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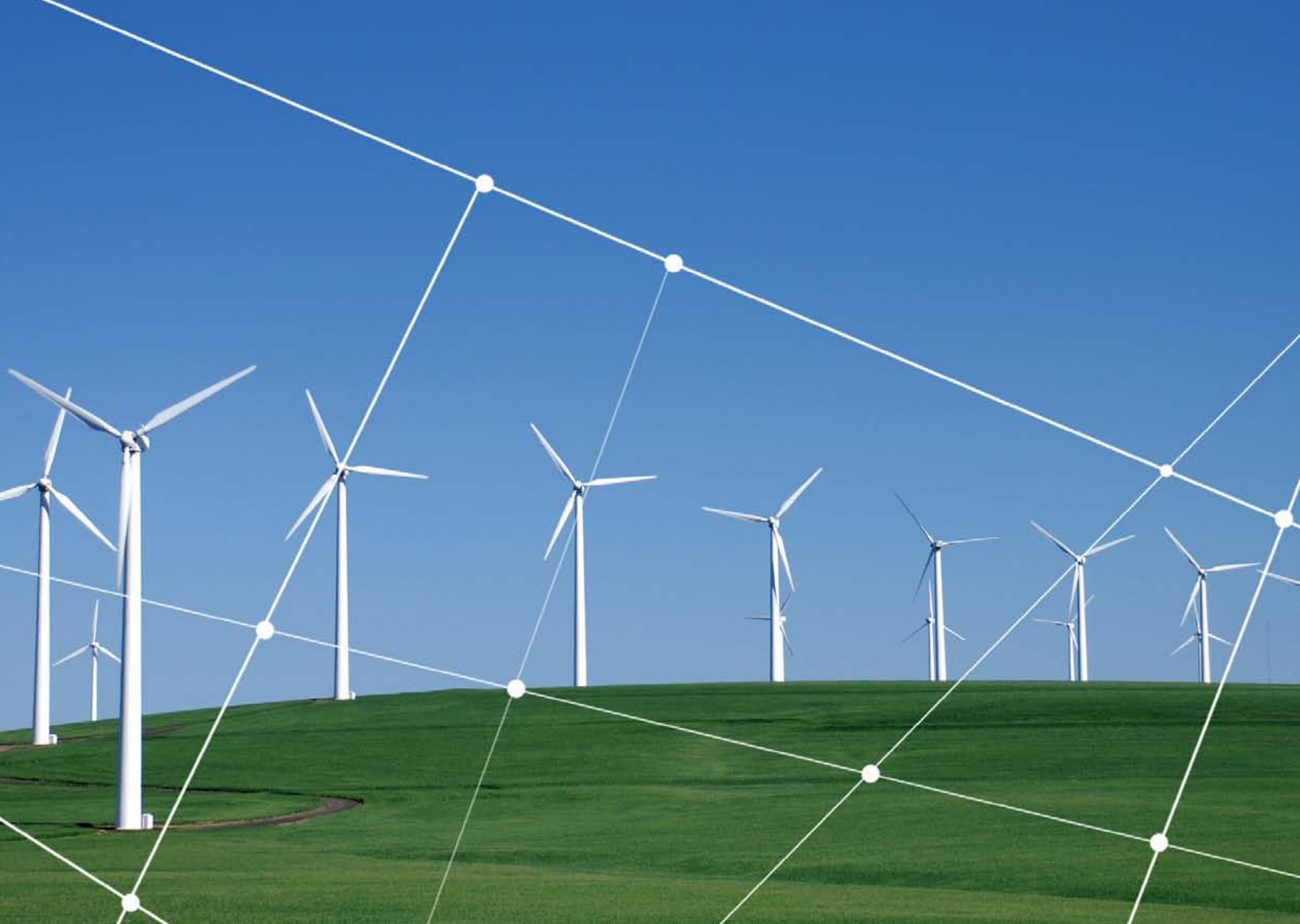
Green Grid

UNLOCKING RENEWABLE ENERGY RESOURCES IN SOUTH AUSTRALIA

A feasibility assessment of transmission and generation potential for 2000MW of wind energy in the Eyre Peninsula



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1. EXECUTIVE SUMMARY

UNLOCKING WIND ENERGY IN SOUTHERN AUSTRALIA

A feasible case for transmission investment

Macquarie Capital Advisers (Macquarie), WorleyParsons and Baker & McKenzie (the Consortium) have assessed new transmission opportunities to unlock large scale renewable energy generation in South Australia.

This report is an assessment of the feasibility for new transmission investment to unlock wind energy generation in the Eyre Peninsula, a region long recognised for its significant wind energy resource but constrained due to a lack of electricity transmission.

We have found a viable business case can exist for investment in new transmission to support 2000MW of new generation in the Eyre Peninsula in wind zones that are highly suitable for large scale wind farming.

South Australia already leads the nation in renewable energy with approximately 900MW of installed wind generation and potential for up to an additional 1000MW in parts of the state where grid capacity currently exists.

To support additional generation beyond this we propose a Green Grid on the Eyre Peninsula supported by system upgrades in South Australia and to Heywood in Victoria which would increase capacity for an additional 2000MW of wind energy generation and enable South Australia to become a significant exporter of electricity.

The proposed transmission configuration would provide the building blocks for further extensions, including a Green Grid Stage 2 for a further 2000 MW. This further stage would require a link from Davenport near Port Augusta to New South Wales that may become viable subject to a higher renewable energy target, price on carbon or the commercialisation of large scale geothermal.

The assessment has been undertaken in three parts. Firstly, wind speeds and wind farm energy yields have been assessed, as well as social and environmental suitability for large scale wind farming, to identify generation opportunities in the region. Secondly, transmission that would be needed to connect this generation to the National Electricity Market (NEM) has been assessed. And thirdly, the augmentation that would be needed in the existing grid, or ‘shared network’, for this generation to be transmitted to demand centres has been assessed.

1. Suitability for large-scale wind energy generation.

The Consortium finds the Eyre Peninsula offers extensive opportunities for wind generation, with four ‘wind zones’ identified as being particularly attractive. These zones experience wind speeds above 8 metres per second with the potential for more than 10,000 MW of generation.

The social and environmental assessment also supports large scale generation occurring in these areas.

The Eyre Peninsula covers 45,000 km^2 from Port August in the north to Port Lincoln in the South and to Streaky Bay in the west. It has a local population of 55,000 in a region similar in size to Tasmania. Sensitive environments including National Parks and reserves of high conservation value, wetlands and coastal views of significant community value have been considered. Outside of these areas are large areas of disturbed agricultural land suitable for wind farming. Our assessment suggests the community pressures that are increasingly experienced in areas of higher population density are less likely to be experienced in this region.

These factors, which strongly support new wind generation on the Eyre Peninsula, have been considered against the costs to developers and to the energy network of overcoming transmission constraints.

2. Connecting wind energy generation in Eyre Peninsula to National Electricity Market

The Consortium has assessed the necessary transmission that would be needed to link any or all of these four wind zones to the NEM and how this can be financed.

It is proposed that a high voltage 500 kilovolt (kV) above ground transmission network be established from Davenport (near Port Augusta) to the west coast at a connection point near Elliston via a central connection point which we call the Central Region. This configuration would connect new generation of up to 2000 MW in two zones at an estimated capital cost of $613m.

3. Strengthening the shared network in South Australia and connection to Victoria

It is proposed that a 500 kilovolt (kV) network form a new transmission backbone from Davenport near Port Augusta to Heywood in Victoria. This high capacity line would connect to existing substations to complement the existing 275 kV South Australian network and provide the foundation for future new generation opportunities as well as potential advances in grid system management (e.g. use of smart metering and energy storage).

This significant investment would enable the South Australian electricity system to support a very different fuel source from what it does today. In times of high wind, enough power would be generated from this source to meet the equivalent of the entire State's average electricity needs. In practice, a large amount of this power would flow to Victoria which operates a 500kv network. It would also result in a stronger network within the State capable of withstanding unexpected line faults and allow increased supply to currently constrained loads.

The generation base in South Australian has changed in recent years with wind generation replacing some thermal generation. Green Grid would be expected to continue this trend. According to the Australian Energy Market Operator (AEMO) greenhouse gas emissions have reduced from approximately 9.9 to 8.8 Mt per annum over the period 2005 to 2010, which corresponds to an installation of 800 MW of wind farm capacity over the same period. An installation of an additional 2000 MW of wind generation in Eyre Peninsula is expected to result in a further reduction of 2.75 Mt CO2 across the NEM.

An emerging regulatory framework for *Eyre Peninsula Green Grid*

Currently, network extensions like those proposed here can only be achieved if either they satisfy a 'regulatory test', called the Regulated Investment Test for Transmission (the RIT-T) set by the Australian Energy Regulator, or they are 'sole funded' by a developer.

It is unlikely that the proposal for new transmission in Eyre Peninsula as well as broader system upgrades would pass the current RIT-T test, which favours transmission upgrades for generation located close to the existing grid and load centres. We also believe it is unlikely any developer or club of developers would be willing to take on the burden of financing the transmission infrastructure as merchant assets.

A new approach to funding network extensions has been proposed by the Australian Energy Market Commission (AEMC). Its proposal for Scale Efficient Network Extensions *(*SENE*)* would enable new extensions to be built by network service providers (NSPs) with costs recovered from generators in an annual charge for the proportion of the line they use.

This feasibility assessment has been undertaken on the basis of the draft AEMC rules.

Financing Eyre Peninsula Green Grid

The SENE mechanism strikes a balance between cost to customers and cost to generators. We believe it is the most likely basis upon which generator contributions could be facilitated for new investment in the Eyre Peninsula. This report is based on the assumption that the SENE proposals, or a similar regulatory arrangement, will be implemented to support the development of remote renewable generation and in light of the requirement for additional renewable generation capacity to meet the expanded LRET and potential CPRS. The Consortium has consulted with prospective wind energy developers to assess market interest on this basis. Four internationally experienced wind energy companies have expressed interest for in excess of 2000 MW of new wind generation.

We estimate the indicative annual charge to generators would be approximately $50 million for the initial 2000MW in order to fund the full cost of the Eyre Peninsula Green Grid. We believe this represents the upper limits of what generators would be able to pay while maintaining reasonable commercial returns. The overall package of transmission investments proposed in this report will be needed to ensure the benefits of Green Grid are high enough to justify the extra cost to generators.

Financing Green Grid augmentations

The business case to construct and finance new transmission for Eyre Peninsula assumes that electricity generated in the Eyre Peninsula can reach load centres in Victoria. Augmentation upgrades of the network from Davenport in South Australia to Heywood in Victoria would be required to strengthen the network and increase export capacity.

We have assessed a number of transmission augmentation scenarios to identify the credible option that could maximise the net economic benefit of electricity consumers and producers. The purpose is to assess whether the deep augmentation required by the Green Grid could satisfy the RIT-T and form part of the regulated asset base of the incumbent NSP. The Consortium's initial assessment suggests that that the 'market benefits' of increasing the transmission carrying capacity for wind generation for an additional 2000MW would exceed the capital and operating costs of transmission augmentation. Accordingly the proposed transmission augmentation would provide an overall net economic benefit and could satisfy the RIT-T.

Proposed Green Grid

	Cost	Funded by
Eyre Peninsula Extensions	$613m	ElectraNet, receiving an annual SENE charge funded by generators
SA system & interconnector upgrades	$840m	ElectraNet via RIT T

Given this assessment, we believe there is a feasible business case for both a new Eyre Peninsula network as well as the necessary augmentations to the shared network.

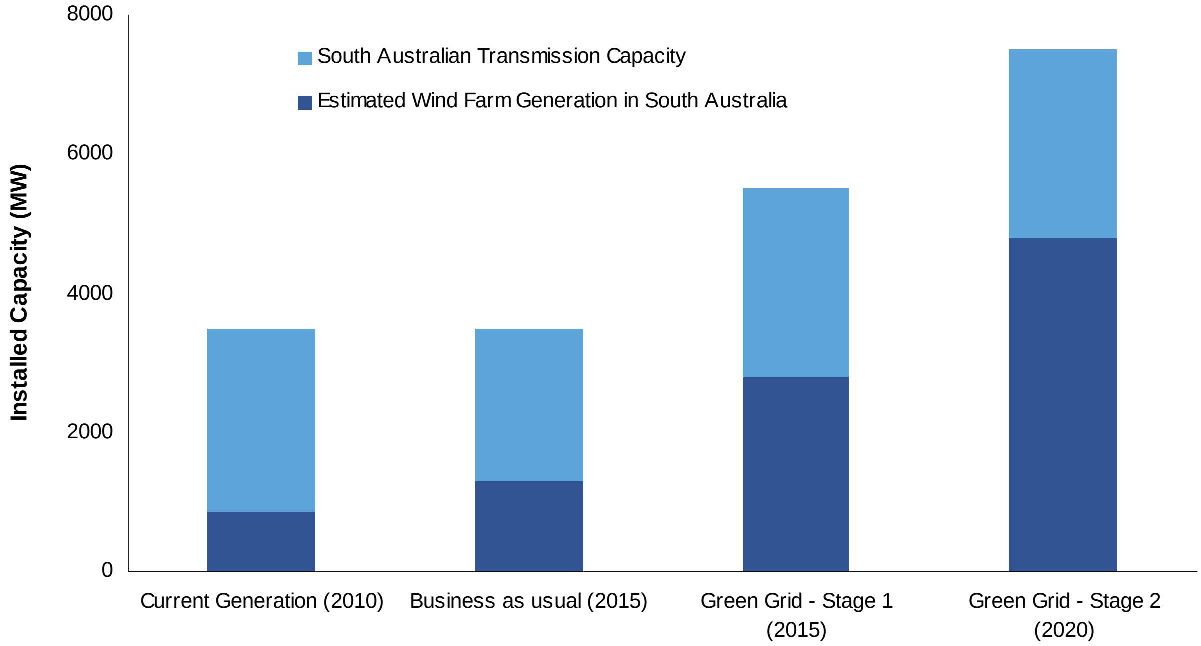
Nation building opportunity

Green Grid would significantly modernise the southern NEM region, increasing network capacity for wind generation from 900MW currently operating to up to 4000MW. This would result in South Australia's contribution to the 2020 Large Scale LRET increasing from an existing 5.7% to a forecast 30% [iii] . Assuming renewable energy developments in Eyre Peninsula absorb the full 2000MW of capacity, this alone would account for 15% of the LRET. This contribution will help Australia meet its renewable energy objectives at a lower cost to the overall economy.

