South Australia – Victoria (Heywood) Interconnector Upgrade

RIT-T: Project Specification Consultation Report

October 2011

ElectraNet electricity transmission

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Executive summary

ElectraNet and AEMO are undertaking a further joint study of the technical and economic viability of a Heywood Interconnector upgrade, including a formal application of the Regulatory Investment Test for Transmission (RIT-T).

This follows the South Australian Interconnector Feasibility Study published in February 2011 and the 2010 National Transmission Network Development Plan (NTNDP) indicating the possibility of net market benefits from increasing the capacity of the existing 275 kV interconnector between South Australia and Victoria.

This Project Specification Consultation Report (PSCR) is the first stage of the RIT-T process, and:

- Describes the identified need – How the existing network between the South Australian and Victorian regions is causing congestion, high market price events and restrictions on windfarm outputs.
- Describes the credible options being proposed for analysis that may overcome the network congestion, specifically:
  - an incremental upgrade to increase capacity from 460 MW to 650 MW.
  - a new 500 kV line from the Heywood terminal station into the South Australian network, providing upto 2000 MW of additional capacity.
  - Non-network options such as demand management or utility scale energy storage.
- Sets out the technical requirements for non-network options in order to meet the identified need.

A Project Assessment Draft Report (PADR), including full option analysis, is expected to be published by end of July 2012.

ElectraNet and AEMO welcome written submissions on this PSCR. Submissions are particularly sought on the credible options presented.

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1 Introduction

This PSCR has been prepared by ElectraNet and AEMO in accordance with the requirements of the National Electricity Rules (NER) clause 5.6.6. This PSCR represents the first stage of the consultation process in relation to the application of the (RIT-T) for the South Australia–Victoria Interconnector (Heywood Interconnector) upgrade.

This PSCR:

- Describes the identified need which ElectraNet and AEMO are seeking to address, and the assumptions used in identifying this need.
- Sets out the technical characteristics that a non-network option would need to deliver in order to address this identified need.
- Describes the credible options that ElectraNet and AEMO currently consider may address the identified need.
- In line with the requirement of NER 5.6.6(c)(6)(iv), discusses specific categories of market benefit which, in the case of this specific RIT-T assessment, are unlikely to be material.

1.1 Submissions

ElectraNet and AEMO welcome written submissions on this PSCR. Submissions are particularly sought on the credible options presented.

Submissions are due on or before 30 Jan 2012.

Submissions should be emailed to Appleby.Simon@electranet.com.au or Planning@aemo.com.au. Submissions will be published on the ElectraNet and AEMO websites. If you do not want your submission to be publicly available please clearly stipulate this at the time of lodgement.

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2 Identified need

2.1 Background

The Heywood Interconnector is located between the South East (South Australia) and Heywood (Victoria) substations. This interconnector was constructed in 1988. It features a 500 kV to 275 kV transformation at Heywood and operates at 275 kV into South Australia.

In February 2011, ElectraNet and AEMO published the South Australian Interconnector Feasibility Study[1]. The purpose of the study was to assess the economic benefits possible from increasing the transfer capacity between South Australia and the rest of the NEM. It was already well recognised that an increase in the interconnector capacity would enable further development of South Australia's renewable generation resources and also provide South Australia with access to reliable thermal generation from the rest of the NEM, particularly at peak times.

The study found that:

1. There is potential for augmenting transmission capacity between South Australia and the rest of the NEM.

2. An incremental upgrade to the existing interconnector showed the largest net economic benefit.

ElectraNet and AEMO are now extending the analysis conducted in the feasibility study by undertaking a formal RIT-T assessment of potential options for augmenting the interconnector capacity.

2.2 Description of the identified need

The 'identified need' for the proposed investment is an increase in the sum of producer and consumer surplus, i.e. an increase in net market benefit. ElectraNet and AEMO believe that reducing the constraints on the Heywood Interconnector will achieve this.

Two main limitations must be addressed. The first involves thermal capabilities and voltage stability limits in south-east South Australia. The second is the transformer capacity at Heywood.

The Heywood Interconnector has a maximum capacity of ±460 MW due to the N-1[2] rating of the 2 x 500/275 kV transformers at the Heywood substation in Victoria.

