SUBMISSION TO THE INQUIRY INTO THE RELIABILITY AND QUALITY OF ELECTRICITY SUPPLY ON THE EYRE PENINSULA

Prepared for:

Essential Services Commission, ESCOSA
GPO Box 2605 ADELAIDE SA 5001

Prepared by:

The Energy Security for SA Working Party (ESSAWP)
Contact: Steve Sawyer (On behalf of ESSAWP)
Email: steve.sawyer@ozemail.com.au
Ph Hm: 08 86835092
Mob: 0429225092
Mail: 17 Queen St, Pt Lincoln SA 5606

WHO ARE THE ENERGY SECURITY FOR SA WORKING PARTY?

The Energy Security for SA Working Party (ESSAWP) are an independent group of people based on Eyre Peninsula, with no vested interests, who are working together to progress an energy future and energy security solution for Eyre Peninsula and South Australia. ESSAWP have been working with stakeholders across government, industry and the region, on a plan and solution for energy security in SA for over 12 months.

The group brings together a wide range of backgrounds with specific skill sets needed to develop solutions in the best interest of South Australia.

The ESSAWP team have good support from regional bodies, local government and RDA Whyalla and Eyre Peninsula and have established connections with ElectraNet, ESCOSA, SA Power Networks, Minerals, Resources Infrastructure and Investment Taskforce, generators, funders, investors and major commercial users including fishing, manufacturing and mining industry stakeholders. ESSAWP are working with all stakeholders, to secure a collaborative, informed and pro-active approach to energy security and energy capacity for South Australia.

The overall objective of ESSAWP is to achieve sustainable, reliable, affordable and energy security for South Australia. The Energy Security for South Australia Working Party's only purpose is to work with government, energy sector companies and agencies, industry and community to get a solution in place for energy security that maximises the generation capacity of the renewable resources and stabilises the grid on Eyre Peninsula, across South Australia, and Australia.

ESSAWP have no political allegiances and have no Commercial interests. We are interested in workable outcomes and have no specific technology solution preferences.

The Energy Security for SA Working Party (ESSAWP) on Eyre Peninsula are committed to working for a collaborative energy security solution. The ESSAWP has been advocating for immediate energy security improvements and for accessing the abundance of renewable energy capacity, with Eyre Peninsula demonstrating some of the highest reserves of untapped wind and solar and emerging pumped hydro capacity and hydrogen to contribute to secure, affordable and low emission energy generation.

Our goals are:

- Affordable energy
- Reliability of supply
- Sustainable systems
- Zero emissions of energy generation
- EP becomes a major exporter of zero emission energy
- Efficient use of energy

ESSAWP, in conjunction with the very successful SALT Festival held the 'Line in the Sand' Energy Security Summit on April 24, 2017 in Port Lincoln, attended by 84 participants (and viewed by 98,000 online). The summit was held to explore solutions for reliable, affordable, sustainable energy and to secure increased energy generation and supply for Eyre Peninsula and South Australia.

The summit featured presentations by Economist Professor Ross Garnaut, Chair of the Outback Community Authority Cecilia Woolford, Chair of Eyre Peninsula Integrated Climate Change Agreement Committee (EPICCA) Brian Foster, Electrical Engineer and a founding member of the Energy Security for South Australia Working Party (ESSAWP) Steve Sawyer, and a facilitated panel session to discuss current issues and opportunities around energy security and climate change for the Eyre Peninsula, and how this sits within the state and national context.

This resulted in the establishment of a taskforce to progress the agreed objectives and has led to presentations to State Government calling on support for a set of projects for the Eyre Peninsula to rapidly progress energy security. The Summit, through the taskforce (ESSAWP), has led to the production of a draft, 20 year, staged energy plan for the region, covering all areas of the region's needs, opportunities an infrastructure requirements in Energy, from large scale transmission upgrades down to small scale energy auditing and incentives schemes for residential customers.

INTRODUCTION:

The Australian Electricity System and the National Electricity Market System in now in the beginning of a new revolution which will see substantial changes on the focus and that way the system is structured and operates

It is changing from the model set up in the last century of large centralised generators feeding into a transmission system and then the distribution network to consumers to a system where these is distributed generation, both large and small, from dedicated generators to customers who are also generators. There will be an increase in the use of battery systems to provide grid stability and short-term storage coupled to longer term storage systems such as pumped hydro. This will also be aided by using smarter grids along with increased customer interaction and input.

The current National Electricity Market and rules are no longer appropriate and are an impediment to the transition to the new renewable energy based generation system and interactive grid systems. This is highlighted by the Independent Review into the Future Security of the National Electricity Market by Dr Alan Finkel. 49 of these recommendations have recently been approved by the COAG Energy Ministers Meeting in Brisbane on 14/7/2017.

Under the Improve System Planning Considerations (ISPC), it recommended the development of an integrated grid plan to facilitate the efficient development and connections of renewable energy zones across the National Electricity Market

In the NEM, there are many players and organisations who are all bound by specified rules, regulations or responsibilities or have responsibilities is specific areas. In a climate where the NEM will become more integrated, consideration needs to be made of the influence of one area with respect to the effect on other areas. Community needs and expectations also need be identified, considered and evaluated in conjunction of the overall plans or goals for the system.

Energy security is an economic imperative for South Australia and the nation. The Eyre Peninsula region of South Australia is a strategic priority. Eyre Peninsula is located at the end of the national grid and has experienced consistent issues regarding reliability, stability of supply and grid capacity. Following the dramatic blackouts of 2016 and the economic impost of rising electricity prices in South Australia, it is evident that immediate effective action is required to establish energy security on the Eyre Peninsula alongside the positive work occurring through the South Australian Government's State Energy Plan.

Eyre Peninsula has a population of 58,000+ people and produces $4.2 billion of regional product and exports a similar value $4.1 billion. Eyre Region includes the major centres of Whyalla, Port Lincoln and Ceduna.