Further, Stage 2 of Green Grid could facilitate an additional 2000 MW of renewable energy in South Australia. Developers may be willing to contribute an annual cost to fund Stage 2, however we believe the significant augmentations needed in the broader network would only be likely to pass the RIT-T process if a higher price of carbon was to emerge or the LRET was increased. In this event, the additional stage would provide significant market benefits of providing large volume renewable electricity to the northern part of the NEM which has less favourable wind conditions as well as offering the potential for base-load geothermal energy.

Indicative configuration. Stage two augmentations to Mount Piper could connect to Davenport or a region further north, closer to potential geothermal energy zones.

Proposed Green Grid



Source: WorleyParsons

Green Grid would have significant economic impacts, with stage one unlocking significant investment in wind energy generation resulting in capital expenditure of $5.8 billion in new transmission and generation assets.[1]

Implementing Green Grid

Electricity networks are long-lived infrastructure that are gradually upgraded. However the LRET requires network change on a much faster timeframe that has typically been the case. Electricity network managers are responding to this challenge and the draft reforms currently before AEMC provide a platform to deliver Green Grid.

We believe that the proposed SENE framework, or a similar regulatory arrangement, is the most likely regulatory framework to support implementation of Green Grid. However, and notwithstanding the progress that is being made to establish a SENE framework, the regulatory and practical challenges remain significant.

Collaboration by Government, energy regulators, NSPs and wind energy developers will be needed to take this initiative from business plan to implementation.

The Consortium believes a collaborative approach is appropriate given developers would be asked to fund their share of network extensions in the Eyre Peninsula in return for regulator support for the modernisation of the existing shared network. Experienced wind farm developers Origin Energy, Pacific Hydro, Transfield Services and Acciona Energy have assisted the Consortium in undertaking the feasibility assessment and have indicated interest to develop in excess of 2000MW of wind generation in the Eyre Peninsula. This collaborative approach could result in significant economic and renewable energy gains for the Eyre Peninsula and South Australia. It could also be a model for future investments to modernise the nation's energy transmission infrastructure.

The Consortium has been assisted in its work by many expert participants in the renewable energy and electricity transmission markets. The strong engagement from prospective wind farm developers and the transmission service provider ElectraNet has been instrumental in completing the feasibility assessment. This cooperative approach provides a solid foundation for implementation of Green Grid.

[1] Economic impact assessment, Evans & Peck

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2. GREEN GRID CONSORTIUM AND CONSULTING PARTNERS

MACQUARIE

Macquarie Group (Macquarie) is a global provider of banking, financial, advisory, investment and funds management services. Macquarie's main business focus is making returns by providing a diversified range of services to clients. Macquarie acts on behalf of institutional, corporate and retail clients and counterparties around the world.

Macquarie Capital Advisers provides advisory and capital raising services to corporate and government clients involved in public mergers and acquisitions, private treaty acquisitions and divestments, debt and equity fund raising and corporate restructuring.

Macquarie's innovative approach to infrastructure has been instrumental in harnessing private investment to help meet global infrastructure needs. With more than 15 years of experience in infrastructure acquisitions, funding and management, Macquarie Capital's Infrastructure & Utilities team has become a global leader in sectors such as tollroads, rail, aviation, ports, energy and water.

WorleyParsons
resources & energy

WorleyParsons is an Australian company which is one of the largest engineering services businesses in the world. It has grown to more than 30,000 employees across the world and has expertise and experience across the entire electricity generation portfolio. It is recognised in Australia as a leader in the area of electricity generation and systems including the critical areas of renewable energy and power transmission.

BAKER & MCKENZIE

Baker & McKenzie has one of Australia's largest energy and renewable energy teams, with experience in all Australian jurisdictions. Globall, Baker & McKenzie employs nerly 4,000 lawyers in 69 offices across 39 countries. It provides clients with an unrivalled combination of local legal expertise and global knowledge and capabilities.

McLennan Magasanik Associates (MMA) is a specialised consultancy providing energy and environmental advice to a broad range of clients. MMA brings the benefits of over twenty seven years consulting experience and provides understanding of policy, market and technology dynamics drives superior strategy formulation. Detailed industry knowledge, built into models and databases repeatedly tested over many assignments, provides MMA operational analyses with essential robustness. Critically, MMA brings operational considerations to strategy and strategic insights to operations.

GL Garrad Hassan is the world's largest renewable energy consultancy and a well known leader in wind farm consulting in Australia. It offers independent technical and engineering services, products, and training courses to the onshore and offshore wind industry and has been involved in some way with most of the wind farm projects built in Australia. GL Garrad Hassan is a consulting company; it has no equity stake in any device or project and this rule of operation is central to its philosophy, something which underlines its independence. It is also widely seen as the technical authority in wind energy, a position which comes from nearly thirty years at the cutting edge of the industry

Evans & Peck is an infrastructure-based advisory company that supports governments and private organisations in the conception, development and delivery of major projects and programs throughout Australia, Asia and the Middle East. Now part of the WorleyParsons Group, Evans & Peck continues to operate as a separate business, providing independent advice and services. Our employee base has evolved to meet the growing needs of our clients. With over 350 employees, we still retain a strong foundation in engineering, but also employ economists, lawyers, accountants, organisational psychologists, graphic designers, environmental scientists, business and management practitioners, and safety professionals. The company's unique mix of people, skills and experience enables it to provide advice across the broad spectrum of infrastructure creation, from the strategic to the operational, from the economic to the commercial.

3. PURPOSE OF WORK

3.1 SOUTH AUSTRALIAN GOVERNMENT SUPPORT

The Consortium has undertaken a scope of works for this feasibility assessment that addresses technical, commercial and regulatory factors.

Technical

The technical assessment, led by WorleyParsons, has considered:

Scenario Planning

Assessment of locations, yields and quantity of new large scale renewable energy developments and connection to load centres. This has identified transmission scenarios on the Eyre Peninsula aimed at unlocking at least 2,000MW of renewable energy projects available in the region. This includes:

- Identifying key renewable energy resources of wind, geothermal and solar across the State and the impact on potential generation scenarios on the Eyre Peninsula (including for any implications that may emerge from the Solar Flagships program);
- The identification of wind energy potential on the Eyre Peninsula using a constraint analysis based on environmental, social, planning and technical criteria;
- The understanding of planned and future credible fossil fuel based generation and load developments throughout the State and the relationship of the South Australian system to similar entities outside of the State but within the NEM;
- The design of transmission scenarios aimed at unlocking the wind energy potential on the Eyre Peninsula; and
- The ranking of these scenarios based on renewable energy quantum unlocked, technical credibility, key stakeholder input and likelihood of success.

This has involved renewable energy, transmission, Geographic Information System, constraint analysis, environmental and planning experts.

System Planning

Transmission solutions to connect wind generation from the Eyre Peninsula to load centres in the NEM has been assessed. This has involved modelling of the NEM, focused on South Australia and neighbouring States, in both energy flow and dynamic simulations, to analyse the scenarios in relation to system stability and impact. This has involved senior system planners, designers and modellers to identify:

- design of transmission elements and augmentations required for the scenario to be considered;
- relative merits of each scenario technically and financially;
- key system metrics for transmission losses relevant to wind development on the Eyre Peninsula; and
- establishment of critical network issues which (including future load growth and system stability)

Green Grid Design

Prospective scenarios for Green Grid were assessed based on technical requirements and consultation with key stakeholders, including;

- key design parameters and conformance of these to compliance with industry norms;
- costs of such designs and the practicality of achieving required planning and build timeframes; and
- peer review of technical and cost results.

Commercial

The commercial assessment has considered:

Building the Green Grid financial model

The financial feasibility assessments for the various Green Grid scenarios have linked transmission costs and generation benefits.

The financial model has estimated potential project and equity returns for Green Grid. The financial model incorporates WorleyParsons' cost estimates for the transmission line and associated augmentation, estimates for the potential quantum of generator's commitments, potential debt and equity funding costs and inputs from selected external consultants, including but not limited to price forecasts for electricity and renewable energy credits. Costs used in this model have been provided by WorleyParsons to a Class II level of accuracy[iv].

Consulting with key stakeholders

Developers have been asked to indicate their interest in developing renewable energy projects in the Eyre Peninsula and nearby regions. The results of these discussions have enabled a 'ground up' view of demand for renewable energy development.

ElectraNet, as the relevant NSP, has been actively engaged throughout the work program. The recommended Green Grid Eyre Peninsula and generation assumptions have been provided as an input to the ElectraNet/AEMO interconnector study. Other stakeholders consulted include State agencies, relevant development councils and AEMO. These consultations have assisted in developing commercially feasible network scenarios for the Green Grid.

Preparing the Green Grid funding strategy

A preliminary assessment of the options available to finance the Green Grid has been undertaken. This assessment includes the availability and costs of debt and equity for the Green Grid, wind farms and required transmission augmentation.

Regulatory

The regulatory assessment, led by Baker & McKenzie, has considered:

- the regulatory requirements for approval and development of the Green Grid under the existing and proposed NEM Rules (e.g. SENE proposals, NSP connection requirements, inter-regional TUoS arrangements, negotiating framework requirements and any WACC restrictions);
- an assessment of the contractual framework required for the Green Grid (e.g. connection arrangements with generators, connection arrangements with other NSPs, construction contracts, operating and maintenance arrangements etc); and
- an assessment of regulatory requirements for planning and construction of the green grid (e.g. EPBC Act and State approvals, obtaining landowner consents, easement requirements etc).

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4. RENEWABLE ENERGY OUTLOOK

Supply and demand for renewable energy in Australia is heavily reliant on the LRET.

The LRET entitles generators to create a renewable energy certificate (REC), which is an additional commodity that generators can sell to compensate for their higher cost of production (relative to fossil fuel generators).

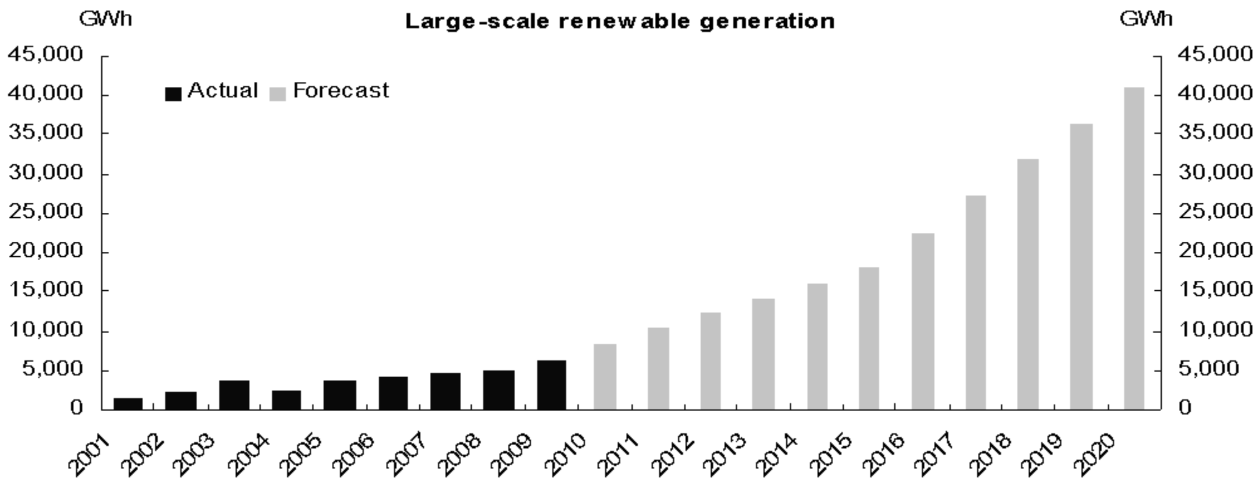
In addition to the LRET, a carbon price in the form of emissions trading or a carbon tax would provide a further uplift in renewable energy investment.

4.1 NATIONAL OUTLOOK[v]

The LRET will, from January 2011, be split into the Small-scale Renewable Energy Scheme (SRES), and the Large-scale Renewable Energy Target (LRET). These changes were prompted following the inclusion of the Government-subsidised solar hot water heaters and small-generation units into the scheme which saw a proliferation in the number of RECs brought onto the market. The consequence was a sharp fall in the REC price from around $50/MWh to as low as $23/MWh.

