



UTS:NEWSALERTS

Towards 100% renewable energy for Kangaroo Island: new study under way

Monday 27 June 2016

Can Australia's iconic Kangaroo Island be powered by 100 per cent renewable energy? This is the focus of a new study announced today by the University of Technology Sydney (UTS) in partnership with the Kangaroo Island Council.

Supported by \$60,000 of funding from the Australian Renewable Energy Agency (ARENA), the Towards 100% Renewable Energy for Kangaroo Island research study will be managed by the Institute for Sustainable Futures (ISF) at UTS.

Acting ARENA CEO Ian Kay said the project represented a great opportunity to demonstrate the potential of renewables to generate clean, reliable and cost effective electricity for fringe-of-grid communities like Kangaroo Island.

Kangaroo Island is currently powered by a 15km long, 33,000 volt undersea electricity cable from the mainland. As the cable is approaching the end of its expected life, South Australia Power Networks (SAPN) is investigating options to continue to provide reliable power to the island.

SAPN has identified that the preferred network option solution is to install a new \$45 million (+10%, - 50%) cable connecting the island to the main electricity grid. As part of these investigations, SAPN has also issued an open two-month request for alternative non-network option proposals to replace the cable.

In response to this request, the ISF study will draw on the latest science to assess the viability of clean renewable energy technology being used to generate power for Kangaroo Island, instead of the proposed new grid-connected cable. In line with SAPN's proposal deadline the study will be completed and released by mid July 2016.

Mr Chris Dunstan, Project Director at ISF said, "Powering a large community like Kangaroo Island with reliable and affordable renewable energy is a challenging task, but the early indications of the study are encouraging.

Media inquiries

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"If we can show that renewable energy is technically and economically viable for Kangaroo Island, it would be a powerful precedent for communities around Australia who are seeking to develop their own renewable energy resources."

Chief Executive Officer of the Kangaroo Island Council, Mr Andrew Boardman welcomed the new investigation.

"Kangaroo Island has great wind, solar and biomass resources and a strong commitment to environmentally sustainable economic development. Reliable, renewable energy should be the cornerstone of this development. It is crucial that we invest the time to investigate properly our clean energy options."

Mayor Peter Clements said, "This is not something new for the Kangaroo Island Council – we have been discussing and working in the area of renewable energy and a low carbon future since 2011 and it is now firmly in the minds of the community."

Proponents of non-network options for Kangaroo Island are encouraged to contact ISF via: Dr Geoff James, Project Manager – geoff.james@uts.edu.au; tel: (02) 9514 4950.

** Kangaroo Island is Australia's third biggest island (after Tasmania and Melville Island), and has one of the largest island populations with about 4,500 residents and more than 200,000 visitors per year.

About ARENA:

ARENA was established by the Australian Government to make renewable energy technologies more affordable and increase the supply of renewable energy in Australia. Through the provision of funding coupled with deep commercial and technical expertise, ARENA provides the support needed to accelerate the development of promising new solutions towards commercialisation. ARENA invests in renewable energy projects across the innovation chain and is committed to sharing knowledge and lessons learned from its portfolio of projects and information about renewable energy. ARENA always looks for at least matched funding from the projects it supports and to date has committed \$1.1 billion in funding to more than 250 projects. For more information, visit www.arena.gov.au.

Project Scope: Towards 100% Renewable Energy for Kangaroo Island

Introduction

SA Power Networks (SAPN) has issued a RIT-D request for non-network proposals for Kangaroo Island seeking proposed non-network alternatives to the network option of building a second submarine cable from the mainland at an estimated cost of \$45 million. Proposal submissions close on Friday, 15th July 2016.

This research project will complement this process by providing a quantitative and qualitative assessment of a 100%, or near-100%, renewable energy (RE) local power supply for Kangaroo Island. This assessment will provide timely analysis of cost effective RE options to build community and South Australian Government support and inform proponents.

The draft assessment will be delivered by 8 July 2016, so that it can contribute to the present RIT-D process¹ by which SA Power Networks (SAPN) will determine the preferred supply option.