This maximum limit is constant in that it does not vary due to generation or demand conditions; however the actual power transfer capability is often restricted due to other constraints including voltage limits or thermal limits that do vary under different generation and demand conditions.

1 http://www.aemo.com.au/planning/saifs.html

2 N-1 loading is the loading following the loss of the most critical network element

AEMO's Constraint Report 2010[3] showed that:

- The power transfer capability from Victoria to South Australia is frequently restricted by voltage stability limits in south-east South Australia, particularly during high demand conditions and when there is high generation in south-east South Australia (bound for 542 hours in 2010).

- The power transfer capability from South Australia to Victoria is frequently restricted by the thermal capability of the South East 275/132 kV transformers in South Australia (bound for 204 hours in 2010).

The 275 kV transmission lines between the Heywood and South East substations are rated up to about 45% higher than the presently limiting transformer section of the interconnector flow path. The current capacity limitation affects the extent to which electricity can flow across the interconnector. Specifically it affects the amount of generation from other regions in the NEM which can be used to meet peak demand conditions in South Australia. It also restricts the amount of wind generation which can be exported from South Australia at times of high wind output but low South Australian demand. South Australia is recognised as having one of the best wind resources in the NEM.

The expansion of the Heywood Interconnector has been previously discussed in:

- AEMO's National Transmission Network Development Plan (NTNDP) 2010[4].
- AEMO–ElectraNet's Joint Interconnector Feasibility Study.
- Annual Planning Reports (APR) in both South Australia[5] and Victoria[6].

Expanding the transfer capacity of the Heywood Interconnector would relieve the current limitations, and would increase both import and export capability. This would then result in an increase in several classes of market benefit, in particular:

- Reduced total dispatch costs (including fuel costs), by enabling low cost generation to displace higher cost generation.
- Reduced generation investment costs, resulting from both the deferral of generation investment (in both South Australia and the rest of the NEM) and reduced capital costs associated with meeting the Large-Scale Renewable Energy Target (LRET) target due to higher wind generation capacity factors in South Australia compared to other locations.
- Potential competition benefits through increased ability of generators to compete across the interconnector.

These classes of market benefit are discussed in more detail below.

[3] http://www.aemo.com.au/electricityops/0200-0006.html

[4] http://www.aemo.com.au/planning/ntndp.html

[5] http://www.electranet.com.au/network/transmission-planning/annual-planning-report/

[6] http://www.aemo.com.au/planning/VAPR2011/vapr.html

2.2.1 Market benefits

The purpose of the RIT-T is to identify the credible option that maximises the present value of the net economic benefits to all those who produce, consume and transport electricity in the market[7].

To measure the increase in net market benefit, ElectraNet and AEMO will analyse the classes of market benefit required for consideration under the RIT-T as set out in paragraph 5 of the RIT-T.

Those classes of market benefit are:

- Changes in generator fuel consumption arising through different patterns of generation dispatch (including changes in carbon costs).
- Changes in voluntary load curtailment.
- Changes in involuntary load shedding.
- Changes in costs for parties, other than the Transmission Network Service Provider (TNSP), due to:
  - differences in the timing of new plant
  - differences in capital costs
  - differences in operational and maintenance costs.
- Differences in the timing of transmission investment.
- Changes in network losses.
- Changes in ancillary services costs.
- Competition benefits.
- Any additional option value.
- The negative of any penalty paid or payable for not meeting the LRET.
- Any other benefits that the TNSP determines to be relevant for a specific RIT-T assessment and which are agreed to by the Australian Energy Regulator (AER)[8].

ElectraNet and AEMO believe that the classes of market benefit that are most likely to change as a result of increasing the capabilities on the Heywood Interconnector are:

- **Changes in fuel consumption arising through different patterns of generation dispatch**
  The current limitations on the Heywood Interconnector affect dispatch outcomes in the NEM. Expansion of the interconnector is expected to improve sharing of generation between South Australia and the rest of the NEM under both high and low demand scenarios, and to result in a reduction in the overall costs of dispatch, including lower fuel costs and variable operation and maintenance costs. This is expected to be a key market benefit associated with the upgrade of interconnector capacity.