As a result, the Government has proposed excluding small-generation units and solar hot water from the LRET scheme, and placing them into their own SRES scheme. This would operate at a fixed REC price of $40/MWh, at an uncapped quantity. The separate LRET would still operate at a variable price with a target of 41,000GWh of large-scale electricity generation.

The new large-scale renewable energy targets



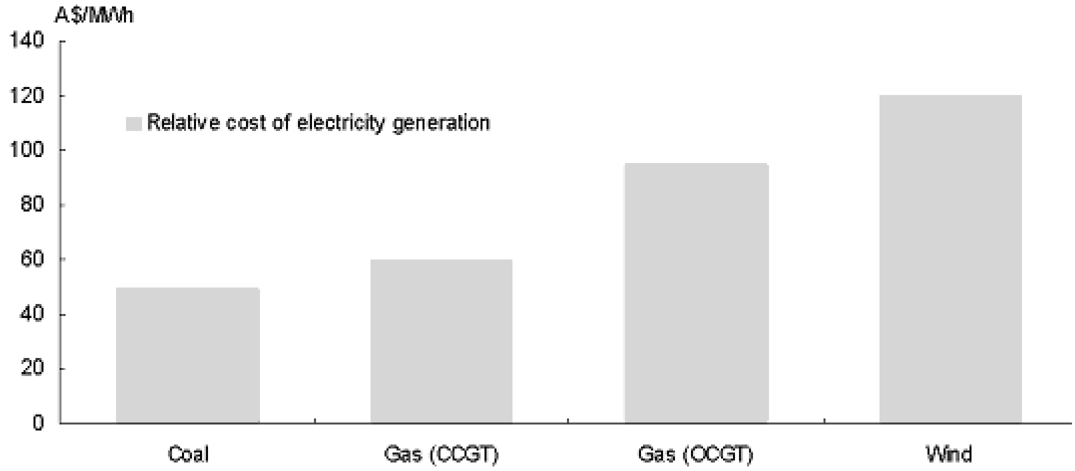
Source: Office of the Renewable Energy Regulator, Department of Climate Change, Macquarie Research, June 2010

The REC price is currently trading around $40/MWh. Macquarie Research believes that this is likely to persist for some time and there will not be sufficient investment in renewable energy to meet the LRET target until the REC price is closer to $65/MWh.

The key reason for this price weakness is market oversupply. This is a legacy of the influx of RECs from small-scale generation units and solar hot water systems in the second half of 2009. With existing RECs available for use in LRET (including all those generated from small-scale systems) this oversupply is unlikely to be resolved soon.

There are currently around 18 million RECs outstanding, of which about 10 million are from small-generation units and solar hot water systems. To put this in perspective, about 12.5 million RECs will be required to meet this year's target. If modest assumptions are made about the build-out of large-scale renewable energy, this surplus will not tighten substantially until 2013-14.

The REC price should reflect the cost differential between renewable and non-renewable generation



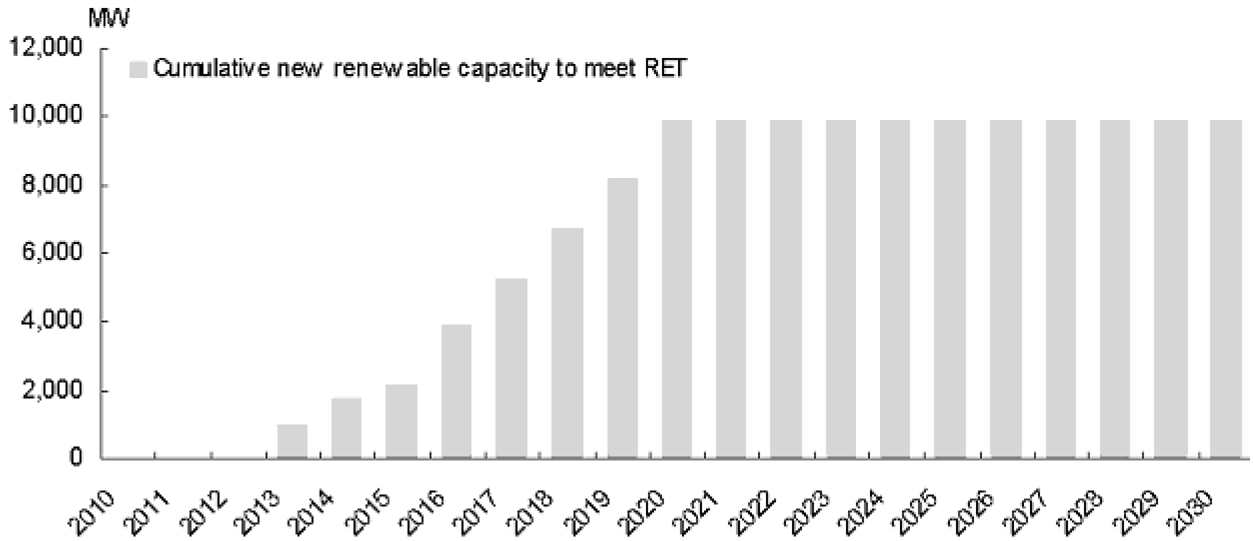
Source: ABARE, ACIL Tasman, MMA, June 2010

This aligns with evidence from individual wind projects in Australia, where the total 'bundled' cost (the amount received for the electricity generated, inclusive of the REC) in order to be economically viable is around $110/MWh. Assuming an electricity price of $50/MWh, the REC price must therefore be around $60/MWh.

Less large-scale development now could be a problem later on

If large-scale developments are put on hold, it will become increasingly difficult to meet the LRET target in the medium-term. For example, AGL Energy has estimated that meeting the LRET will require up to 10,000MW of additional renewable capacity. Comparing this to the current pipeline of renewable energy projects, 1,000MW of additional capacity is slated to be completed in the next 3 years, based only on projects where the final investment decision has been made.

The LRET will require increased renewable energy capacity



Source: AGL Energy, June 2010

Australia may see an undersupply of large-scale renewable energy around 2014-2015 if additional capacity is not brought on. Although the higher REC prices would likely result in further investment, these may not come online until 2016 or later.

The pipeline of potential projects may be extensive but the extent to which all of them are viable is hard to assess.

Geothermal contribution to LRET

Modelling undertaken for the Senate review of the initial LRET legislation suggested that geothermal could contribute up to 25% of Australia's large-scale renewable energy generation required under the LRET by 2020.

This is at odds with recent modelling by the Australian Bureau of Agriculture and Resource Economics (ABARE), which suggests that because commercial viability of this form of geothermal power has not yet been demonstrated and due to the distance of many of the resources from existing transmission load centres, geothermal will only contribute 6,000 GWh p.a. by 2029-30. It is likely the Senate estimates overstate the medium-term prospects for geothermal electricity generation.

Wind contribution to LRET

A lower contribution for geothermal does not necessarily imply being unable to meet the LRET target. Wind will likely make up much of the shortfall, with ABARE suggesting that 44,000GWh of wind power could be generated by 2030 (compared to 4,200GWh in 2009). Australia likely has capacity from other renewable energy sources of around 3,000GWh of bagasse (compared to 600GWh in 2009), 2,000GWh of wood waste (compared to 170GWh in 2009) and 1,200GWh of landfill gas (compared to 700GWh in 2009) by 2020.

There is a substantial pipeline of wind generation projects in Australia, with over 14,000 MW announced to be in development, construction or operation. The bulk of this pipeline (over 12,000MW) is in various stages of development and it is difficult to estimate the extent to which these projects will proceed to commissioning. A significant portion of developments will require comprehensive transmission network solutions and permitting approvals before they can proceed.

4.2 SOUTH AUSTRALIAN OUTLOOK

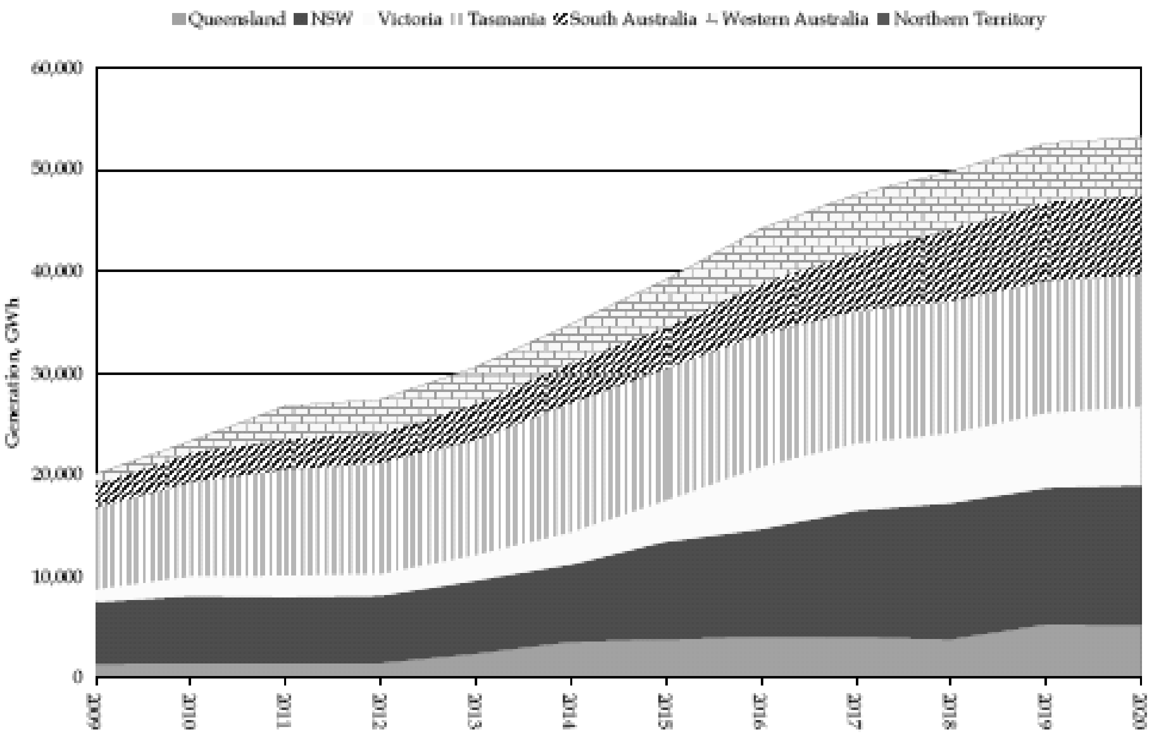
South Australia currently has 868 MW of renewable energy operating, representing 18% of its overall generation base and over 40% the nations wind generation. Despite its excellent wind, geothermal, solar and wave energy potential this growth could be limited by three factors: South Australia is forecast to experience only marginal growth in electricity demand, its location at one end of the NEM limits its electricity export opportunities and its transmission network is constrained in certain areas.

There are a range of forecasts for renewable energy generation in South Australia.

MMA research commissioned by the Australian Government provides one view of the likely impact of an expanded LRET and a CPRS on renewable energy generation in Australia. This research assumed that geothermal, which is concentrated in South Australia, becomes a commercially viable technology and that existing technical impediments are overcome. The MMA modelling suggest that geothermal contributes 10,000 GWh of the 45,000 GWh required by the LRET in 2020.

Not withstanding this large role for geothermal, the overall contribution by South Australia to meeting the expanded LRET is expected to be just 11%. The majority of additional investment is expected to occur in Western Australia, Queensland and NSW, 18 per cent, 18 per cent and 28 per cent respectively (mostly biomass and geothermal in Queensland ; wind, geothermal and biomass in New South Wales; and biomass and wind in Western Australia). Victoria also has a high uptake, particularly in wind generation. The relatively low increase in investment in South Australia is due to a low wholesale price for electricity that would emerge for generation beyond this level. In other words, demand for renewable energy generation in South Australia does not support growth beyond this modest level.

Forecast Renewable Energy Generation by State (CPRS plus expanded LRET)^



^Excludes small scale PV and solar hot water heaters
Source: McLennan Magasanik Associates

However, other forecasts present a different picture. The ABARE Australian Energy Projections to 2029-30 suggest South Australia will experience the strongest growth in electricity generation among all states and territories with an average annual growth of 3.4% compared to a national average of 1.8% until 2030.vi This high growth is due mainly to wind energy with an average growth of 5%. The increase in generation is unlikely to be caused by growing demand, with ABARE projectng annual growth of 1%, well below a national average of 1.4%. It is likely that this growth in generation is contingent on higher levels of transmission capacity to export power to NEM load centres outside of South Australia.

A large increase in renewable energy generation in South Australia was assumed by the Garnaut Review and Treasury Modelling, which indicated a need for between 3000 and 5000MW of wind generation in South Australia to meet the LRET and assumed transmission upgrades would occur “as and when required” vii.

The risk that these augmentations will not occur *as needed* has been highlighted by the Financial Investor Group, an affiliation of eight major investors in Australian energy and transmission distribution businesses, states that:

“*Without those upgrades wind generation in South Australia will be limited to 2000MW resulting in the 20% LRET either not being reached or only being reached by using generation sources that are of a higher cost than wind (e.g. photovoltaic solar)*” viii

South Australia’s contribution to the LRET will be limited by the quality of its network rather than the quality of its energy resources. Increasing transmission interconnection between South Australia and the other NEM States is the key to unlocking these renewable energy resources.