This Project will assess the costs and benefits of a mix of renewable energy, energy efficiency, energy storage and supporting infrastructure to meet the current and foreseeable future energy needs of the Kangaroo Island community, while improving reliability and convenience, and without increasing energy bills. The project aims to be a landmark in the development of RE in Australia and crucial signpost to a future 100% renewable electricity system for Australia.

A preliminary analysis by SAPN found that a RE power supply for the island, maintaining the present level of reliability, would be more expensive than the network option. However, this estimate appears to be based on costs that do not represent the present market for RE supply, storage and demand management. We expect that a more comprehensive analysis and more up to date costing data will indicate more favourable economics for RE options.

Serving the Kangaroo Island community

The Kangaroo Island community is proud of its clean and green image. Pioneering a transition towards 100% RE would reinforce the Island's strong identity and enhance its attractiveness to visitors. However, to be viable, it is essential that a decentralised renewable energy approach is cost effective and delivers reliable power.

The assessment will include the short-term and long-term potential cost and benefits for Kangaroo Island customers and for SAPN, compared to investing in a second cable. The sharing of costs and benefits depends on the regulatory framework, and potential regulatory pathways will be considered.

Kangaroo Island can serve as a microcosm for Australia's RE transition and as such the project can be a valuable precedent for all Australian customers, networks, and project proponents.

¹ SAPN, 12 April 2016, [Non-Network Options Report: Kangaroo Island Submarine Cable](#)

Scope of Work

The work includes the following key steps:

1. Develop renewable energy and demand management scenarios with stakeholder input.
 - Kangaroo Island relies proudly on its clean and green credentials for tourism and some local industries. To the extent that the tight timeframe allows, community representatives will be consulted to understand the types of renewable energy and demand management that are likely to be preferred.
 - The project team will examine a rapid but incremental build of renewable energy supply on the island to transition away from reliance on the existing cable connection, which is still within its design lifetime, until the newly installed generation and storage capacity is sufficient to provide reliable 100% local energy supply. This will permit a managed transition so that balancing controls can be carefully developed and tested.
 - The assessment will also consider contingencies to avoid reliance the existing Kingscote diesel power station. Renewable energy generation can be distributed to reduce peak loading on the existing weak network on Kangaroo Island, and inverter-connected resources can be controlled as a group to provide network support services. Therefore the assessment will evaluate the potential for RE supply to provide greater reliability than the present and cable replacement arrangement.
2. Prepare input technical and costing data.
 - The supply chain for renewable energy and energy storage technologies has advanced rapidly, even in the last year, so recent data will provide up-to-date costings for renewable energy supply options and battery energy storage. This will include resources connected at the network-side or the customer-side of customer meters, with new business models allowing for customer contributions and investments in their own secure, renewable, grid-connected electricity supplies.
 - A preliminary resource assessment will provide estimates of capacity factors for renewable energy generation units, and likely seasonal variations to allow estimates of necessary installed capacity to provide year-round system adequacy.
 - Energy efficiency and demand management opportunities will be identified to assist the efficient investment in and integration of renewable energy generation.
3. Run numerical analysis per scenario.
 - Using software tools available at ISF, and based on load profiles of previous years and renewable energy resource assessment for the Kangaroo Island region, options for 24/7 power supply will be simulated. The island will be divided into up to 4 regions and hourly electricity demand and supply will be modelled for each of the individual regions. Different technology mix options (solar photovoltaic, wind, bioenergy and storage) will be analysed in regard to both economic and technical advantages.
 - The following key questions will be addressed:
 - What is likely to be the most cost-effective renewable energy supply option for Kangaroo Island?
 - What are the reliability and contingency arrangements and how do they change as the renewable energy supply and demand-management options are built out?

- What are the costs and benefits to consumers, the Kangaroo Island community and SAPN, to provide a reliability level comparable to a new submarine cable over the next 25 years?
- How do these costs compare against the network option (a second cable) and what are the net impacts for customers and SAPN?