Eyre Peninsula is a region of innovation with a diversified economy including agriculture, aquaculture and seafood, tourism, manufacturing, mining and minerals processing and the renewables sector. Economic development is currently constrained due to energy security, affordability and reliability issues. The region's current energy requirements are up to 30 MW for the Southern Eyre Peninsula inclusive of Port Lincoln and around 50 MW for the balance of Eyre Peninsula.

The Eyre Peninsula region is a major economic contributor to the state's economy. Current electricity infrastructure is not fit for purpose and this includes the power line from Whyalla to Port Lincoln and the significantly under sized power line to Streaky Bay and to Ceduna. The Port Lincoln's Power Station, which is currently identified as the backup power supply in case of blackout, has not successfully operated for some time. Its failure to provide the required backup in the 28 September 2016 event cost Eyre Peninsula $8.33M. The station costs $10 million annually and the generator's ten-year contract for that back-up supply concludes at the end of 2018.

The region has significant electricity generation potential. The 2010 Select Committee on Wind Turbines Report undertaken by Worley Parsons and Macquarie Capital identified over 4000 MW of easily harvested wind generation. A further capacity of over 4000 MW of solar generation on Eyre Peninsula has also been identified.

SPECIFIC COMMENTS ON SECTIONS IN THE REPORT:

3.1 Reliability outcomes on Eyre Peninsula

The reliability indexes for the averages over the last 3 years for Eyre Peninsula are stated as USAIDI is 400 minutes per annum and USAIFI is 3.5 per annum.

There is no statement about meeting the Regulatory targets and whether these are acceptable.

The SA Power Networks Jurisdictional Services Standards for the 2015 -2020 Regulatory Period Final Targets (issued October 2014) from the ESCOSA website gives the targets shown in Table 1 extracted from this report.

The Short Rural Feeder category is likely to cover most feeders emanating from the zone substations at Pt Lincoln, Yadnarie and Wudinna.

The Long Rural Feeder category is likely to apply to

SA Power Networks' Network Segments

Network Type	Definition	% of Customers	$USAIDI_n$ (average minutes off supply per customer per annum)	$USAIFI_n$ (average no. of supply interruptions per customer per annum)
CBD feeder	A feeder supplying predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.	0.3%	15	0.15
Urban feeder	A feeder, which is not a CBD feeder, with actual maximum demand over the reporting period per total feeder route length greater than 0.3 MVA/km.	69.3%	120	1.30
Short Rural feeder	A feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km. Short Rural feeders may include feeders in urban areas with low load densities.	14.1%	220	1.85
Long Rural feeder	A feeder which is not a CBD or urban feeder with a total feeder route length greater than 200 km.	16.3%	300	1.95

Table 1

some most feeders fed from the 66 kV line from Wudinna to the Ceduna/Streaky Bay area, assuming the line length definition includes the 66 kV lines

While the published Quarterly Reports for overall performance across the state shows compliance with these targets, there is no breakdown of the various areas of the state available. These are provided by SA Power Networks and were previously published on a quarterly basis.

This does not allow for easy identification of problems in specific areas of the state which are suffering poor performance. If these were highlighted, corrective action could be undertaken in a timely manner, rather than waiting for a major system event (which may not happen for many years) to bring this matter into focus.

Recommendation: ESSAWP recommends that ESCOSA reintroduce a breakdown into specific areas into the Quarterly Performance Reports for SA Power Networks to enable easier and timely detection of poor performing areas.

3.2 Concerns raised by Customers

The survey undertaken by the Regional Development Australia – Whyalla and Eyre Peninsula (320 business respondents) indicates that 35 % of these business respondents had invested in back up power systems (as a result of the unreliable power supply).

A similar survey of residential customers (both town based and rural) needs to be undertaken their concerns and confirm that there is also a large number of these customers who have invested in back up facilities due the unreliable power supply.

This survey should also include questions about response received to complaints about power outages. There is a general attitude within the community that complaints are not actioned and many customers do not bother reporting issues. While this is sometimes dismissed as apathy, it is a case of wasted time, and customers resort to other solutions such a generator sets. These numerous generation sets are costly and in effect a waste of a resource.

Recommendation: ESSAWP recommends that additional surveys be undertaken to gauge attitudes and issues of the wider community about grid reliability and back up facilities.

SECTION 4: OPTIONS FOR IMPROVING RELIABILITY OF SUPPLY

4.1 OPTIONS PROPOSED BY ELECTRANET

ESSAWP has made a submission to ElectraNet as part of their Regulatory Investment Test – Transmission, RIT-T which closed on 21 July 2017.

The following sections in italic are extracts from this submission.

Option 1 – Re-conductoring of the existing 132 kV single-circuit network and the continuation of network support at Port Lincoln.

Any option that relies on the continued operation of the existing power station raises concerns as to the reliability and adequacy of ongoing maintenance and support of the existing generation equipment. As all are well aware, this power station failed during the Sept 28th storm in 2016, costing the community $8.33M. There is no evidence that has been provided to show that the existing station problems have resolved and the system definitely has not been tested show that it is capable of re-energising supply to Pt Lincoln in the event of an outage on the 132 kV lines feeding Pt Lincoln.

In the 2012 Report, the only credible options identified were about construction of new 275 kV circuits and the 132 kV option was not progressed. Rebuilding of the 132-kV line with higher capacity was considered in the 2013 PADR and ranked last of the options investigated. This indicates that this is not a credible option.

Option 2 – Construction of a double circuit 132 kV line.

This option removes the current concerns about the reliability of the Pt Lincoln Power Station. The capacity of the proposed lines has not been suggested, so it is concerned that this may not even remove the existing constraint.

Construction of a 132 kV provides minimal opportunity for the large generation potential from the Wind and Solar Resource on Eyre Peninsula. While the current generation connection arrangement may not come under the existing RIT-T process, this needs to be acknowledged and stated as a major disadvantage in this option.

Option 3 – Construction of two single circuit 132 kV lines.

This option also removes the current concerns about the reliability of the Pt Lincoln Power Station. The capacity of the proposed lines has again not been suggested, so again it is concerning that this may not remove the existing constraint.