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5. ELECTRICITY TRANSMISSION REGULATORY ENVIRONMENT

5.1 OVERVIEW

Australia's electricity network comprises high voltage transmission networks and lower voltage distribution networks. There is limited connection between the transmission networks in different States.

The transmission system is generally owned in each State by one dominant transmission service network provider (NSP), with multiple distribution network service providers (DNSPs) owning multiple distribution networks. The monopoly aspects of both transmission and distribution network services are regulated by the Australian Energy Regulator (AER).

Investment in the electricity network can either be for 'prescribed services' where the relevant NSP is entitled to recover the cost of the investment from customers in accordance with its regulated rate of return, or for 'negotiated services' where the relevant NSP recovers the cost of the investment from those requiring the investment (generally developers in the case of generator connection).

Some industry participants have expressed concern that investment in Australia's electricity network will not keep track with the need for new renewable generation. This issue has also been raised by the Garnaut Review and Infrastructure Australia. In August 2008 the Ministerial Council on Energy (MCE) commissioned a review by the AEMC of Energy Market Frameworks in light of Climate Change Policies.

The AEMC review identified that the present binary approach to network investment in the NEM Rules (i.e. if a network investment does not meet the regulatory test than it must be sole funded by the proponents) would make it difficult to facilitate the large scale development of the network needed to meet the scale of renewable energy capacity necessitated by the LRET and a CPRS. This was due to several factors, including:

- NSPs not having any incentive to undertake network development unless the development was guaranteed of funding;
- the existing regulatory test not expressly recognising the policy benefits of additional renewable energy generation as a "market benefit" for the purposes of the regulatory test, making it difficult for network extensions to connect new renewable generation to satisfy the regulatory test and be funded by customers;
- the sole fall back being that connecting generators are required to fund connection to the shared network;
- the existing regulatory test generally being a reactive process that did not allow scope for NSPs to develop network extensions to connect future renewable generation *in anticipation* of that generation capacity, or to appropriately size network extensions to realise scale efficiencies; and
- the absence of workable inter-regional charging arrangements to ensure that States who benefit from a network investment share the cost of that investment.

The AEMC review recommended regulatory reforms that could facilitate implementation of Green Grid. These reforms included allowing NSPs to anticipate future levels of generation connection capacity, the development of network assets to reflect the capacity and timing of this future generation connection capacity and having customers finance approved network development until the forecast future generation eventuates. Draft rule changes for these SENE assets have been prepared by the AEMC and provided for public consultation.

The SENE proposal still requires a number of regulatory issues to be tested and resolved. The AEMC consultation paper accompanying the draft SENE rules itself highlights a number of issues still need to be resolved regarding the SENE arrangements. The industry submissions to the consultation paper have identified further still. Further, some industry participants have indicated opposition to the proposed SENE arrangements in preference for addressing the issue in other ways, including by changing the existing regulatory tests for network assets.

While most industry participants agree that some measures are required to ease the barriers to entry for remote renewable generation, it appears that further consultation and refinement of the SENE proposals will be necessary before the SENE arrangements can be implemented. Accordingly, there is speculation that the timeframe for consideration and adoption of the SENE rules, or any preferred alternative rule formulation, is likely to be delayed.

5.2 REGULATED ASSETS AND THE REGULATORY INVESTMENT TEST

In order to pass the costs of network investment through to customers under regulated network charges, the relevant investment must satisfy a regulatory test. A separate regulatory test for transmission (the RIT-T) has recently been formulated and a regulatory test for distribution (RIT-D) is in the process of formulation. The previous regulatory test continues to apply to distribution network assets in the interim.

Using the RIT-T as an example, an investment will be approved by the AER where the NSP can demonstrate that the chosen investment option provides the maximum present value of the expected net economic benefits from all credible options. This requires consultation on all credible options to satisfy an identified need, and a comparative cost/benefit analysis for each of these options.

Some submissions to the proposed SENE rule changes argue that the RIT-T could accommodate SENE-like assets with only minor modifications.

5.3 MERCHANT ASSETS CONNECTING TO NATIONAL ENERGY MARKET

Sole use network investment, or network investment that does not satisfy the regulatory test, must currently be funded by the relevant proponents. In these cases (generally associated with individual generator connection applications), the NSP is not required to undertake any investment until the cost of the investment is fully underwritten by the proponents.

Where an asset is sole funded by a proponent and another generator subsequently connects to that asset, the initial generator is entitled to have the subsequent generator contribute to the development costs. The NEM Rules do not give any priority to the initial generator in terms of dispatch and the initial generator does not have any ability to exclude subsequent generators from connecting to the asset.

5.4 SCALE EFFICIENT NETWORK EXTENSIONS

The AEMC's SENE proposals are intended to:

- replace the piecemeal approach to generator-led transmission network development with a regime that would allow the NSP to consider likely future generator connection capacity and then optimally size the transmission asset development; and
- have customers finance any shortfall in the NSP's return on the relevant transmission asset until the forecast generation connects. Provided the forecast generation connection capacity eventuated as forecast, customers would then fully recover this financing as the capacity of the transmission asset was fully subscribed by generators.

The SENE proposals would require AEMO to identify possible scale efficient generation zones and to consider applications by NSPs to develop new transmission infrastructure to those zones. The factors that a NSP must consider developing options for a potential SENE asset include:

- the possible location of fuel sources for future electricity generation capacity;
- the viability of future electricity generation projects within the relevant area using existing generation technologies;
- the likelihood of the development of more than one electricity generation project in the relevant area;
- topography and other characteristics of the relevant area; and
- the likely location and scale of the development of generation capacity within the relevant area.

Once a generator makes a connection enquiry in respect of the identified potential SENE developments, the NSP would seek other expressions of interest from potential generators and formulate a forecast profile of generation capacity. This generation forecast will form the basis of optimising the sizing and configuration of the SENE asset and the NSP's selection of the proposed SENE asset development.

AEMO will review the NSP's forecast generation profile and advise the AER whether it believes the forecast profile is reasonable. The AER, with the benefit of AEMO's review, will then approve or reject the NSP's proposal to develop the SENE asset.

The NSP would charge an annual fee to connecting generators (based on their contracted capacity entitlement) at a rate sufficient to recover the full cost of the investment and customer financing based on the forecast generation profile. In the event that generators do not subscribe for the full capacity of the SENE asset, or delay their connection from the timing assumed in the generation forecast, then the NSP may recover any shortfall from customers. If the forecast generation profile eventuates as forecast, customers will be repaid any initial funding in full by the end of the SENE's economic life.

Other regulatory proposals relevant to the Green Grid are also being developed in parallel to the SENE proposals, including the charging of the cost of network developments to other State's benefitting from those developments (to levy a "load export charge" as part of a framework for inter-regional Transmission Use of System charging) rather than requiring only customers in South Australia to fund the costs of network investments located in South Australia.

5.5 CLARIFICATION OF SCALE EFFICIENT NETWORK EXTENSIONS

The AEMC had announced its intention to establish the draft SENE rule by December 2010. However, as noted above the number of outstanding issues and the submissions from industry participants suggest this timeframe may not be met.

The outstanding issues with the SENE proposal include:

- Whether the SENE asset should be classified as a shared network asset or network extension asset;
- where the relevant transmission connection point for a SENE would be located, and the implication of having a connection point that is not proximate to where the generator connects to the SENE;
- whether the annual SENE fee is to be recovered over the economic life of the SENE asset or some other period (e.g. the connecting generator's economic life);
- whether loads connecting to a SENE would contribute to annual costs, and whether the connection of loads should lead to the re-classification of the SENE asset as a shared network asset;
- how generators connecting to the SENE at a location other than at the SENE hub should be charged; and
- whether NSPs can return loss rentals earned on the SENE back to connecting generators so that connecting generators effectively incur only actual losses on the SENE asset.

The Consortium has itself made a submission to AEMO requesting clarification on whether the SENE charge is to be determined by the economic life of the SENE asset or connecting generators. The economic life of wind turbine generators is typically 20 years and for transmission assets is typically between 40 and 55 years.

We believe the SENE annual charge should be matched to the SENE asset life, which would be the optimal way to achieve the National Electricity Objective to 'promote the efficient investment in, and efficient operation and use of electricity services for the long term interests of electricity consumers'.

The matter of accounting for losses in the system network is addressed in Section 10.

5.6 SUMMARY OF REGULATORY POSITION

The SENE proposal represents a hybrid approach to the existing "prescribed services" and "negotiated services" given it contains elements of both existing approaches. As a result, the proposed SENE rules are difficult to implement and do present some "knock on" issues in how other elements of the NEM Rules would operate with regard to SENE assets. It is also possible that the SENE proposals can be achieved through other, alternative means.

Notwithstanding these remaining issues and proposed alternatives, the relevant regulators and most industry participants do appear open to lowering the barriers for remote generation, particularly remote renewable generation. These regulators and participants are searching for a way to achieve this objective with the minimum amount of disruption to the existing regulatory arrangements. While this may mean that the SENE rules may not be implemented in the exact form proposed, or in the suggested timeframe, the Consortium considers it likely that some form of revised regulatory arrangement to facilitate the Green Grid will be implemented in the near future.

Regulatory matters have been further assessed by Baker & McKenzie.

6. ELECTRICITY NETWORK IN SOUTH AUSTRALIA

EXISTING NETWORK

South Australia's main transmission system comprises a network of 5,700 circuit kilometres of 275 kV and 132 kV transmission lines and 76 switching stations. Within this system, a high capacity 275 kV main grid backbone connects base load generation to the major load centre, Adelaide, while the remaining transmission network is developed on a lower capacity 132 kV. The electricity network in the Eyre Peninsula is a single 132kV line that is unable to accommodate load/wind generation increases of any significant magnitude (>5 MW) without some form of major augmentation.

The South Australia system is connected to the rest of the Australian National Grid via two interconnectors; the Heywood and Murraylink interconnectors to Victoria as follows;

- Heywood interconnector – a 275 kV double circuit between ElectraNet's South East Substation in South Australia and SP AusNet's Heywood terminal station in Victoria; and
- Murraylink interconnector – which is a single high voltage direct current (DC) circuit operating between ElectraNet's 132 kV Monash Substation in South Australia's Riverland and SP AusNet's 220 kV Red Cliffs terminal station in Victoria.

South Australian Electricity Transmission Network

Source: ElectraNet

6.1 CURRENT AND FORECAST ELECTRICITY LOAD

Demand for electricity in South Australia fluctuates from a load in winter of 932 MW (as at June 2009) to a high in summer of 2829 (as at Feb 2009). It is forecast that average load will increase by approximately 100MW per year and for the summer peak to be approximately 3530 MW by 2015.

However this forecast does not account for increases in load that may result from large resource developments currently under consideration.

The generation and load profile for electricity in South Australia is presently well matched. The expected increase in load and the technical capacity of the existing network would support up to an additional 1000MW generation of wind energy. However, opportunities for large scale wind generation beyond this will rely on improved access to load centres interstate.

Currently there is a thermal limit of about 500 MW between South Australia and Victoria due to the constraints on the Heywood transformers. During periods of light load in SA (~ 1500 MW) this will be the most significant constraint on any new generation *anywhere* within South Australia.

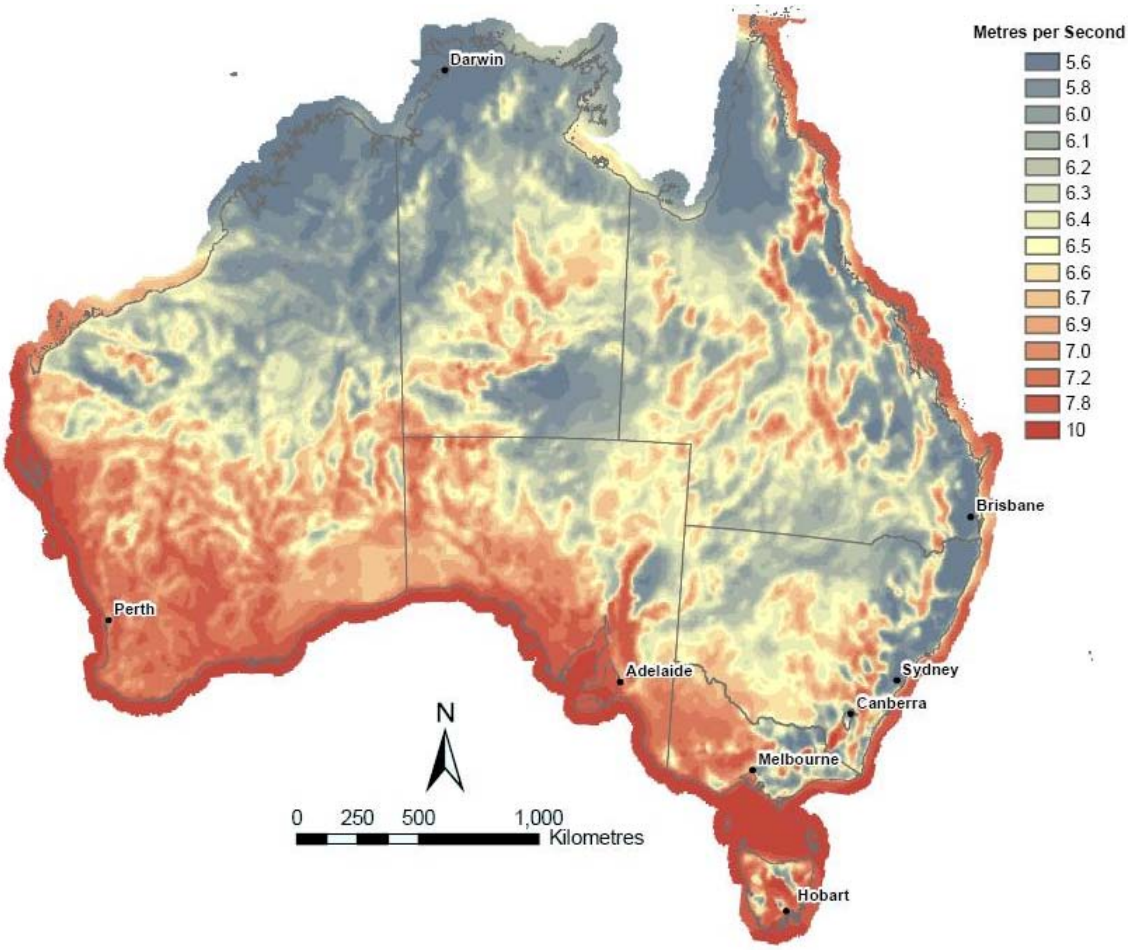
Further assessment of the electricity network in South Australia has been undertaken by WorleyParsons .