  Specifically, at times of high demand the interconnector upgrade is expected to enable the dispatch of lower cost generation in Victoria (or elsewhere in the NEM) to displace the higher cost generation currently operated in South Australia to meet peak demand. At times of low

[7] NER 5.6.5B (b)

[8] See the AEMO-ElectraNet Joint Interconnector Feasibility Study

demand, the interconnector upgrade is expected to enable increased exports of low cost wind generation from South Australia, displacing higher cost thermal generation elsewhere in the NEM.

- **Changes in costs for parties, other than the TNSP, due to differences in the timing of new plant, capital and operating and maintenance costs**
  Increasing the capacity in the Heywood Interconnector is expected to affect the pattern of generation investment in the NEM, resulting in market benefits.

  An expansion of interconnector capacity is expected to lead to the deferral of the timing of additional thermal generation investment in South Australia, as it will enable the use of existing generation elsewhere in the NEM to meet high demand periods in South Australia. It may also affect the pattern of generation investment elsewhere in the NEM, as it will facilitate increased exports of lower cost renewable generation from South Australia.

  South Australia has one of the best wind resources in the NEM. Increased interconnector capacity will relieve the current constraint on wind generation exports from South Australia. This may affect the pattern of investment in wind generation, with more wind developments being added in South Australia rather than in less-efficient wind locations elsewhere. Higher wind capacity in South Australia means less wind generation capacity needs to be built in South Australia than in other jurisdictions in order to achieve the same MWh wind generation output. Therefore, increasing the Heywood Interconnector capacity may result in an overall market benefit associated with the capital cost savings in establishing wind generation. This is particularly relevant given the current LRET target, which is defined in relation to the required output from renewable generation by 2020.

- **Competition benefits**
  Increasing the capacity of the Heywood Interconnector will increase supply between South Australia and Victoria. During periods of high demand in South Australia the increase in available generation from the rest of the NEM may increase the amount of competition between generators (in South Australia and elsewhere).

  Similarly, during periods of low demand in South Australia, increased exports of renewable generation from South Australia may increase the amount of competition between generators in the rest of the NEM.

  To the extent that the increase in competition results in a different pattern of dispatch (over and above that associated with the displacement of higher cost generation with lower cost generation, as discussed under point (1) above), this represents a potential 'competition benefit' associated with the interconnector expansion.

In addition to the above three categories of market benefits, ElectraNet and AEMO also expect changes in the following categories of market benefit (as specified in the RIT-T) to be material:

- **Changes in network losses**
  Increasing the capacity of the Heywood Interconnector may increase network losses as the spare capacity of the 275 kV lines between Heywood and Tailem Bend substations will be utilised.

  Under Option 2 in section 3.1, losses associated with imports and exports between Victoria and South Australia are expected to fall due to improvement in the marginal loss factors, however overall system losses may increase due to the increased energy transfer.

  ElectraNet and AEMO note that increased network losses may represent a negative market benefit. The market benefits of any change in losses for this RIT-T will be captured as part of the general change in generation production costs.

- **Changes in involuntary load shedding**
  Raising the import capacity of the Heywood Interconnector will increase generation supply availability from Victoria. This will provide greater reliability for South Australia by reducing the potential for supply shortages and consequent risk of involuntary load shedding. At the same time, increasing the export capability from South Australia should provide greater reliability for the Victorian region.

  The PADR will contain a complete discussion and quantification of these market benefits, and any other market benefits which are found to be material for this RIT-T assessment.

2.2.2 Assumptions made in relation to the identified need

ElectraNet and AEMO have previously carried out market modelling and have identified that positive net market benefits from expanding the capacity of the Heywood Interconnector are likely[9].

