

**Submission to Inquiry**

**Essential Services Commission of South Australia (ESCOSA)**

**Prudent and efficient options for improving the reliability and quality of  
electricity supply to electricity customers on the Eyre Peninsula**

**By**

**Enlighten Power Systems**

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## Reliability and quality of electricity supply to electricity customers on the Eyre Peninsula

### Purpose

We note the objective of the Commission is to inquire into prudent and efficient options for improving the reliability and quality of electricity supply to electricity customers on the Eyre Peninsula. The Commission is to consider, in particular, the following matters:

- i. Electricity reliability and quality of supply outcomes to customers on the Eyre Peninsula during the period 1 January 2007 to 31 December 2016.
- ii. Prudent and efficient options for improving the incentives to ElectraNet and SA Power Networks, to upgrade current network infrastructure and restore supply following an outage.
- iii. Possible technical solutions for improving reliability and quality of electricity supply on the Eyre Peninsula and potential costs to consumers of implementing those solutions.

Our submission addresses item iii. of the list above.

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### About the author

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The management and key personnel of Enlighten Power Systems have many years of experience in the electricity industry in Australia, including South Australia and Eyre Peninsula in particular. The owner, GJM Group Pty Ltd, was formed in 1995. Its directors and associates have made a significant contribution to the power and energy industry in South Australia. In relation to Eyre Peninsula and immediate neighbourhood we either directly or while employed via other Australian companies contributed at:

### Whyalla Steel Works

Number 5 Boiler, Critical Controls replacement

Works-wide Safety Integrity Level assignment

Energy Plant Reliability Assessment

### Flinders Power

Playford Power Station

Safety Integrity Level assignments

Northern Power Station

Safety Integrity Level Assignments

Critical controls and excitation upgrade for Unit 1 and 2 Turbo-alternators

### Engie

Control System upgrades for Port Lincoln 3 x GE Frame 5 Peaking gas turbine generator units

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### Background to present situation.

Since the recent closure of Northern Power Station, the connection from other larger-sized synchronous generators in Adelaide has become important for transient stability. The system capacity for event ride-through of the Eyre Peninsula's power supply has been diminished. The small cogeneration input from the Whyalla Steelworks site provides some synchronous generation. The proportion of non-synchronous capacity has greatly increased and under some conditions the non-synchronous generated power exceeds 100% of the load within the state, requiring export through the Heywood Interconnector for balance or curtailment of energy production. Under revised Standard Operating Procedures, at least 2 large synchronous machines are scheduled by AEMO, but all these are located in Adelaide. Fault clearance can be problematic areas where network impedance is such that short circuit currents are limited from synchronous generators in Victoria or further afield. The DC Murraylink interconnector cannot deliver inertia.

The 3x ~20MW Gas Turbines at Port Lincoln are only capable of running on distillate. This is too costly for other than peak demand situations at high wholesale price levels. The September 2016 incident exposed a failure to deliver on contracted Black Start function, with an attendant long period of interrupted power availability, and high economic impact on local businesses and workers, as well as most power users

Power quality is reportedly problematic with voltage excursions and premature failure of electric motors in commercial refrigeration.

### Recommendation

In our opinion the best way to address this is to locate additional synchronous generation in the Eyre Peninsula, say at Port Lincoln. Additional MW Scale solar and wind generation projects are planned in the area, as are Grid Connected Battery systems, but these do not inherently provide inertia, unless forced to by new ESCOSA Generator Licensing rules, at considerable cost to developers.

Depending on the future of the Whyalla steelworks, an additional 100MW of power may be generated with new technology , but no commitments have been made

It is yet unclear whether this would be a continuous output or subject to the works production schedules, and the timing is at best several years away.

Therefore we recommend that in the interim a Powership be deployed. Powership is a brand of Karpower International . A Powership is an ocean-going ship into which a utility scale power station has been integrated. They are designed for rapid deployment, within 120 days of a contractual commitment. Typical agreements are for minimum of 2-3 years up to more than 10 years.

As an option this could all work in conjunction with Renewable sources, for an overall hybrid power aspect in the short to medium term.

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### Reasons for Recommendation

A Powership has been proposed for several aspects of the SA Government's Energy plan and other potential contracts.

1. The Powership is able to deliver power via overhead lines to the shore based terminal point, while moored up to 1.2km away from the nearest pylon. All required isolation and protection functions are provided. A dual circuit HV-Switchyard is on the deck, ready to connect to feeders.
2. Connection Voltage can be up to 400kV (or 33kV for smallest sized Power Ships).
3. They can provide the full suite of Ancillary Services per NEM definitions, including Black Start, Voltage Control and controlled active power (fast raise/lower).
4. The largest Powerships require only 7m of draft, and can continue to operate in swells of up to 3m.
5. There are thus very many locations where the Powership can be located.
6. Other interesting locations are at Port Lincoln and the new Port being considered for the Central Eyre Iron Project.
7. If Port Lincoln were the site and LNG the fuel, a natural gas supply could be readily made available economically to provide natural gas fuel for domestic, commercial and industrial purposes, such as for additional value adding to the aquaculture and fishing industries outputs.
8. Karpower International, the dominant player in this field has over 2700MW of Powerships in operation worldwide with a further 5000MW under construction. The nearest current deployments are in Indonesia.
9. The highest international standards for environmental, OHS and reliability of operation, are met.
10. Karpower's parent company has been in interval-traded Power Generation internationally for over 30 years and also has interests in hydro and other renewable generation in land based facilities.
11. A Powership can provide up to 10,000m<sup>3</sup>/day of desalinated water as a by-product.

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### Conclusion

As 2017-18 summer approaches businesses and consumers in Eyre Peninsula will wish to see tangible evidence that steps have been taken to avoid a repeat of September 2016 extended blackout and economic loss of production and wages, with associated impact on general economy and consumer and business confidence. A Powership™ can be deployed within 120 days of a commitment.

This would be a significant capital cost saving to tax payers and consumers. It potentially can add generation capacity to the National Electricity Market (NEM). That may lower the wholesale power price and offset or reduce the electricity price increases to customers arising from transmission and distribution network changes envisaged by item ii) above.



*Fig: A typical Powership deployment close\* to shore*

*(\*may also be up to 1.2 km away from shore)*



**References:**

1. <http://www.karpowership.com/en/about/karpowership>

2. Draft Licencing changes to Generator Licencing in SA 2017

<http://www.escosa.sa.gov.au/ArticleDocuments/1048/20170501-Inquiry-LicensingArrangementsForGeneratorsInSA-DraftReport.pdf.aspx?Embed=Y>