4. Assess regulatory situation and pathways.

- As well as providing electricity supply, potentially including contingency and balancing supply to assist a managed transition to 100% renewable energy, the cable connection to Kangaroo Island ensures that the National Electricity Law and National Energy Retail Law apply to the island. This provides protection for customers against non-regulated electricity price increases. Should the cable fail and not be replaced, “an islanded solution would require considerable stakeholder consultation (SA Government, KI Council, AER, ESCOSA etc.) to determine the form of regulation and who would oversee that regulation” ([SAPN Non-Network Options Report, 2014](#)).
- Some likely regulatory pathways for Kangaroo Island will be considered, their implications noted, and plausible solutions suggested to address these implications. Benefit sharing and incentives will be discussed in the present regulatory context and in consideration of possible future regulatory pathways.

5. Write final report.

A draft report, and final report will be provided. The draft report will be the basis of material presented at the on-line forum (or an in person forum if funding permits).

6. Build proponent network and present on-line forum.

- Engagement with non-network alternative proponents, to ensure they are well briefed on the analysis so that it may inform their own more detailed work, in submitting non-network options to the RIT-D. (Note: it is not the intention of this assessment to submit a concrete proposal to the RIT-D RFP, but instead to support those parties who are intending to do so.)
- Prepare presentation materials to inform proponents, the community, the government, SAPN, and other stakeholders about the assessment outcomes.

Staff

Key ISF staff contributing to this project are:
<i>Chris Dunstan</i> , Research Director
<i>Dr Geoff James</i> , Research Principal
<i>Dr Sven Teske</i> , Research Principal
<i>Joe Wyndham</i> , Research Assistant
AECOM is also supporting the Study in a technical peer review role.

Notes:

Reliability

An important requirement of any new supply arrangement is to provide the same, or a higher, level of reliability compared to cable supply. The present contingency support is the Kingscote power station comprising three (soon four) 2 MW diesel generating units. These can support the island's demand in the case of cable failure; however, this is a standby plant that normally operates only a few hours each year. This facility would also be available for contingency support for a RE option.

The Non-Network Options Report requires that "the proposed non-network option must be able to supply Kangaroo Island for 25 years without the use of a mainland cable connection."

We will examine a rapid, incremental build of RE supply on the island to transition away from reliance on the existing cable connection, which is still within its design lifetime, until the newly installed generation and storage capacity is sufficient. This will permit a managed transition to near 100% RE so that balancing controls can be carefully developed and tested. The assessment will also consider contingencies to minimise reliance on the existing Kingscote power station.

Reliability assessment should also account for the weakness of the present grid on Kangaroo Island. The RE supply is likely to be distributed and less subject to a single point of failure, so the full loss of the island's generating capacity is highly unlikely. Importantly, the geographical distribution of supply can be designed to reduce the peak demand on the island's present grid segments, thereby reducing the likelihood of grid failure. This is particularly the case when there is a significant component of "behind-the-meter" solar PV and battery storage, because these inverter-connected resources may be controlled as a group to provide network support services². Therefore we will investigate the potential for RE supply to provide greater reliability than the present and cable replacement arrangement.

Precedents and Preferences

Different technology mix options (solar photovoltaic, wind, bioenergy and storage) will be analyzed both in regard to economic and technical advantages. As precedents demonstrating effectiveness and reliability, two case studies of existing 100% RE supplied islands will be examined: The German North Sea island Pellworm (35km², population 1,500, hosting 300,000 tourists per year) and the Danish Baltic Sea island Samsø (120km², population 3,700) are both well-documented energy systems with a track record of over 10 years' experience. We will document the modeling inputs and results of this study with reference to precedent systems such as these and other high-penetration RE power supplies.

In addition to this quantitative analysis, the assessment will include consultation with key Kangaroo Island stakeholders to develop preferred options. We will liaise with SAPN to seek to understand their perspective based on previous analysis and the features of the present Kangaroo Island infrastructure including network and back-up generators. Benefit sharing and incentives will be discussed in the present regulatory context and in consideration of possible future regulatory pathways. We plan to liaise with the SA Government to ensure that non-network options are given balanced consideration in the RIT-D process. Finally, we will prepare a summary report and engage with potential project proponents and inform them of our assumptions and outputs, and run a (live or on-line) forum for the community, proponents, government, and SAPN. This will help to ensure that the options we study are aligned with stakeholder preferences.

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² <http://arena.gov.au/project/consumer-energy-systems-providing-cost-effective-grid-support-consort/>