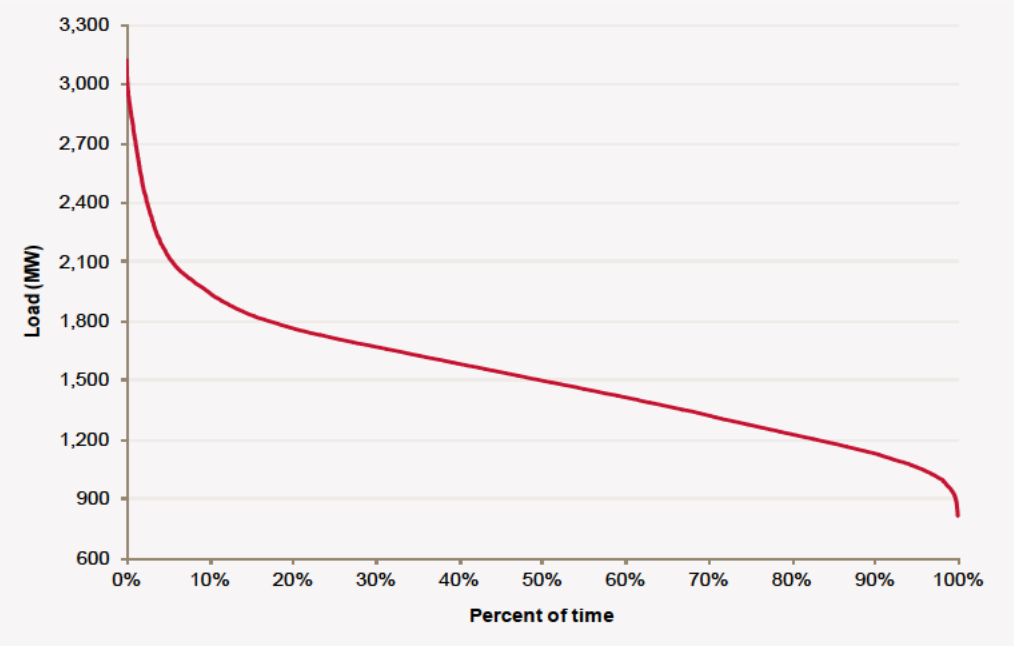
The following key assumptions drive the market benefits expected from relieving the capacity limitations on the Heywood Interconnector:

- The particular characteristics of the South Australian load profile.
- The higher capacity factor of wind locations in South Australia.

Figure 1 shows the load duration curve for South Australia for 2009/10. The figure shows sharp peaks of short duration, and average-to-low demand for most of the year.

[9] See the AEMO-ElectraNet Joint Interconnector Feasibility Study

Figure 1 South Australian Load Duration Curve (2009/10)



The capacity required to meet the peak load in every year occurs for about 1–2% of the year. Better efficiency is likely if generation can be used from elsewhere in the NEM to meet this peak demand (via an expansion of the interconnector capacity), or demand side participation can be increased, rather than building additional generation in South Australia to meet this very short peak period.

ElectraNet and AEMO believe that the current limited capacity of the interconnector leads to increased South Australian wholesale electricity market prices, as shown in Table 1, and also contributes to high price/price separation events during summer months, as shown in Table 2.

Table 1 Average Wholesale Electricity Market Prices[10] ($/MWh)

Year	SA	VIC
2008	66	40
2009	60	36
2010	40	34
2011	42	32

[10] Data sourced from AEMO's Market Management System September 2011

Table 2 Average price during separation events[11] ($)

Date	NSW	QLD	SA	TAS	VIC
02/11/2009	42.7	39.0	9,999.7	38.2	39.5
08/01/2010	51.5	46.5	9,999.7	44.1	56.1
11/01/2010	83.8	81.8	9,999.8	47.7	77.5

The higher prices in South Australia and the extent of price separation indicate the impact of the Heywood Interconnector's capacity constraints on the NEM.

The interconnector capacity expansion would enable peak load to be met by lower cost generation from other regions, resulting in a reduction in South Australia's peak prices, as well as a reduction in price separation events. ElectraNet and AEMO note that changes in prices are not themselves included as a market benefit in the RIT-T (which captures changes in the combination of consumer and producer surplus). Rather, the sources of market benefit are the lower dispatch costs and different generation investment patterns associated with the changed price outcomes.

In addition the higher wind resource efficiency in South Australia reflects extensive wind generation development in South Australia and the potential for further development. Present wind generation capacity is about 1200 MW, and delivers more than 20% of South Australia's total energy requirements.

Currently the interconnector capacity constraints mean that wind generation exports are constrained at times when such generation is not needed to meet South Australian demand. In addition, surplus wind generation under light load conditions causes low/negative price events, as shown in Table 3 and Figure 2. The impacts of negative prices and curtailment of wind generation reduce the incentives for further investment in South Australia and could result in less efficient investments elsewhere in the NEM.