Again, construction of a 132 kV provides minimal opportunity for the large generation potential from the Wind and Solar Resource on Eyre Peninsula. While the current generation connection arrangement may not come under the existing RIT-T process, this needs to be acknowledged and stated as a major disadvantage in this option.

Option 4 – Construction of a double circuit 275 kV line.

This option also removes the current concerns about the reliability of the Pt Lincoln Power Station. The capacity of the proposed lines has again not been suggested. Both the 2012 and 213 Reports nominated the Cultana to Yadnarie options of 1000 MVA or 600 MVA and from Yadnarie to Pt Lincoln and Yadnarie to Wudinna as 600 MVA

The 600 MVA lines does allow for connection of proposed loads such as the iron Road Development but only allows for a small part of the large generation potential from the Wind and Solar Resource on Eyre Peninsula. This is not sufficient to allow the development of the full potential of the resources. Again, while the current generation connection arrangement may not come under the existing RIT-T process, but this needs to be acknowledged and stated as a major disadvantage in this option.

Option 5 – Construction of two single circuit 275 kV lines.

This option also removes the current concerns about the reliability of the Pt Lincoln Power Station. The capacity of the proposed lines has again not been suggested. Both the 2012 and 213 Reports nominated the Cultana to Yadnarie options of 1000 MVA or 600 MVA and 600 MVA from Yadnarie to Pt Lincoln and Yadnarie to Wudinna. The 600 MVA lines provides minimal opportunity of the large generation potential from the Wind and Solar Resource on Eyre Peninsula, but it is not sufficient to allow the full potential. Again, while the current generation connection arrangement may not come under the existing RIT-T process, this needs to be acknowledged and stated as a major disadvantage in this option.

There are several issues relevant to this Inquiry made in these paragraphs:

- The reliability of the existing Port Lincoln Power Station to meet the requirements of backing up the existing 132 kV line in the interim period of construction and commissioning of any new option is a major concern. Some of the options offered would not be implemented until the 2020 to 2023 period. While the existing contract between ElectraNet and the Engie/Synergen will expire at the end of 2018, the risk is it may be extended as this would be a far less expensive option that another generator provider supplying a “new” generator.

- Since the Transmission Licence Compliance Review ElectraNet Pty Ltd on the 28 September 2016 state-wide power system outage was completed, more information has surfaced into the poor maintenance practices and about the 5 days taken to find and rectify the fault on Set 1 & 2 generator transformer. This is detailed in a later section.

- No suitable explanation has been forthcoming about the "circuit breaker failure" on Set 3 resulting in it being unable to go online after the initial trip at 0100 hrs on 29 September 2016.as reported in AEMO's October Report. Local information indicates this was a closing coil failure and required SA Power Networks staff to fly from Adelaide the next day to affect repairs, but still the set did not go online.

- It took 2 days 4.5 hours to affect repairs the fault on the 132 kV line, but the power station was only able to provide supply for 5 hours.

- Increasing the capacity of the transmission system will lead to the installation of more wind and solar generation across the Peninsula. This will improve the generation reliability, particularly in the event of the separation of Eyre Peninsula from the rest of the network as happened on 28 September 2016, and would need to be implemented with a means of providing essential FCAS Services. (such a grid connected battery system as per ESSAWP interim proposal outlined in a later section)

- Installation of a ring system with geographical separation in the transmission system (as opposed to a dual circuit or two collocated lines) is preferred as this improved the reliability of the transmission network to other parts of the peninsula. (see later section on the Long Term Plans for the Eyre Peninsula Transmission System)

Increasing the system voltage for the transmission system will result in a more robust line which is less prone to lighting problems, hence improving the reliability of these.

Recommendation: ESSAWP recommends that ElectraNet utilise reliability as a major assessment criteria in the selection of options to upgrade the transmission system on Eyre Peninsula. This includes upgrade of system capacity to remove existing constraints and enable additional generation which will improve the reliability of the system.

Recommendation: ESSAWP recommends a change in the regulatory and infrastructure upgrade requirements that shift the priority to increasing energy security through increasing the State's ability to connect additional renewable generation capacity.

4.2 OPTIONS PROPOSED BY SA POWER NETWORKS

4.2.1 Distribution network hardening options

Option 3 as proposed would represent the best improvement, calculated at $17,782 per minute saved. If the improvement in reliability does not result, then Option 1 or 2 can be implemented in subsequent years.

The proposal indicates the new insulators will be lightning resistant ones, while many insulators on the market are described as puncture proof. Doug Schmidt, General Manager Network Management was questioned on this at a recent SA Power Networks Directions Workshop and advised that these insulators are puncture proof.

Recommendation: ESSAWP recommends that SA Power Networks confirm that the proposed insulators are puncture proof and represent the best the long-term performance and hence reliability of the reticulation system.

4.2.2 Generation options

Option 1 – this proposal is interesting from the perspective that the system has previously been run in this mode when works was being undertaken by ElectraNet on the Cultana Substation, requiring all of Eyre Peninsula to be supplied from the Port Lincoln Power Station.

This is essentially a transmission solution as Port Lincoln would supply power over ElectraNet's 132 kV line from Port Lincoln to the substation at Yadnarie and then to the Wudinna Substation.

ElectraNet have stated that their transmission system are unable to supply power from Port Lincoln to Yadnarie and then to Wudinna (assuming loss of the Cultana to Yadnarie line) The Port Lincoln generators are not designed to energise long transmission lines and deal with the line charging on lightly loaded lines (i.e. they lack reactive power absorb capability). They are also sized to provide backup to Port Lincoln and not the wider Eyre Peninsula in line with the reliability standards set out in the Electricity Transmission Code.

There may also be an issue if there is only one earth reference point in the system, which would typically be at the Cultana Substation's 275/132 kV transformer on the 132 kV winding side. This may require the installation of solutions such as neutral earthing transformers at substations such as Yadnarie or Port Lincoln. This needs to be further investigated with ElectraNet.