7. EYRE PENINSULA WIND RESOURCE

7.1 WIND ASSESSMENT OF EYRE PENINSULA

Australia's best wind resources are typically located in regions along the southern and western coastline. Eyre Peninsula is one of these regions with strong and consistent wind speeds and extensive areas suitable for large scale wind farming.

Renewable Energy Atlas of Australia: mean wind speed at 80m above ground level

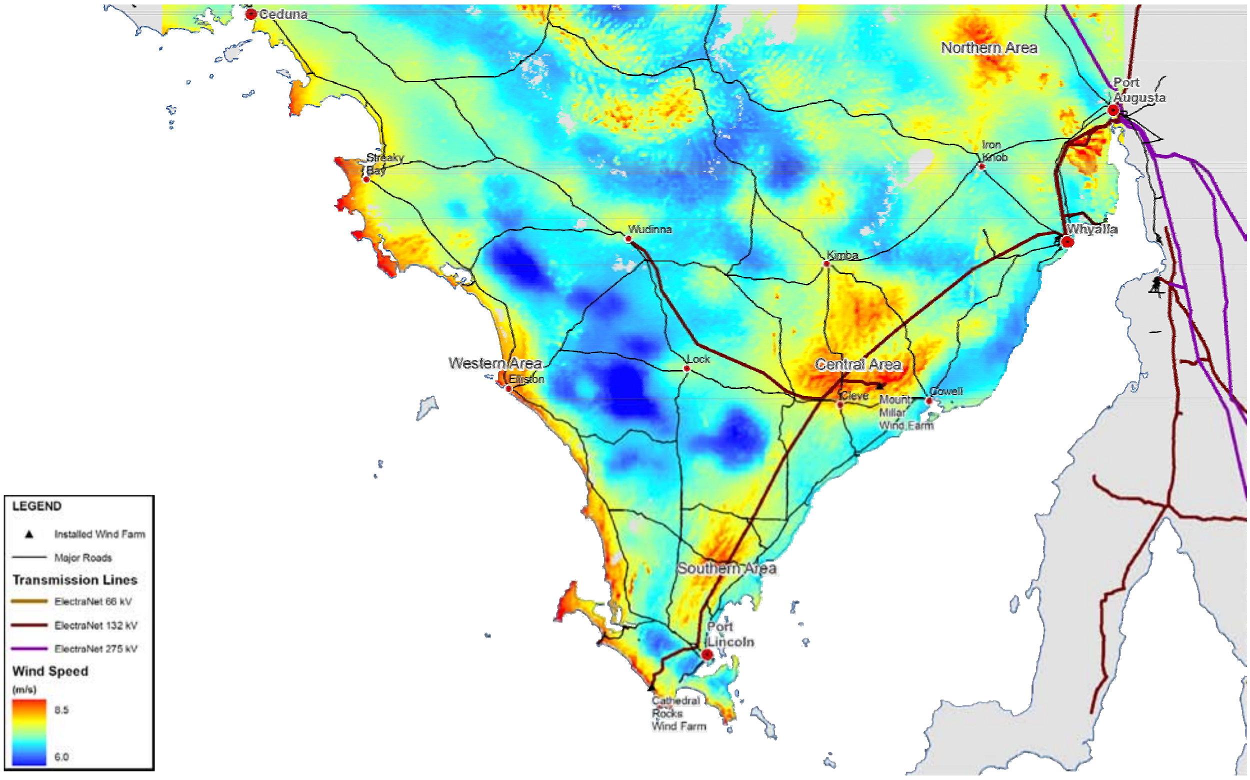


Source: Australian Government, Department of the Environment, Water, heritage and the Arts

The Renewable Energy Atlas of Australia provides an overall picture of wind resource across Australia.

The Consortium commissioned Garrad Hassan to model wind speeds for the Eyre Peninsula, with their final output producing estimates at wind turbine heights for locations every 500m. The results reveal significant areas with wind speeds above 8 m/s, considered excellent for wind energy generation. This modelling work was calibrated against a number of wind farm monitoring masts in the area as well as Bureau of Meteorology information.

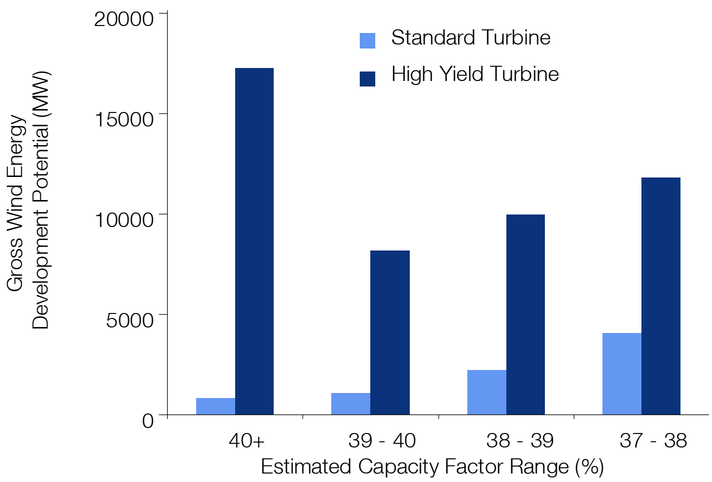
Eyre Peninsula Wind Map



Source: Worley Parsons

An assessment of wind farm capacity factors was also conducted assuming the use of either 'standard' wind turbines which reflect the characteristics of turbines commonly installed in Australia or 'high-yield' wind turbines which reflect higher performance turbines now also available in the market. A capacity factor measures the proportion of electricity that a generator is able to sustain which is a key economic indicator. Wind farm developers in Australia typically target areas that support capacity factors of above 35%.

There are extensive areas of the Eyre Peninsula that could support capacity factors above this level. Total generation potential using standard turbines is estimated at more than 10,000MW. This indicates the overall quality of the wind resource of the Eyre Peninsula however it is unlikely such a large concentration of generation would be economically feasible.



7.2 OVERALL SUITABILITY OF EYRE PENINSULA FOR WIND FARMING

There are a range of factors that influence the suitability of sites for large scale wind farming. The quality of wind speeds and capacity factors determine electricity generation potential. Access to transmission and distance to energy load centres, determine the market for that power. The suitability of an area from a technical, logistics, environmental, planning and social perspective is also of critical factors for large scale wind developments.

WorleyParsons assessed these factors to identify the most suitable locations for large scale wind farming in the Eyre Peninsula. This analysis included:

- Wind speed
- Proximity to urban environment and population (i.e. outside of suitable buffers)
- Engineering constraints (i.e. roads, railways, pipelines, water courses, flood zones etc)
- Ground slopes that support wind farm construction (i.e. less than 15°)
- Ground types that allow for wind turbine foundations (i.e. soil types and presence of rock)
- Mining and designated Aboriginal areas
- Areas of known environmental sensitivity
- Known areas with rare or endangered fauna and flora
- Areas requiring removal of native or remnant vegetation

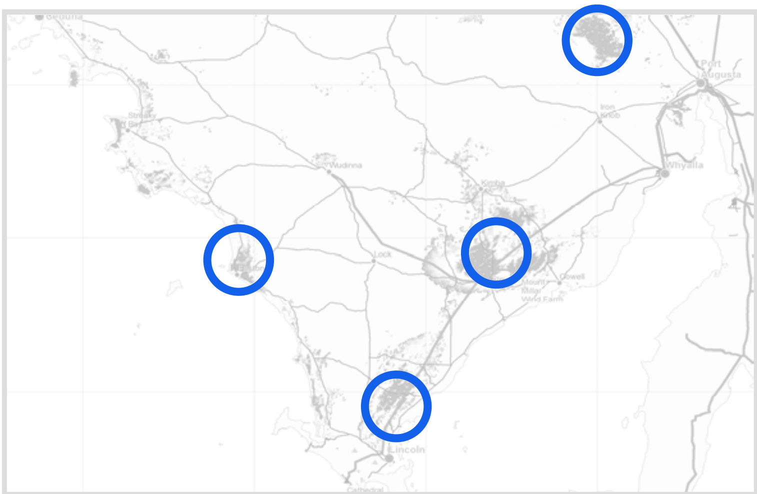
Areas considered unacceptable for wind farming included:

- National Parks and specific Reserves (Commonwealth and State)
- Wetlands and areas of high conservation value (such as Ramsar wetlands)
- Urban areas
- Existing easements
- Water courses or that prone to flooding or tidal inundation
- Areas with significant heritage (World, National or State)
- Commonwealth land, such as that used for military purposes

The analysis confirms the Eyre Peninsula is highly suitable for large scale wind development..

7.3 RECOMMENDED WIND ZONES OF EYRE PENINSULA

The assessment of social and environment as well as wind resource criteria reveal four exceptional wind.



- **Southern Area** – inland area of higher elevation north of Port Lincoln
- **Central Area** – large inland area of higher elevation north of Cleve
- **Northern Area** – Large remote inland area north-west of Port Augusta
- **Western Area** – coastal areas around Elliston

Of these four wind zones, the Central & Western zones were prioritised due to the size and maturity of potential wind farm developments being considered, and ease of planning and logistics. It is proposed that Stage 1 of Green Grid unlock these two zones while Stage 2 focuses on the Northern and Southern areas. The preferences of wind farm developers have influenced the proposed transmission configuration. In the event these preferences change in further planning then it may be appropriate to review the sequence of unlocking the zones.

8. WIND GENERATION DEVELOPER INTEREST IN THE EYRE PENINSULA

8.1 SUMMARY OF CONSULTATION WITH DEVELOPERS

Wind energy development companies were invited to participate in the Green Grid initiative. The consortium consulted with companies with active development portfolios in Australia to assess market interest in new wind generation facilities in the Eyre Peninsula. Developers were asked to indicate the location and size of new investment that they would consider in the event access to load centres in the National Energy Market was facilitated by the Green Grid initiative.

Developers were asked to indicate their interest in new investment opportunities in the Eyre Peninsula in the event transmission challenges were addressed, with four providing further information on their development plans.

8.2 PARTICIPATING DEVELOPERS IN GREEN GRID

There exists strong interest among developers to invest in new wind generation on the Eyre Peninsula.

The participating developers have been consulted as to the proposed configuration and cost for the Eyre Peninsula Green Grid, system upgrades in the shared network (including upgrade to the interconnector) and the indicative annual charge that could apply to developers under a SENE regulatory framework. The developers have expressed support for the proposal.

Certain developers participating in this Study have secured access to land for future development on the Eyre Peninsula and have initiated early stage development work. Acciona Energy

Acciona is a globally recognised specialist in developing and managing renewable energy projects including wind, hydro, biomass and solar. Based in Spain, Acciona has a wind turbine manufacturing business and in 2008, Acciona had approximately 3,700MW of installed wind capacity globally.

8.2.1 Acciona Energy

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8.2.2 Origin Energy Limited

Origin is Australia's second largest energy provider, with more than 3 million customers. It has an active business in gas and oil exploration and production as well as power generation and energy retailing in Australia, New Zealand and the Pacific.

8.2.3 Pacific Hydro

Pacific Hydro is an Australian company specialising in hydroelectric and wind farm projects globally. Pacific Hyrdo has 1,934 megawatts (MW) of hydro power and wind farm projects at varying stages of development, construction and operation in Australia, Chile, Brazil and the Philippines.

8.2.4 Transfield Services Limited

Transfield Services delivers essential services to key industries in the Resources and Industrial, Infrastructure Services and Property and Facilities Management sectors. Transfield is a leading global provider of operations, maintenance, and asset and project management services, and has more than 28,000 employees in Australia, New Zealand, the United States, the United Arab Emirates, Qatar, New Caledonia, South East Asia, India, Chile and Canada.

