep the lights on, bills affordable and decarbonise electricity.

The Key Concepts Report for the Electricity Network Transformation Roadmap identified measures, which could see 10 million participants using the grid as a platform for energy

²⁰ CSIRO and Energy Networks Australia 2016, Electricity Network Transformation Roadmap: Key Concepts Report (Roadmap).

exchange, customers saving over \$414 per year on average, total savings of \$101 billion in system expenditure and zero net emissions for the electricity sector by 2050.

Should the Committee require any additional information, please feel free to contact Norman Jip, Energy Networks Australia's Senior Program Manager – Transmission on (02) 6272 1521 or via e-mail: njip@energynetworks.com.au.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'John Bradley', is positioned above the printed name.

JOHN BRADLEY
Chief Executive Officer