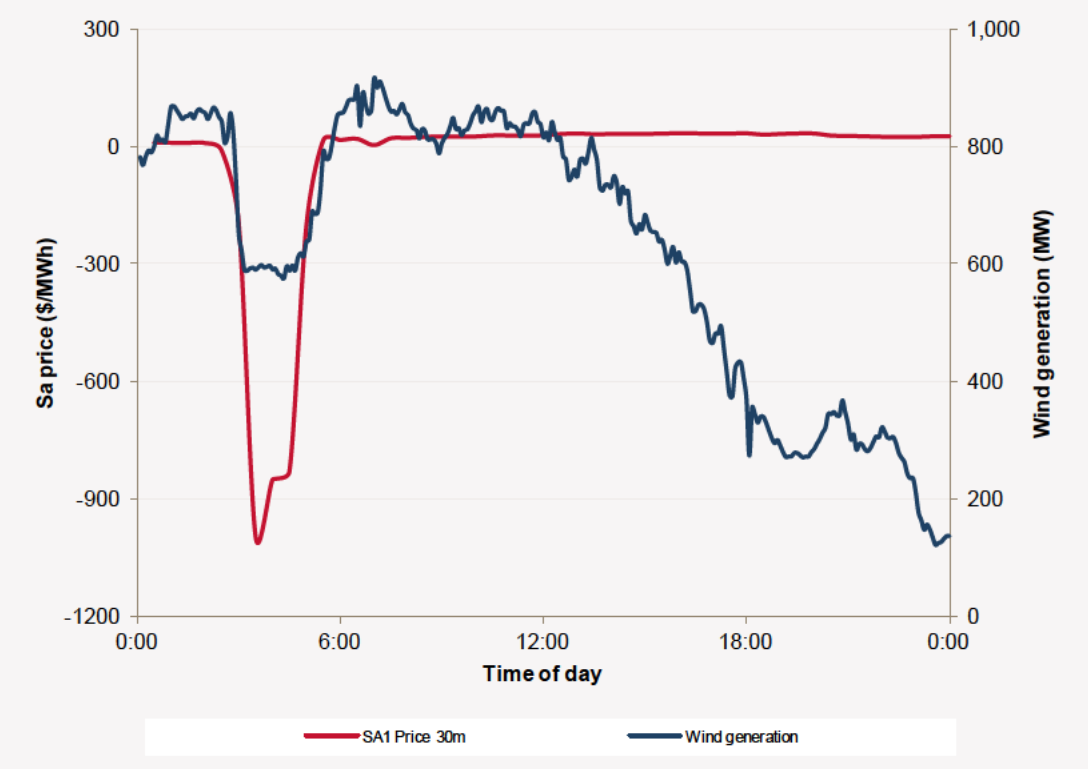
Table 3 Negative Price Events in the South Australian region

Year	Total
2006	1
2007	10
2008	51
2009	93
2010	139

[11] Ibid

These events affect the revenues of existing wind farms, potentially deterring prospective developers from connecting in South Australia and leading to sub-optimal investment in renewable resources in the NEM.

Figure 2 Example of impacts of interconnector export limitation (07/03/2011)



2.3 Required technical characteristics for a non-network option

Clause 5.6.6(c)(3) of the National Electricity Rules(NER) states that the PSCR must include the technical characteristics of the identified need that a non-network option would be required to deliver.

For investments such as the Heywood Interconnector expansion where the 'identified need' is an increase in market benefits, non-network alternatives would need to result in increases in the same key categories of market benefits as those identified for the network options. The magnitude of the market benefit for these categories may differ for the non-network options. However, overall the non-network options would need to be able to deliver a higher net market benefit (i.e. market benefit minus costs) than the network options in order to satisfy the RIT-T.

The following is provided as a guide to non-network proponents wishing to present alternative options to the Heywood Interconnector expansion.

The key sources of market benefits for the interconnector expansion options have been described above and can be summarised as:

- The market benefit associated with increasing inter-regional trade during times of peak demand in South Australia, leading to the displacement of higher cost generation in South Australia with lower cost generation imported from elsewhere in the NEM and the deferral of generation investment.
- The net market benefits associated with increasing wind exports from South Australia at times of low South Australian demand, resulting in the displacement of higher cost generation elsewhere in the NEM with lower cost generation and the deferral of generation investment.
- Potential competition benefits from increasing the ability of generators to compete across the interconnector.