It would have no effect on the power flows in SA Power Network's system and hence it is a normal situation from the distribution perspective.

While installation of improved SCADA and automation to Rudall, Lock and Polda substations is beneficial in reducing outage times, if this is needed to provide reliable supply then this option should already be in SA Power Networks Forward Works or Construction plans and being implemented. Reference to the SAPN Distribution Annual Planning Report 2016/17 to 2020/21, which lists all of SA Power Networks substations with SCADA, found that Polda is already on SCADA. No project proposals for the Eyre Peninsula Region could be found in this report, or on their website.

In proposing generation options, a number of factors need to be considered:

- Relative risks associated from loss of the system upstream from Yadnarie and the risk of loss of the 2 main sections of 132 kV network downstream on Eyre Peninsula.

  The approximate lengths of lines involved are:

Cultana to Yadnarie	100 km
Yadnarie to Port Lincoln	150 km
Yadnarie to Wudinna	140 km

  At first examination, the risk of a fault on each of these sections is approximately the same (terrain conditions etc. are not significantly different), except that supply to Cultana is subject to the upstream system, and this is the section that initially failed on 28th September 2016.

  Hence the conclusion is that the loss of the Cultana-Yadnarie line or loss of the upstream supply is more likely. From this, the option No 1 proposed by SA Power Networks would be the preferred option.

- Length of transmission – sub transmission – distribution line to towns and their population

ESSAWP have undertaken a risk study of all the 13 larger towns connected via the Yadnarie Substation. This modelling takes into account population, length of line from the secure source to the location and the number of alternate means of supply available.

The results are given in Table 2

Eyre Peninsula Power Supply to Towns

Risk Rating based on population,reticulation length and back up generators

Town	Population 2011 Census	Risk Rating	Priority Ranking
Port Lincoln	14088	1711692	1
Ceduna	2289	1030050	2
Streaky Bay	1005	376875	3
Tumby Bay	1474	215941	4
Penong	343	178360	5
Kimba	795	143100	6
Wudinna	513	123120	7
Cummins`	719	111445	8
Pt Neill	510	109650	9
Cowell	692	103800	10
Cleve	809	87372	11
Elliston	209	73150	12
Coffin Bay	392	56840	13
Arno Bay	273	38493	14

Notes:

The availability of the Port Lincoln Power station makes no difference to the rating as first priority

Reticulation length is based on estimated distance to secure suppy point (N-1)

Town Population based on 2011 Census

Population of areas surrounding each town are approx equal to the Town popoulation
Inclusion of area population did not affect the order

Table 2

This modelling indicates that Port Lincoln has the highest risk, even though it has a backup power station. Second and third was Ceduna and Streaky Bay respectively, primarily due to the added length of about 200 km of sub transmission and distribution system from Wudinna. This finding also reflects the length of time (up to 5 days) that customers in these areas were off supply during the September 28th 2016 storm and the published reliability data for Eyre Peninsula. It also aligns with the draft findings of the report in Section 3.

This analysis would lend support towards Option 3 where generation is installed at Wudinna, Ceduna and Streaky Bay but also suggests a new option of generation at Ceduna and Streaky Bay only.

Recommendation: ESSAWP recommends that option 1 would be the preferred option as this will service the maximum number of customers.

4.2.3 SCADA Options

The future of the transmission and Distribution Networks lies in the transformation to smart grids which enable interaction with customers and responds to their needs. Smarter control of these systems is required and up to date SCADA system will play an important role in reducing outage times and providing better management tools for the network.

Otherwise there will be a proliferation of solar / battery storage systems to improve reliability at the customer premise and increasing numbers of customers leaving the grid, which results in higher grid charges for those still connected.

Recommendation: ESSAWP recommends the adoption of Option 1

4.3 Options proposed by Eye Energy

4.3.1 Eyre Peninsula Solar PV – Cleve and Wudinna

Installation of two PV generators will improve the quality of supply in the area but is unlikely to change the reliability of the grid. Installation of batteries might improve the reliability to the customer(s) to whom it is connected, but not the wider grid. It might be open to an arrangement of a mini grid operation if it can be automatically isolated from the grid. Use of solar alone would reduce the peak demand by only about 20% but results in a steep rise around 5:00 pm with a new peak of 80% about 6:00 pm. This is illustrated in Figure 1 using the load profile for Port Lincoln.

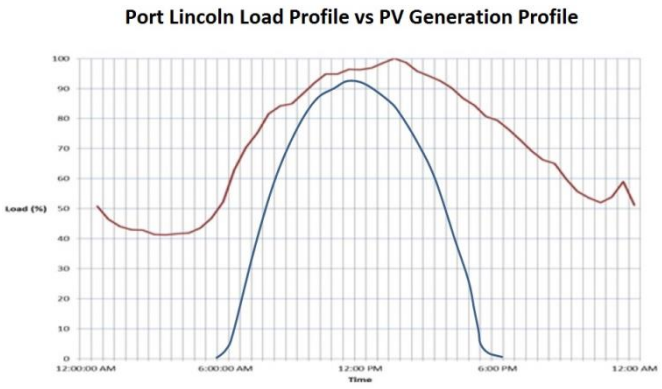

Figure 1

Recommendation: ESSAWP recommends that this proposal can proceed on its own merits as it does not affect other proposed improvements in system reliability.

4.3.2 Port Lincoln Tuna Industry Solar PV – Smart Mini Grid/Virtual Net Metering

This proposal may provide improve reliability of supply to only the six customers it is proposed to connect if a battery storage system is also installed and if the area can automatically become an islanded grid if there is a fault on the network. It will also reduce the load on the Pt Lincoln Substation which may provide some small benefits to a larger scale battery system proposed for Port Lincoln

Recommendation: ESSAWP recommends that this proposal is allowed to proceed on its own merits as it does not detract other proposed improvements in system reliability.

5. Regulatory Issues

ESSAWP fully agree with the Draft Recommendation except this needs to be more strongly worded, ie “there will be benefits…”.