8.3 INVESTMENT CONSTRAINTS IDENTIFIED BY DEVELOPERS

Wind energy development companies have expressed confidence in the quality of the wind resource and the suitability of many areas of the region for large scale wind farming. However, constraints to investment are regarded as significant. Limitation of existing transmission south-west of Port Augusta precludes significant new expansion. Congestion in the South Australian grid and at the interconnectors exacerbates this problem. The transmission constraints of the region are well known and previous unsuccessful attempts to overcome these challenges have further discouraged investment.

The consultation process identified other investment constraints, including high prevailing financing costs, a current low REC price, difficulty in securing power purchase agreements (PPAs) of sufficient value (both cost of energy and contract period) to allow projects to secure financing and provide sufficient project returns as well as market uncertainty of the future value of renewable energy certificates.

While these constraints are common to the broader energy market, they have the effect of encouraging investment to sites with strongest transmission access. The uncertainty of a possible future price on carbon means developers are reliant on energy market prices that reflect current market settings, namely spot and forward market prices plus RECs with little allowance for a future price on carbon.

These broader market factors are further addressed in Section 4.

9. RECOMMENDED EYRE PENINSULA GREEN GRID

9.1 UNLOCKING ECONOMICALLY VIABLE NEW GENERATION

The emerging regulatory environment outlined in Section 5 is expected to facilitate network extensions that respond to current demand for new generation as well as likely future demand. This would allow transmission decisions to be made in the short term that account for longer-term generation opportunities. This approach is well suited to the renewable energy generation sector which is expected to experience predictable demand growth in line with the LRET target.

To identify a transmission configuration for the Eyre Peninsula Green Grid, the Consortium has considered the following key factors:

- overall quality of the wind resource and therefore opportunity for further developments;
- response from developers as to preference for locations and size of developments;

And has balanced these factors against:

- value in the market for this extra energy, and its impact on electricity and REC prices;
- costs to developers of the SENE; and
- costs to the NEM for funding augmentations to the grid in South Australia and to interconnectors

The overall quality of the wind resource in the four target wind zones as identified in Section 7 could support as much as 10,000 MW. It is highly unlikely that this level of generation would be viable given likely planning restrictions, transmission capacity and the significant downward pressure it would have on energy prices available to the generating entities.

Four developers have indicated potential interest in developing generation assets in excess of 2, 000MW, all of which is presently un-viable due to transmission constraints, which would amount to an estimated 15% of the overall LRET.

This level of new renewable generation would represent a significant boost to the electricity generation base in South Australia. According to market modelling conducted for this Study extra generation in the Eyre Peninsula of up to 1000 MW by 2020 could be absorbed by load centres in South Australia, principally Adelaide. This would be expected to increase to 1500 MW if expansion of Olympic Dam goes ahead. However, 2000MW of wind generation would oversupply the major load centre of Adelaide during peak wind periods. Accordingly, in order to accommodate the large scale generation that the Green Grid could unlock, additional transmission augmentation from Davenport to Heywood would be required to export generation interstate.

9.2 PROPOSED CONFIGURATION OF EYRE PENINSULA GREEN GRID

The proposed Eyre Peninsula Green Grid configuration would allow for high capacity transmission to unlock 2000MW of wind generation from two wind zones as Stage 1. The design would also allow for further extensions to unlock up to a further 2000MW of wind generation as Stage 2. The conditions that would be necessary to support this further stage of transmission expansion is considered in Section 9.3

The Eyre Peninsula Green Grid would consist of a 500 kV network established from Davenport[xiv] near Port Augusta to a point on the West Coast provisionally identified as near Elliston with two connection points: the first near Cleve, which is described as the Central region and the second near Elliston described as Western region. From Davenport to the Central region a double line circuit will be established while one line would extend from Central to the Western region.

The use of 500 kV lines will enable very large generation output to be carried at any one time, with each line rated as allowing an average maximum of 1000 MW, with a tolerance to accommodate almost double this amount on occasions of very high generation.

Currently, the highest rated lines in the existing system are 275 kV in South Australia.

The configuration is designed to minimise physical electricity losses[xv], maximise generation output and increase broader system stability. The issue of system stability requires that augmentations occur in the shared network to overcome existing constraints that would otherwise be made worse by new generation connecting at Davenport, as detailed in the next Section.

Proposed Green Grid

Source: WorleyParsons

9.3 FURTHER DEVELOPING EYRE PENINSULA GREEN GRID

The configuration outlined above provides the building blocks for further extensions in the event market developments support the further generation of renewable energy in southern Australia.

Stage 2 of Green Grid is proposed to consist of an additional 500 kV line from the Central region, most likely to a Southern region near Port Lincoln to unlock up to a further 1000MW and from Davenport to a Northern region, again for a further 1000MW, with the total configuration supporting 4000MW.

The extensions benefit from considerable economies of scale, with the first development laying the foundations for the further build out. However, the challenge of getting this much larger volume of electricity to load centres is exponentially greater. The first 2000MW of power would meet demand in the southern NEM (SA and Victoria) however the grid augmentations needed to transport this second 2000MW could not easily be accommodated as additions to the existing grid. Also, while the first volume of power is expected to meet demand in southern NEM the second volume would likely depress prices to unviable levels if it was to arrive at the same destination.

It is proposed that Green Grid Stage 2 would be supported by augmentations that would link Davenport to Mt Piper in NSW via a High Voltage Direct Current (HVDC). The proposed configuration would enable 2000MW of new generation to be sourced from the wind zones of the Eyre Peninsula or alternative new generation sources, for example, geothermal near Innamincka in northern South Australia.

The two stages of Green Grid would enable the transmission network to support an increase in generation capacity in South from 3,500 up to 7,500MW.

9.4 COSTINGS FOR EYRE PENINSULA GREEN GRID

WorleyParsons has assessed the overall capital cost for Stage 1 of Green Grid to be $613m, of which 78 percent is for line costs and 22 percent for substations. Operation and maintenance of the Stage 1 transmission assets is expected to cost $11.7m per year.

The additional step of doubling generation opportunities in the Eyre Peninsula from 2000MW to 4000MW benefits would cost an additional $296m for capital and $6.6m per year for operations and maintenance.

Further assessment of cost of Eyre Peninsula Green Grid has been undertaken by WorleyParsons.

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10. EXPORTING GENERATION FROM EYRE PENINSULA TO LOAD CENTRES

The Eyre Peninsula Green Grid would result in significant capacity for new generation to enter the NEM at Davenport, near Port Augusta. The ability for this extra electricity to flow from this point would be severely constrained based on the current grid.

WorleyParsons modelling of the current network has found that the limit on interconnectors to Victoria is the greatest impediment to large scale wind generation on the Eyre Peninsula. As further wind developments take place elsewhere in the State – and we believe up to a further 1000MW is technically possible in the current network – a series of additional bottlenecks will emerge. The network has been reviewed to identify the augmentations needed to overcome these bottlenecks to provide unconstrained access from Davenport all the way to the Victorian interconnector.

The most immediate bottleneck is the interconnector, followed by the 275kV backbone grid between Tungkillo and Tailem Bend and between South East and Tailem Bend. The line between Davenport to Tungkillo can also be expected to become heavily congested in the event of substantial increases in generation.

WorleyParsons recommends a phased upgrade to establish a single line 500kV system from Davenport to Heywood. The new system would follow a “daisy chain” from Davenport to Tungkillo, to Tailem Bend, to South East and finally to Heywood substations.

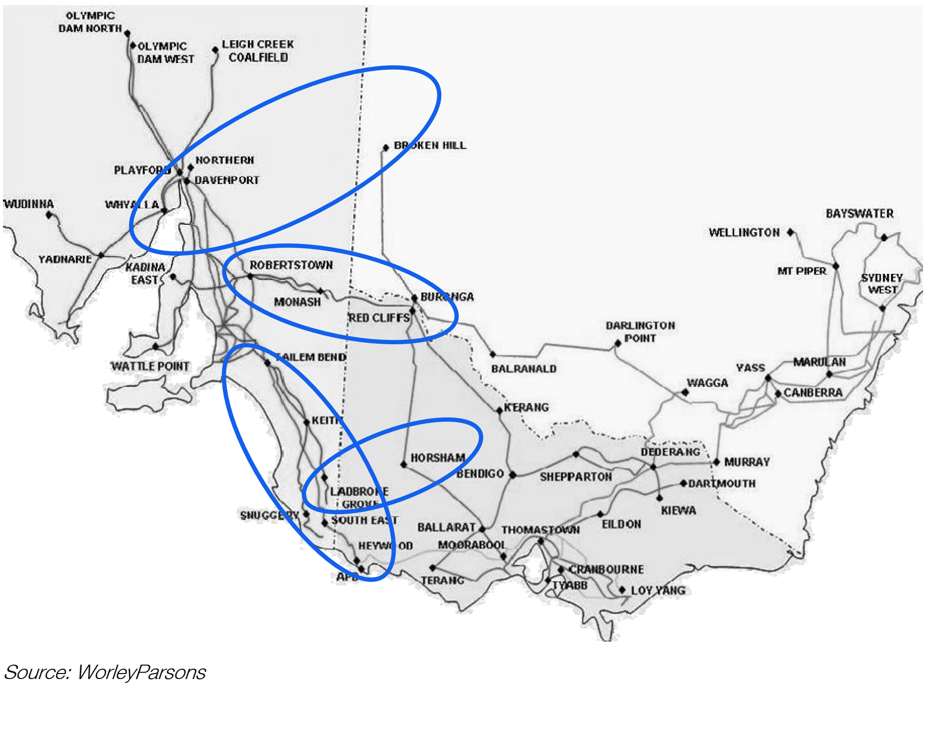
10.1 ACCESING LOAD CENTRES IN EASTERN STATES

South Australia is currently connected to the NEM via Victoria. In order for substantial volumes of new generation in South Australia to be economic access needs to be increased to Queensland, New South Wales or Victoria.

WorleyParsons has considered the technical options for achieving much higher levels of interstate power export. Queensland would be the furthest connection point to east coast markets. It is unlikely that this higher transmission cost would be offset by energy demand growth therefore connection to Queensland was excluded from our assessment.

Four options were considered as depicted below. A fifth option (i.e. a HVDC interconnection from Davenport to Mt Piper) was also considered for wind capacity of significantly more than 2000 MW.

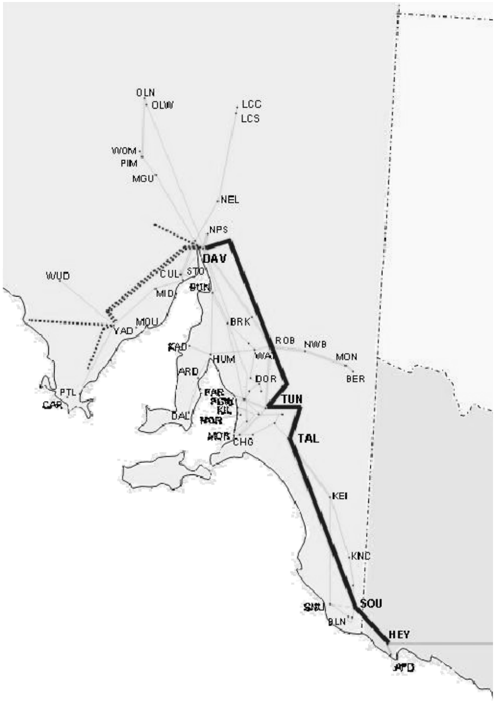
Potential transmission upgrade options



Source: WorleyParsons

The Heywood interconnector upgrade is recommended as the best of these options as it represents least cost, can be built in stages and would enable substantial extra electricity to flow to Victoria. The configuration would more than double export capacity between the two states.

Proposed augmentations to shared network



Source: WorleyParsons

STRENGTHENING SOUTH AUSTRALIA'S NETWORK

The proposed 500 kV network would form a new energy backbone for South Australia. This high capacity line would connect to existing substations to significantly strengthen and complement the existing 275 kV network. This would provide the foundation for future new generation opportunities as well as potential advances in grid system management, for example use of smart metering and energy storage.

WorleyParsons has undertaken modelling to assess risks that could emerge from a large increase in electricity flows and the performance of the system in the event of unexpected faults. The system was found to be resilient including in the event of a sudden loss of 1000MW of wind generation on the Eyre Peninsula which could be managed as a result of the upgraded interconnector to Victoria.

The interconnector would enable substantial extra electricity to flow to Victoria, which has strong demand growth for electricity in the medium term. The result of these augmentations would be a substantial strengthening of the South Australian system capable of being integrated with the 500 kV network already in place in Victoria.