To achieve similar categories of market benefits, in the first instance non-network or market service options would need to be able to reduce load in South Australia at peak demand times to the extent that they reduce the need for expensive peaking generators to be dispatched and/or defer the need for further investment in peaking plant.

Further, a non-network or market service option would also need to be able to shift load, or to store the output of wind generators in a manner which utilises the current surplus of wind energy at times of low demand in South Australia.

2.4 Requirement to apply the RIT-T

ElectraNet and AEMO are required to apply the RIT-T to this investment in accordance with clause 5.6.5C(a) of the NER.

3 Potential credible options to address the identified need

This section summarises the credible options (both network and non-network) of which ElectraNet and AEMO are currently aware.

3.1 Description of credible options

The network options all relate to an expansion of Heywood Interconnector capacity.

Option 1 – Installation of a third 500/275 kV transformer at Heywood along with reactive support in South Australia

This option will maximise the use of spare capacity available on the Heywood–South East transmission line and provide a net increase in Heywood Interconnector capability of about 40% to around 650 MW.

This option includes the installation of a third 500/275 kV transformer and associated works at Heywood and additional reactive support in South Australia. The assessment of the optimal reactive support required in South Australia to support the higher interconnector capacity is currently underway. Some of the possible solutions will include:

- Shunt capacitors in the south-east region.
- Combination of SVC and shunt capacitors in the south-east region.
- Combination of series capacitors (on Tailem Bend–South East 275 kV lines) and shunt capacitors in the south-east region.

ElectraNet and AEMO also note that the existing 132 kV line between Snuggery–Keith and Keith–Tailem Bend is very old and causes some of the existing thermal limitations on the Heywood transfer capacity. As part of the assessment, studies of possible network reconfigurations in the south-east region to optimise the interconnector capability are also being undertaken.

The estimated cost of this option is in the range of $60 to $80 m. The estimated construction timetable is three years, with a potential commissioning date of June 2016.

This option was discussed in AEMO's latest NTNDP[12] and ElectraNet's 2011 APR[13].

Option 2 – Construct a new Krongart–Heywood 500 kV interconnector

This is a greenfield option which can provide a much higher Heywood Interconnector capacity (about 2000 MW additional capacity). This is the lowest cost of all the large interconnector options considered previously in studies such as the NTNDP 2010 and the AEMO-ElectraNet Joint Feasibility

[12] AEMO, 2010 NTNDP, see section 4.6.3

[13] http://www.electranet.com.au/network/transmission-planning/annual-planning-report/

Study. While the estimated cost of this option is higher than option 1, the capacity provided is also higher and may therefore lead to greater net market benefits than option 1. ElectraNet and AEMO therefore consider it prudent to evaluate this as a separate option under the RIT-T.

The cost of this option can be staged by initially operating the new transmission line at 275 kV and therefore saving some substation and transformer costs.

The estimated cost of this option is around $530 m depending on the assumed timing and staging of development. The estimated construction timetable is 7–10 years, with a potential commissioning date of 2025[14].

This option was noted in AEMO's latest NTNDP[15] and ElectraNet's 2011 APR[16].

3.2 Non-network options

ElectraNet and AEMO have identified three potential non-network options that may create market benefits similar to those of the network options.

Subject to costs and the magnitude of the benefits associated with these non-network options, these options may present competitive alternatives to the network options. At this stage ElectraNet and AEMO have not determined whether these options are commercially and technically feasible at the scale required, or whether they could be available in a similar timeframe to the network options. However, as discussed below, ElectraNet and AEMO propose to undertake indicative modelling for these options to identify the potential magnitude of market benefits, notwithstanding the current lack of identified proponents for these options.

Non-network option 1: Demand management

Demand management can be discussed in two contexts. Firstly, demand curtailment has the potential to reduce peak demand in South Australia. Secondly, demand shifting could shift consumption from peak to off-peak periods.

The reduction of peak demand can create positive market benefits. In particular it could reduce the dispatch cost associated with meeting peak period demand by reducing the need to run higher-cost peaking plant in South Australia. It may also defer the need for investment in peaking plant in South Australia.