This same issue has also arisen in discussions with Electranet as the same situation applies.

Recommendation: ESSAWP recommends that the wording of the Regulatory Issues Draft Recommendation be more strongly worded, ie “there will be benefits…”.

5.4 The need for effective joint planning

The current National Electricity Market and rules are no longer appropriate and are an impediment to the transition to the new distributed renewable energy based generation and interactive grid systems.

This is highlighted by the Independent Review into the Future Security of the National Electricity Market by Dr Alan Finkel.

49 of the 50 recommendations have recently been approved by the COAG Energy Ministers Meeting in Brisbane on 14/7/2017.

Under the Improve System Planning Considerations, it recommended the development of an integrated grid plan to facilitate the efficient development and connections of renewable energy zones across the National Electricity Market (Recommendation 5.1 of the Finkel Report)

Recommendation 5.5 of the Finkel also recommends a review of the Regulatory Investment Test for Transmission, which relates to the preceding recommendations.

Recommendation: ESSAWP recommends that the wording of this be changed to: "Pursue changes to the NER to strengthen the requirements for joint planning, including greater independence into the joint planning process" in line with recommendations of the Finkel Report.

ETC reliability standards at Port Lincoln Terminal

The existing transmission arrangement of a single line from Yadnarie coupled with a Network Support Agreement with the existing power station owned by Synergen/Engie has demonstrated that this existing arrangement does not meet the ETC Reliability Standard.

While ESCOSA has already undertaken a review of the Transmission Licence Compliance Review of Electranet in respect to the 28 September 2016 outage, more information has surfaced and this has relevance to the ongoing reliability of Eyre Peninsula as this is the prime back up for Port Lincoln and can play an important role in the back up of power to all or Eyre Peninsula in the event of the loss of the Cultana to Yadnarie transmission line or loss of upstream supply.

This information has revealed that this station is near the end of its economic life and some plant has never been reliable since the day of recommissioning on this site.

- **Maintenance**
  - The current maintenance program needs to be reviewed as this is suspected to be having an adverse effect on the reliability of operation of these generating sets.
  - Originally there were full time maintenance staff employed by Synergen. After the loss of these staff, the electrical maintenance works maintenance works were undertaken by outside contractors who provided staff for one day every fortnight.
  - It is understood that currently there is only 1 permanent employee (the site manager) and no regular maintenance program, work is only undertaken on a breakdown basis, which is not acceptable in meeting the required reliability standards

- **Transformer Fault sets 1 & 2 on 29 September 2016**
  - Transformer 1 (transformer for generator sets 1 &2) is fitted with 2 breathers/dryers. One is connected to the transformer tank/conservator and one to the 11 kV cable termination box. These dryers contain a

Silica gel compound such as Zeolite which change colour as it absorbs moisture. These cells were checked fortnightly when permanent maintenance staff were employed.

- These inspections previously led to the discovery of moisture ingress into the cable termination box on Generator 3 transformer some years ago, enabling remedial works to be undertaken before the moisture level increased to a level where a fault can occur and the protection system isolates the transformer.

- The present Inspection regime is unknown but following a transformer protection trip (as occurred on 29th September 2016) the colour change of the desiccant would have been an immediate alert to a moisture problem. Instead it took 2 crews and 5 days to find the moisture in the cable termination box.

- After an earth fault protection trip in a power system, the common practice to isolate the fault zone into segments and test each of these. In this case it is the transformer cables and the 11 kV winding of the transformer. These are disconnected in the cable termination box on the transformer; if this had been undertaken then the moisture issue in this box would have been discovered in a short timeframe. It appears that industry practice was not followed as this took 5 days.

- **Regular test runs and testing of the power station**

  - Examination of data shows that the station did not run during the period of September 2015 to February 2016, a period 6 months. Sets 1 & 2 were test run on 2 March 2016, but Set 3 was not tested until 11 May 2016, a period of 8 months. Figure 3 and 4 show these 2 runs.

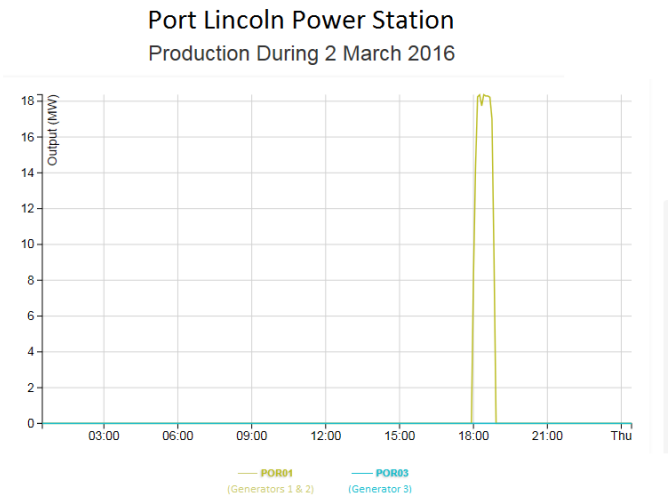

Figure 2

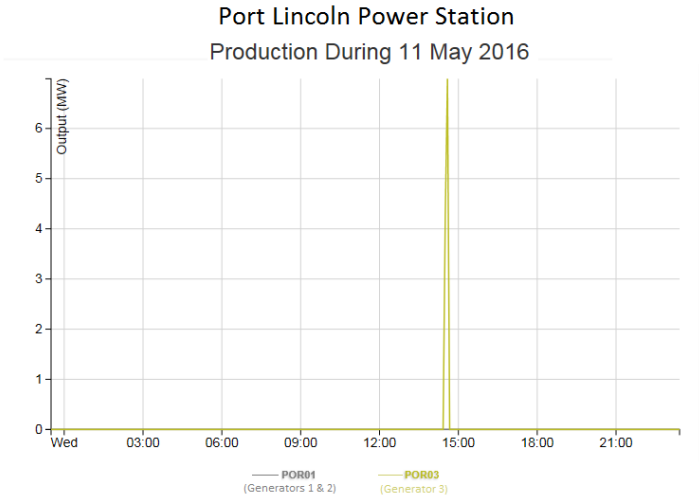

Figure 3

  - In the Transmission Licence Compliance Review – ElectraNet – in Section 6.3.1 titled Historical performance at Port Lincoln the following was extracted:

> In addition to providing network support, regular testing of the Port Lincoln power station has occurred to ensure successful operation of the generating units. In the same period, 30 tests were performed on a periodic basis. The units successfully synchronised 28 out of the 30 times (93 percent of the time).