10.2 GREEN GRID AND SYSTEM 'LOSSES'

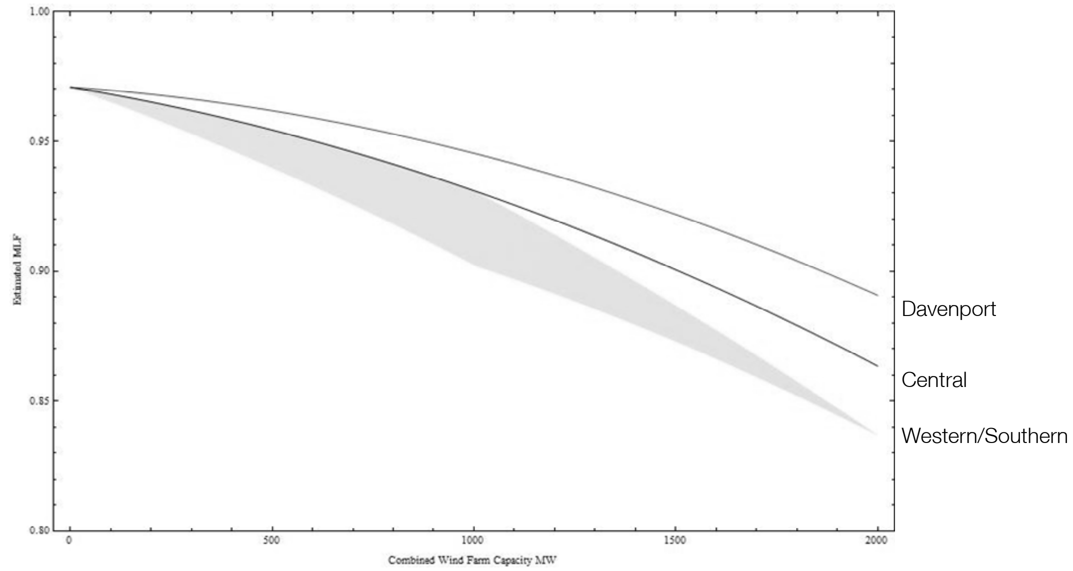
Generators connecting to the NEM are allocated a marginal loss factor (MLF) determined by AEMO. The affect of this MLF is to adjust the volume of electricity for which the generator can receive revenues in order to recognise the losses that will be incurred through the transmission network.

The formula that determines the MLF accounts for a range of factors including the type of transmission asset installed the difference in generation and load volumes in a region and the distance to load centres. The current MLFs that apply to regions near the Green Grid transmission corridors are described below. [xvi]

Location	Voltage (kV)	TNI Code	2008/09 MLF	2009/10 MLF
Davenport	275	SDAV	0.9699	0.9691
Port Lincoln	33	SPLN	1.000	0.9768
Whyalla	33	SWHY	0.9867	0.9836
Yadnarie	66	SYAD	0.996	0.9823

Losses deteriorate as more generation is established without commensurate increase in local load. The proposed configuration for Eyre Peninsula Green Grid is estimated by WorleyParsons to result in the following loss profile assuming no further augmentations in the shared network.

Marginal Loss Factors: Eyre Peninsula Green Grid without additional network augmentation



Source: WorleyParsons

Growth in local demand will improve the loss factor on the Eyre Peninsula. The loss profile at Davenport would improve significantly in the event the expansion of Olympic Dam goes ahead.

The base case assumed by the Consortium is for loss factors that reflect forecast load growth as published by the Electricity Supply Industry Planning Council of South Australia. This provides a conservative basis which does not account for the upside impact of an expanded Olympic Dam or other mineral resource development in or near the Eyre Peninsula.

Loss factors can be expected to improve with the augmentations that improve access to load centres.

Average Loss Factors

Across the NEM, more losses are accounted for than actually occur. AEMO accrues the surplus losses and then returns these losses each year to NSPs. NSPs in turn distribute these to customers in the shared network to compensate them for higher transmission charges incurred. These losses should equal the approximate difference between the forecast marginal loss factor and actual losses overall for a specific customer.

In the case of transmission assets that have been paid for by generators, surplus losses could be returned directly to the entity paying for the transmission asset. Where the metering point is remote from the customer's premises, the customer incurs average losses between their premises and the metering point. The surplus losses are returned to them at the connection point when they purchase power and incur TUoS charges.

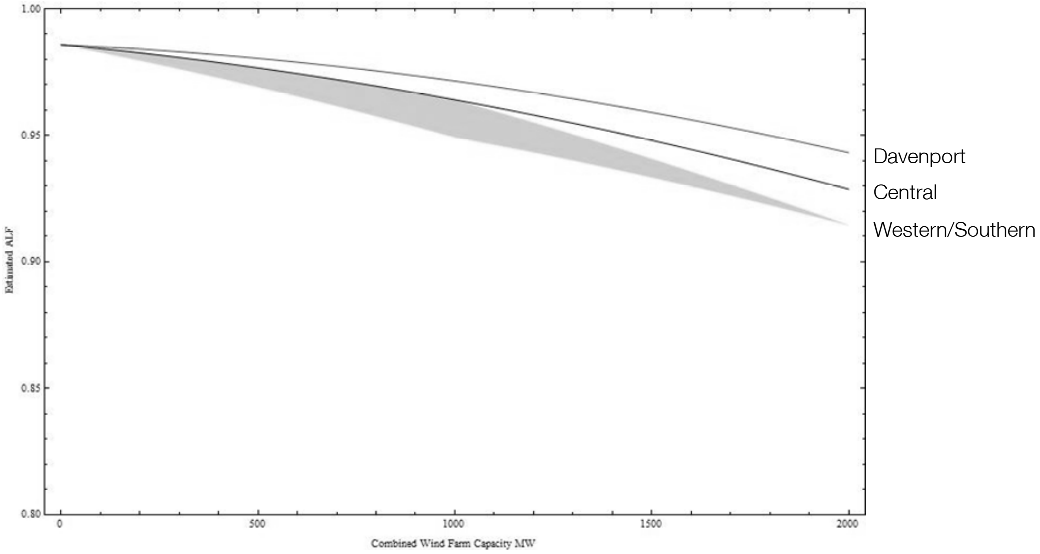
In the case of a SENE asset, surplus losses arising in respect of the SENE should be returned to generators in proportion to their annual payment for the asset (that is their exposure to the cost of the SENE). To the extent that customers share the cost of part of the SENE they may receive a share of the settlement of surplus losses. This result may require some refinement to the existing NEM Rules and an appropriate basis to calculate settlement rentals relating specifically to the SENE asset.

The effect of returning these losses to the generator achieves an 'average loss factor' for the SENE based on actual losses. WorleyParsons and MMA estimate that average loss factors are typically half MLF losses. This is a significant factor for prospective generators in the Eyre Peninsula, where MLFs have been typically poor. For example at Mt Millar an MLF of 0.89

will be applied for every unit of power generated. In other parts of the network, for example a generator close to Adelaide, would be paid 1.00 for every unit.

The Consortium believes it would be reasonable to expect generators connected to a SENE would recover their surplus system losses.

Average Loss Factors: Eyre Peninsula Green Grid with proposed network augmentation



Source: WorleyParsons

Further assessment of proposed augmentations including the Heywood interconnector upgrade and assessment of system losses has been undertaken by WorleyParsons.

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11. FINANCING EYRE PENINSULA GREEN GRID

11.1 PROPOSED SCALE EFFICIENT NETWORK EXTENSION (SENE)

The regulatory environment that would apply to the transmission asset is described in Section 5. As noted there, the draft (SENE) rule would require generators to pay for their portion of the installed generation capacity connected to the SENE.

11.2 FUNDING THE GREEN GRID

The total capital expenditure for the proposed Green Grid is approximately $625 million for Stage 1 to connect the Central and Western regions and $300 million for Stage 2 to connect the Southern and Northern regions[xvii]. Based on transaction costs and 60% gearing[xviii], this would require approximately:

— $375 million in debt and $250 million in equity for Stage 1 and

— $180 million in debt and $120 million in equity for Stage 2

11.3 ANNUAL CHARGE TO DEVELOPERS

The annual SENE revenue has been calculated according to the post-tax revenue model (PTRM) used by the AER to determine the maximum allowable revenue for regulated transmission assets. This approach has been used on the basis that the SENE shares similar characteristics to regulated assets including:

— the SENE operator will be entitled to receive fixed annual revenues based upon the expected generation capacity that connects to the Green Grid; and

— the fixed annual SENE revenues will be underwritten by electricity customers in the event that there are shortfalls in generation capacity connected to the SENE.

The annual SENE charge is assumed to be a fixed[xix] annual payment per MW of installed capacity. The charge is calculated by pro-rating the total SENE revenues for the life of the SENE asset against the forecast SENE generation profile. The business case assumes that the annual cost is based on the economic life of the transmission assets, which is estimated to be 50 years for transmission lines and sub-stations. For the avoidance of doubt, Macquarie has requested policy clarity from AEMC that this assumption is correct[xx].

The revenue allowance from the SENE charge comprises a regulated return on capital, return of capital (depreciation), operating expenditure, and a tax allowance. The estimated capital and operating costs of the SENE were provided by WorleyParsons[xxi] and the financial assumptions for the weighted average cost of capital (WACC) were compiled with reference to the prevailing market and recent regulatory decisions by Australian regulatory bodies[xxii]. These assumptions are outlined in the table below.

Green Grid WACC Assumptions

Year	2010	2013	2018	2023
Nominal Risk Free Rate	5.8%	5.6%	5.6%	5.6%
Inflation Rate	2.5%	2.5%	2.5%	2.5%
Cost of Debt Margin over risk free rate	3.1%	3.0%	2.3%	1.5%
Market Risk Premium	6.5%	6.5%	6.5%	6.5%
Gearing	60%	60%	60%	60%
Equity Beta	0.8x	0.8x	0.8x	0.8x
Nominal Return On Equity	11.0%	10.8%	10.8%	10.8%
Nominal Pre-tax Cost of Debt	8.9%	8.6%	7.8%	7.1%
Nominal Pre-tax WACC	9.7%	9.5%	9.0%	8.6%
Corporate Tax Rate	30%	30%	30%	30%

Source: Australian Energy Regulator, Economic Regulation Authority of Western Australia

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12. FINANCING SHARED NETWORK AUGMENTATION

FUNDING AUGMENTATIONS FROM DAVENPORT, SOUTH AUSTRALIA TO HEYWOOD, VICTORIA

NSPs are required to consider the potential benefits of deeper network augmentations as part of the SENE development process. The AEMC has indicated that the deep network augmentations that would be required as a result of a SENE could be subject to the RIT-T, with costs of any investment that satisfied the RIT-T being funded by customers.

12.1 COSTING FOR RECOMMENDED AUGMENTATIONS

WorleyParsons has assessed the required augmentations to the shared network to allow the network to absorb the additional generation capacity that can be unlocked by the Green Grid. The key aspect is to ensure that the additional generation during peak wind periods can be exported through the interstate interconnectors.

The table below outlines the schedule of upgrades and associated capital and operating cost for each step:

— Stage 1 outlines the augmentation and costs required to deliver an additional 2000MW of wind generation in the Eyre Peninsula. The key interconnector upgrade is to increase the export capacity from Heywood in South Australia to Victoria. The total estimated funding requirement for Stage 1 augmentations is approximately $818 million.

— Stage 2 outlines the required augmentation to deliver a further 2000MW of additional wind generation through a HVDC link directly from Davenport to Mt Piper in New South Wales. The total approximate funding requirement for Stage 2 is $1.85 billion.

Green Grid Stage	Description	Maximum ex Davenport	Maximum to Victoria at Heywood	Capital Costs $m	Operating Costs $m/yr
	Do nothing	500 MW	460 MW	$0	$0
1	Heywood 500/275 kV transformers	500 MW	700 MWxxiii	$28.16	$0.84
	Tungkillo to Tailem bend 500 kV line operating at 275 kV	600 MW	700 MW	$71.97	$1.44
	Reactive support at Tailem Bend and Heywood	700 MW	700 MW	$51.17	$1.54
	Heywood to SE substation 500 kV line operated at 275 kV	900 MW	700 MW	$75.99	$1.23
	Davenport to Tungkillo and Tailem Bend to SE substation 500 kV line operated at 275 kV	1000 MW	700 MW	$496.80	$7.66
	Operate Heywood to SE Substation at 500 kV	1200 MW	900 MW	$42.48	$1.12
	Reactive support at Tungkillo	1700 MW	1100 MW	$28.21	$0.85
	Reactive support at Tailem Bend	1800 MW	1300 MW	$22.96	$0.69
	Total Stage 1			$818	
2	Davenport to Mt Piper HVDC line	4000 MW	1300 MW	$1,853.71	$37.16
	Total Stage 2			$1,853.71	

12.2 DELIVERING MARKET BENEFITS & MEETING RIT-T

The RIT-T requires a transmission solution to be selected that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options.

Section 10 outlines the shared network augmentation options assessed by WorleyParsons. These options are considered to be the credible options available to deliver additional large scale renewable energy generation in South Australia.

McLennan Magnasik and Associates (MMA) has conducted a preliminary assessment of the market benefits for the shared network augmentation solution to determine whether it would satisfy the RIT-T. Based on their analysis, MMA concludes that the proposed Stage 1 transmission solution would provide a positive net economic benefit under a range of different Green Grid generation scenarios, including 2000MW of installed capacity in the Eyre Peninsula.

This suggests that the shared augmentation would satisfy the RIT-T as long as the proposed transmission upgrade schedule is confirmed as the most cost effective solution. This confirmation can be completed once the preferred SENE zone is finalised and a final Green Grid proposal developed.