The period was stated as the 5 years up to December 2016. This gives an average interval of 2 months between tests.

ESSAWP examined the NEM data for the period April 2014 up to Dec 2016 for run times and found the following:

- April 2014 to Dec 2014, 2 occasions with runs on set 1 and 2 only occurred
- January 2015 to December 2015 shows 2 occasions when all 3 sets were run and one month where set 3 was run twice (this is after an interval of 12 months where it was not run at all).

- January 2016 to August 2016 (September 2016 to December 2016 was not included as there were large numbers of test runs and attempts to fix the problems encountered on September 28 and 29) shows 5 monthly occasions where all three sets were run and 1 month where only sets 1 & 2 were run.

- This shows that here were only 7 occasions when all three sets were tested, giving an average interval of about every 4 months.

- The average loading on the set during these tests was typically 20% to 30% and does not reflect the load it might endure during backup operations. Annual load tests at 100% are needed

The conclusion to these events is that the station is not being adequately tested on a regular basis.

The statement the station had only successfully synchronised 28 out of the 30 times is also alarming and reinforces concerns with problems at this power station. The operational availability needs to be 100% (excluding scheduled maintenance) and not a 93% success rate.

This is also reflected in the 28 February 2016 load shed in SA where the station was called to go online to help prevent load shedding of customers and failed to go online.

All of the routine test runs involve synchronising with the existing grid and then ramping load onto the sets. This does not simulate the conditions under which this station will be called to operate, which is starting from a black condition and switching loads onto the station. While this will require lots of coordination and deliberately blacking the Port Lincoln region, this needs to be undertaken at a time of least inconvenience to customers to prove the reliability of the station operation.

On 7th and 8th July 2017 the station ran continuously for a 24 hour period with 20% load on set 3 and varying loads on sets 1 & 2. These are shown in figures 4 and 5.

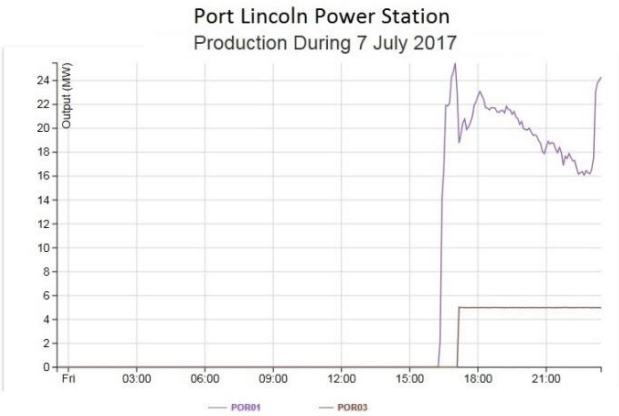

Figure 4

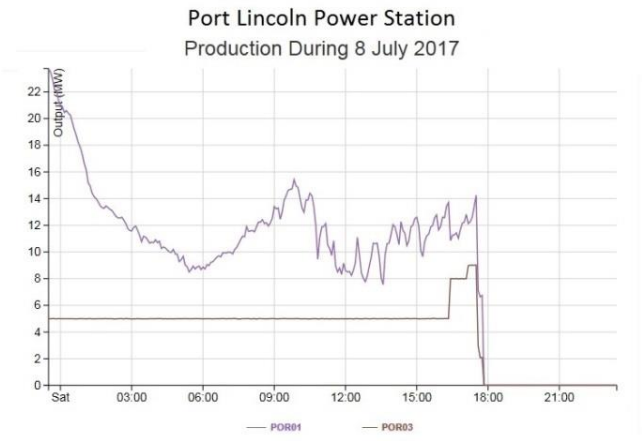

Figure 5

It is unclear why the station run for this period of time (it does not appear to coincide with times of constraints on wind generation), but this is the first time a run of this length has been seen and it does prove that the station can operate for longer periods than the typical one-hour test runs.

The reliability of this station is a major concern to the Port Lincoln Community who suffered $8.33M losses in September 2016 due to the failure of the entire station.

The reliability of this station is also critical for the proposal to utilise this power station to provide power to other parts of Eyre Peninsula such as in the SA Power Networks Option 1.

Electranet has publicly stated that contract cost for this station is $10M annually (which is born by all customers). It is provided to meet the ETC reliability requirements at Port Lincoln, but appears to be very unreliable, poorly maintained and not meeting the required ETC standard.

Recommendations:

1. ESSAWP recommends that ElectraNet- Engie-Synergen be requested to undertake reliability tests to prove that it meets the ETC reliability level that is required.
2. ESSAWP recommends that ElectraNet- Engie-Synergen be requested to provide details of ongoing maintenance that is being undertaken to keep this station operating at the required level of reliability.

ESSAWP Short Term Proposal for Improving regional reliability and energy security

A short term solution needs to meet the following criteria:

- Can be implemented in a relatively short timeframe.
- Cost effective
- Can secure funding.
- Benefit all of Eyre Peninsula if feasible.
- Be able to dovetail into the longer term plans and proposals for Eyre Peninsula.

Grid connected PV systems

The level of residential and commercial rooftop PV systems is increasing and proposed programs will increase this further. Advances and decreasing costs of batteries for behind the meter battery systems will see these become common place, but for the next few years the simpler grid connected PV systems with no storage will be dominant.

The ElectraNet Transmission Planning Reports show a decline in the apparent loads to Pt Lincoln an Eyre Peninsula. This is attributed to the increasing number of these grid connected PV systems

Keeping these online is critical to preventing sharp increases in demand during/following faults and disturbances. This would require Frequency Controls and Ancillary Services (FCAS) as well and can be achieved by installation of grid scale battery systems with short term storage.

Benefits to all of Eyre Peninsula Customers

A short term grid scale battery system at Port Lincoln could service all the loads connected to the Port Lincoln substation, as far north as Port Neill and includes Cummins and Coffin Bay. This area represents greater than 50% of the population of Eyre Peninsula.

If a system is also installed at Ceduna and Streaky Bay (or a combined one servicing both centres), then the coverage will increase to approximately 75 % of the customers on Eyre Peninsula.

Incorporation of existing Eyre Peninsula Generators and additional generators

At the present time, there are only 3 licenced generators on Eyre Peninsula:

- Port Lincoln Power Station (Diesel fuelled, provided to meet ETC reliability standards for Port Lincoln).
- Cathedral Rocks Wind farm near Port Lincoln.
- Mt Millar Wind Farm near Cleve.

A short term grid scale battery system would enable the Port Lincoln Power Station to come on line after an upstream supply failure to Port Lincoln without loss of supply to customers and provide longer term generation in the event of a long outage on the transmission system. This no break system would also all the grid connected solar systems to remain on line and not increase the demand.

This arrangement could enable the utilisation of Cathedral Rocks Wind Farm to reduce the load on the Pt Lincoln or if there is sufficient wind resource at the time, shutting down of the Pt Lincoln Power Station. At the moment, Cathedral Rocks Wind Farm is not fully dispatchable and this feature would need to be implemented for this to happen. It is acknowledged there is a cost to do this, but it is likely to result in an increase in the annual production as the farm would not shutdown as often as the current practices

Mt Millar Wind Farm is fully dispatchable, so subject to the fault or cause being located upstream from Yadnarie, this generator would be able to provide power into the isolated grid as a result of the Frequency Referencing gained from the Port Lincoln Grid Battery with the establishment of a suitable SCADA connection.

After restoration of the incoming supply, it can seamlessly transfer back to the transmission line and taking the Pt Lincoln Power Station off line (if online)

The FCAS services that can be provided by the grid battery system may also help the stability and reliability of the Port Lincoln Power station.

To cover the loss of the transmission or sub transmission line from Yadnarie to the west coast area, a short term grid scale battery system is needed for Ceduna and Streaky Bay. This will require other sources of generation such as wind / solar farms or fossil fuelled backup generators connected in the area to provide power beyond the storage capacity of the batteries.

This proposal is depicted in Figure 6. Stage 1 covers the system at Port Lincoln and Stage 2 covers a combined or 2 separate systems for Ceduna and Streaky Bay.

Further advice is that in stage 2, option 2 is preferred as the 66 kV line from Streaky Bay to Ceduna (via Tarlton) cannot be utilised without the line to Wudinna being connected due to lack of a system earth reference. This can be overcome with the installation of a neutral earthing transformer in the section but also involves a more complicate protection scheme.

Other generation is required in these zones to provide longer term to meet the demand. This can be backup generators typically diesel fuelled or renewable generation sources such as solar and wind farms.

Figure 6

Once the proposed longer term plans for a new transmission system on Eyre Peninsula are implemented, these battery systems will play an essential role in the provision of FCAS services to the many proposed solar and wind farms on Eyre Peninsula.

One major grid connected battery system provider has already expressed interest in supplying these systems and an estimated 50% of funding would come from the private sector. A 30 MW 30MWh system for Port Lincoln would cost of the order of $30M and about $20M for the 2 smaller systems at Streaky Bay and Ceduna

Once detailed requirements have been agreed, the supply, installation and commissioning could be undertaken in less than six months. Back up generation for the Streaky Bay need to be determined, simular to Option 3 of SA Power Networks Generation Options.

Recommendation: ESSAWP recommends that that ESCOSA endorses the ESSAWP short term proposal as the preferred plan as it improves reliability and continuity of supply to the majority of customers on Eyre Peninsula

Long Term Plans for the Eyre Peninsula Transmission System

As stated earlier, short term plans need to able to dovetail into the longer term plans and proposals for Eyre Peninsula

A longer term plan needs to accommodate the following:

- Sufficient capacity for proposed wind and solar generation facilities.
- Sufficient capacity to supply proposed large loads such as the Iron Road Development.
- Allow for connection of large scale storage systems such as a pumped storage hydro scheme.

- Meet ETC reliability and quality of supply requirements.
- Geographical isolation of the transmission lines to improve the reliability for the majority of Eyre Peninsula customers

The plan developed by ESSAWP to meet these requirements is shown in figure 6 below.