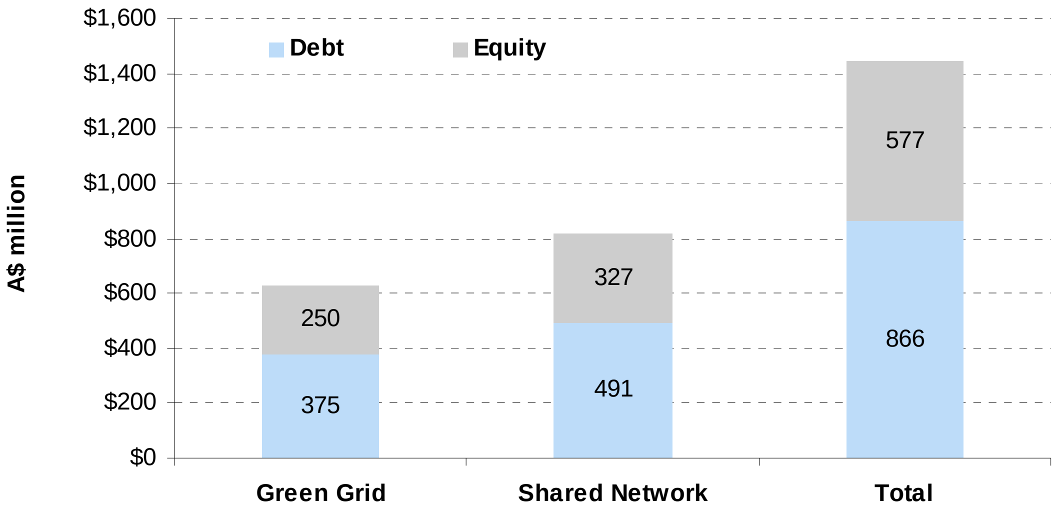
12.3 FUNDING THE SHARED NETWORK AUGMENTATIONS

The proposed network augmentations would form part of ElectraNet's regulated asset base. ElectraNet can propose the shared network augmentation during its next regulatory review period which will be from 2013/14 to 2017/2018. This timing of the next regulatory review period dovetails with the proposed approval and development timeline of the development for the Green Grid.

If the shared augmentation is included as part of ElectraNet's permitted capital expenditure, then ElectraNet will be able to raise equity and debt financing to fund the upgrades to the transmission network. Based on 60% gearing, this would require $491 million in debt and $327 in equity.

A key consideration is that the funding for both the Green Grid and shared network augmentation will need to be raised simultaneously. A total funding requirement of $1.44 billion (approximately $866 million in debt and $577 and equity, assuming 60% gearing) will be required order to develop the Stage 1 transmission assets (Green Grid and shared network augmentations) to unlock up to 2000MW of additional wind generation.

Capital Expenditure for Green Grid Stage 1



Source: WorleyParsons

13. ECONOMIC AND EMPLOYMENT IMPACT OF GREEN GRID

The transmission investments proposed in the business case would result in considerable economic benefits for the State and the nation. Evans & Peck[xxiv] was engaged to assess the economic impact (direct and indirect) of the proposed project.

The proposed transmission investments for Green Grid Stage 1 would create 2000MW of additional generation opportunities worth approximately $4.5 billion in wind energy generation.

It estimated that Green Grid Stage 1 would create around 1400 direct construction jobs, an additional 1600 indirect jobs during construction and approximately 5000 FTE jobs in total over at the first 20 years of the operational life of the project.

The economic impact of Green Grid Stage One would be:

— Total capital expenditure of $5.8 billion with $1.8 billion within South Australia

— Increased Gross State Product (GSP) arising from construction of $2.7 billion

— Direct construction employment of 1381 FTEs within South Australia and total additional employment of 3039 FTEs when indirect effects are included

— Direct expenditure within South Australia of $104 million p.a. and 121 permanent jobs (FTEs) associated with operation and maintenance

— Additional GSP of $158 million p.a. and an aggregate annual employment benefit of 266 FTE jobs (direct and indirect workforce) over the initial 20 years of operations

Evans & Peck identified that the Green Grid is likely to generate greater benefits for this region than benefits generated for other regions as a result of energy sector projects in Australia in the past. International experience has shown that wind energy projects generate more new jobs than conventional fossil fuel projects per kilowatt hour, approximately 27% more than coal and 66% more than natural gas. This is in part because wind farms generate additional revenue for the landholders from the energy.

Strong demand for wind generation to meet the LRET may encourage local manufacturing of wind turbines in Australia. A consistent build program of large scale wind farms in the Eyre Peninsula could be a favourable consideration in any such assessment. The Consortium is aware of interest by an international wind turbine manufacturer to assess market conditions for local manufacturing.

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14. IMPLEMENTING GREEN GRID

14.1 INDICATIVE REGULATORY TIMEFRAME

The feasibility assessment has assumed that the SENE proposals, or an alternative regulatory arrangement, will be established to facilitate network extensions to meet demand for future generation from fuel sources remote from transmission. The draft rule for *Scale Efficient Network Extensions* being considered by the AEMC provides a model for achieving this and upon which this business case is based. As described in Section 5 there has been extensive industry consultation regarding the draft SENE arrangements which has elicited support and opposition to the proposed rule. The AEMC had announced that it intended for the new rule to be in place by December 2010. On 1 July 2010, the AEMC set a revised date for determination of the rule to 3 February 2011.

14.2 OVERALL PROPOSED TIMEFRAME

The following timeline has been developed in consultation with experienced wind energy generation companies and with ElectraNet to indicate a timeline that is technically possible (but remains subject to resolving the regulatory arrangements).

Oct 2010	ElectraNet/AEMO assessment of interconnector options completed High level assessment of options to upgrade interconnector capacity from SA to other NEM load centres. Green Grid is a key input to this study
Dec 2010	Release of National Transmission Development Plan (NTDP) by AEMO The NTDP will set a plan for the national transmission grid over a 20-year planning horizon. It is expected to identify likely candidates for network extensions. This will be the first NTDP to be issued
Feb 2011	SENE rule to be adopted by AEMC The MCE has endorsed the AEMC reform proposals and instructed it to progress the draft SENE rule. Industry consultation on the draft SENE draft rules has elicited extensive comments leading to industry speculation that the December deadline will not be met. * All dates after this point assume that the draft rule - or a variation of it - is adopted. A delay to this happening would have a knock on affect to the timeline
July 2011	NSPs respond to NTNDP as part of their Annual Planning Reports ElectraNet is expected to include Eyre Peninsula Green Grid and related augmentations in the shared SA network that it may trigger, in its Annual Planning Report
Sept 2011	Application by ElectraNet to regulator for SENE approval Expected to build on Green Grid initiative, this is likely to involve further technical revision by ElectraNet of outcomes made in the feasibility assessment report. The application will be contingent on receiving a generation connection enquiry, undertaking the calls for other interest and developing options for SENE development. Once a generator connection is received, ElectraNet would confirm its forecast generation profile and develop a Standard Connection Offer in conjunction with the applicant. The forecast generation profile and Standard Connection Offer would be submitted to the AER for approval, involving full economic and technical evaluation of the SENE and an assessment by AEMO of the reasonableness of the forecast generation profile
Dec 2011	Decision by AER on SENE Draft SENE rule provides expeditious approval process with applications to be approved or rejected within 30 business days
2011	Planning commences for wind farms Including wind monitoring and undertaking environment assessments and planning applications by wind generation developers

2012	Upgrade of shared network within SA passes the RIT T A process expected to take 12 months. This timeframe assumes ElectraNet had commenced this process as part of its response to NTNDP in July 2011
2012	Approval by AER for preferred interconnector solution from SA to NEM Decisions by the AER on interconnector upgrades may take longer than for augmentations within states. In this case, as the augmentations within SA and the upgrade to the interconnectors are linked it is assumed they follow a similar timeframe It is also assumed that a basis for charging inter regional (load export) charges between South Australia and Victoria is developed by this time
Apr 2013	Approval for AER of allowable revenue for ElectraNet This is expected to confirm funding for SENE and shared augmentation investments
2013	Technical planning and detailed design for SENE Undertaken by ElectraNet and subject to consultation with developers, likely to include route finalisation, easement acquisition and project tendering
2013	Planning approval for wind farm generation obtained
2014	Initial farms reach financial close Developer achieves investment approval for project finance
2014	Initial wind farms move to development
2014	SENE construction
2015	SENE commissioned
2015	Wind farms commissioned
2015 - 2020	Wind farm generation ramps up at an estimated 400MW per year for five years
2015 - 2020	Shared network augmentations take place commensurate with generation ramp up It may be that some augmentations commence earlier than this time, however the augmentation for large capacity increases are likely to occur in parallel with new generation commencing

14.3 COLLABORATIVE GOVERNMENT AND INDUSTRY PARTNERSHIP

The Consortium believes a viable business case exists for implementation of Green Grid. This assessment is based on certain key assumptions, including that:

- The AEMC adopts a rule to enable generators to contribute to costs for Eyre Peninsula Green Grid (either the proposed SENE arrangements or alternative arrangements achieving a similar outcome)
- The AEMC adopts a rule to allow for inter regional TUoS charges (to allow customers in one jurisdiction to contribute to the costs in another based on the flow of market benefits)
- ElectraNet successfully proposes establishment of Eyre Peninsula Green Grid (as a 'SENE' asset) to the AER
- Developers participating in the Green Grid initiative undertake to develop generation and to contribute their share of annual cost for the asset
- ElectraNet successfully proposes SA and interconnector augmentations under RIT T

Achieving any one of these factors would represent significant reform to the electricity market in Australia. Achieving all of them will be necessary to implement Green Grid.

Achieving regulatory certainty for the financing of network extensions like those proposed in this report will be critical. However, even with this certainty there will be considerable work to move to implementation.

There is a balance between the long-lead time for transmission planning and the need for large scale renewable energy in the medium term. The willingness of generators to invest in the Eyre Peninsula and to contribute to the transmission costs of the Eyre Peninsula Green Grid, is linked to the LRET which is due to expire in 2030. In other words, the window of opportunity to attract investment for renewable energy generation in the Eyre Peninsula is likely to exist in the next five or so years.

It is the Consortium's assessment that implementation of this initiative will be best achieved by establishing cooperation between the developers indicated in this report, the network operator (AEMO), transmission network provider (ElectraNet) and Government (including on behalf of the resource industry and regional development authorities).

It is recommended that a forum be established to bring these entities together for the purposes of considering this report and implementing Green Grid. This forum can then usefully contribute to the development of the SENE or similar regulatory arrangements required to implement the Green Grid.

i In forming this view the Consortium has relied on information that may be confidential or commercially sensitive which is not disclosed in this report but is available to Government.

ii WorleyParsons estimate based on extrapolation based on 2005-2010 data from South Australian Supply and Demand Outlook, AEMO, 2010.

iiii Based on the LRET target of 41,000 GWh by 2020. The 4000MW of capacity can be absorbed by both renewable and non-renewable generation. The proportion absorbed by wind generation would depend on market conditions and the levelised costs of production for each technology. Using a ‘business as usual’ case where the Green Grid is not built, MMA forecasts approximately 1300MW of wind generation will be commissioned in South Australia by 2020. Under a ‘Green Grid’ case, this forecast increases to approximately 2800MW of wind generation in South Australia by 2020.

Iv Economic Impact Assessment, Evans & Peck

iv Class 11 provides cost estimates to a degree of accuracy that is expected to be within +30% accuracy.

v This section has been derived based on Macquarie Economics Research, Macquarie

vi Australian energy projections to 2029-39, ABARE research report10.02, March 2010, Commonwealth of Australia

vii National Electricity Market Management Company (NEMCO), Key energy policies and economic drivers – Stage 1 Final report, KPMG, March 2009

viii Financial Investor Group, Submission to the AER WACC Parameter Review, Jan 2009

ix Australian Energy Regulator, Final Regulatory Investment Test for Transmission, June 2010

x Green Grid, Eyre Peninsula, Stream 2 – Network Issues, WorleyParsons

xi The Eyre Peninsula region has a population of 55, 000 inhabiting 45,000 square kilometres. Most of this population in concentrated in the cities of Port Augusta, Whyalla, Port Lincoln and Ceduna.

xii The indication of support by developers is contingent on their own assessment of project viability and does not represent any binding commitment.

xiii http://www.pacifichydro.com.au/ Pacific Hydro, 2009

xiv Davenport is the sub-station location near Port Augusta which is proposed as the connection point to the existing shared network

xv The alternative to a 500kV line could be a twin circuit 275kV line for a similar capital cost however physical losses of units of electricity would increase from x to x which would increase and significantly erode generator revenues

xvi AEMO, Regional Boundaries and Marginal Loss Factors for the 2009/2010 Financial Year

xvii Inclusive of capital expenditure, easement and stamp duty costs and estimated transaction costs hence these figures are slightly higher than the capital costs presented elsewhere in the report

xviii Transaction costs of $12 million for Stage 1 and $9 million for Stage 2

xix Fixed in real terms. The nominal SENE charge will escalate with inflation

xx Macquarie submission to AEMC review of request for rule change – Scale Efficient Network Extension, May, 2010. The issue in question is whether the annual charge is based on economic life of the transmission asset or economic life of the connected generation asset. The Consortium assumes it is the former.

xxi As outlined in Section 9.4

xxii Including the Australian Energy Regulator and Economic Regulation Authority of Western Australia

xxiii Note that in the market studies this stage was modelled as 760 MW transfer in each direction. Thus the optimisation model interpolates between the 760 MW result and the 460 MW result to determine market prices.

xxiv Economic Impact Assessment, Evans & Peck