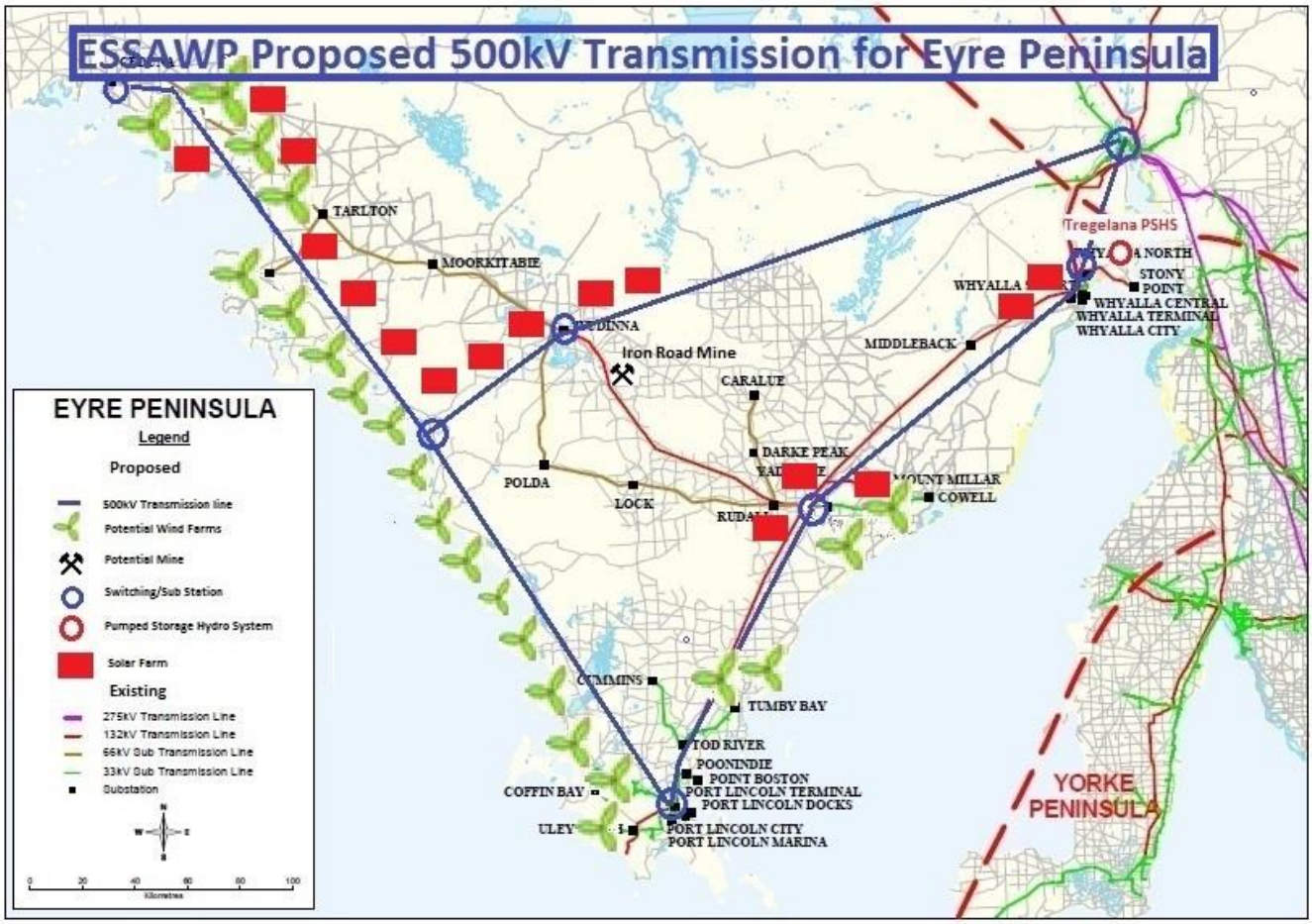

Figure 6

Upgrading the system voltage for 500 kV (primarily to provide increased capacity) will also result in a more robust line which has superior lightning performance, hence further improving the reliability of the transmission network.

The short term plan proposed by ESSAWP fits with this plan as the grid connected battery systems will be required to provide FCAS services required for the large number of wind and solar farms proposed.

Recommendation: ESSAWP recommends that ESCOSA ensure that reliability proposals will align with the longer term plans for Eyre Peninsula, South Australia and the wider NEM Network.

Summary

Recommendations made in this submission:

1. ESSAWP recommends that ESCOSA reintroduce a breakdown into specific areas into the Quarterly Performance Reports for SA Power Networks to enable easier and timely detection of poor performing areas.

2. ESSAWP recommends that additional surveys be undertaken to gauge attitudes and issues of the wider community about grid reliability and back up facilities.

3. ESSAWP recommends that ElectraNet utilise reliability as a major assessment criteria in the selection of options to upgrade the transmission system on Eyre Peninsula. This includes upgrade of system capacity to remove existing constraints and enable additional generation which will improve the reliability of the system

4. ESSAWP recommends a change in the regulatory and infrastructure upgrade requirements that shift the priority to increasing energy security through increasing the State's ability to connect additional renewable generation capacity.

5. ESSAWP recommends that SA Power Networks confirm that the proposed insulators are puncture proof and represent the best the long-term performance and hence reliability of the reticulation system.

6. ESSAWP recommends that SA Power Networks Distribution Network Hardening option 1 would be the preferred option as this will service the maximum number of customers.

7. ESSAWP recommends that SA Power Networks SCADA option 1 would be the preferred option as this will service the maximum number of customers.

8. ESSAWP recommends that the, Eyre Peninsula Solar PV – Cleve and Wudinna that this proposal can proceed on its own merits as it does not affect other proposed improvements in system reliability.

9. ESSAWP recommends that the option proposed by Eye Energy, Port Lincoln Tuna Industry Solar PV – Smart Mini Grid/Virtual Net Metering proposal is allowed to proceed on its own merits as it does not affect other proposed improvements in system reliability.

10. ESSAWP recommends that the wording of the Regulatory Issues Draft Recommendation be more strongly worded, ie "there will be benefits…".

11. ESSAWP recommends that the wording in the need for effective joint planning section be changed to: "Pursue changes to the NER to strengthen the requirements for joint planning, including greater independence into the joint planning process" in line with recommendations of the Finkel Report.

12. ESSAWP recommends that ElectraNet- Engie-Synergen be requested to undertake reliability tests to prove the ongoing reliability that is required.

13. ESSAWP recommends that ElectraNet- Engie-Synergen be requested to provide details of ongoing maintenance that is being undertaken to keep this station operating at the required level of reliability.

14. ESSAWP recommends that that ESCOSA endorses the ESSAWP short term proposal as the preferred plan as it improved reliability and continuity of supply to the majority of customers on Eyre Peninsula

15. ESSAWP recommends that ESCOSA ensure that reliability proposals will align with the longer term plans for Eyre Peninsula

Reliability of the electricity network is of utmost importance and all options need to be investigated and the resulting plan needs to be implemented as soon as feasible. Many of these proposals are funded by private enterprise and reduce the burden that would otherwise be borne by the existing Utilities (and inevitably justify higher charges for their services).