In order to realise some of these classes of market benefit, demand shifting would also be required. Where demand can be shifted from high demand to low demand periods (particularly those at night when wind generation surplus is highest), then it can be met by using low cost wind generation, which will reduce the overall fuel costs associated with dispatch.

[14] South Australian Interconnector Feasibility Study

[15] AEMO, 2010 NTNDP, pg. 175

[16] http://www.electranet.com.au/network/transmission-planning/annual-planning-report/

ElectraNet and AEMO plan to model a demand-shifting response of similar scale to the capacity of the smaller network option (i.e. 650 MW interregional capacity) in order to identify the scale of market benefits that may be realised as a result of a non-network option of this type.

ElectraNet and AEMO are not in a position to estimate the likely costs or technical characteristics of such an option, and welcome submissions on this point to enable further consideration of this option in the RIT-T assessment.

Non-network option 2: Utility scale storage

Utility scale storage is the storage of the output from electricity generators for later use. Utility scale storage would enable the output from wind generators at times of high wind (i.e. typically during the night) to be stored and then used to meet high demand during the day. Such storage would likely result in lower dispatch costs (with low cost wind generation replacing higher cost peaking generation in South Australia) and may defer the need for generation investment in South Australia.

Utility scale storage solutions are rare in electricity networks. Historically they have been expensive to implement and the flexibility of conventional generation has efficiently addressed consumer need. In some rare circumstances storages have been used to meet unique grid requirements.

The rise of intermittent renewable generation has improved the economics of electrical storage in the NEM. Whilst the costs of storage remain high, the increased volatility in electricity prices generates greater revenue opportunities for electrical storage.

ElectraNet and AEMO are not in a position to suggest the technical characteristics of a storage solution that could compete with the network alternatives being considered for the Heywood Interconnector, or to estimate the total cost. ElectraNet and AEMO welcome submissions on this point to enable further consideration of this option in the RIT-T assessment.

As mentioned above, ElectraNet and AEMO intend to model demand management at a level that is sufficient to match the 650 MW interconnector capacity. At this stage ElectraNet and AEMO envisage that the market benefits of storage and demand management are likely to be similar (as they are both consequences of substituting low cost wind generation for higher cost peaking generation in South Australia). The differences between the options would therefore primarily relate to implementation costs.

3.3 Material interregional impact

In accordance with NER 5.6.6(c)(6)(ii), ElectraNet and AEMO have considered whether any of the credible options above are expected to have a material interregional impact. ElectraNet and AEMO consider this to be the same as a material inter-network impact, which is defined in the NER as:

A material impact on another Transmission Network Service Provider's network, which may include (without limitation): (a) the imposition of power transfer constraints within another Transmission Network Service Provider's network; or (b) an adverse impact on the quality of supply in another Transmission Network Service Provider's network.

ElectraNet and AEMO believe that both of the network options described above would have a direct material impact on the interregional system other than just between Victoria and South Australia, and could result in a marginal improvement in the Victorian Export Transient stability limit. This may impact on export limits for the interconnection between Victoria and Tasmania, Victoria and New South Wales and New South Wales and Queensland. Further analysis will be conducted and will be published in the PADR. Any approvals or sign offs required will be obtained from the relevant TNSPs through planning co-ordination activities.

None of the non-network options discussed above are expected to have a material impact on the interregional system.

3.4 Options considered but not progressed

Network option: South Australia – NSW Interconnector

ElectraNet and AEMO have considered an option from the South Australian Interconnector Feasibility Study which involves an additional greenfield interconnector from South Australia to New South Wales at an estimated cost in the range of $2.5 to $3.5 bn.

The AER RIT-T Guidelines note that as a general rule an option is likely to be economically feasible where its estimated costs are comparable to other credible options which address the identified need[17]. The exception is where it is expected that an option with higher costs is also likely to deliver materially higher market benefits. The Joint Feasibility Study found that due to its high cost, a positive net benefit from this option only occurs under limited scenarios towards the end of the planning horizon (around 2025 to 2030). ElectraNet and AEMO are therefore not proposing to include this option as part of the RIT-T assessment.

Non-network option: Electric vehicles

Over the next few years many major vehicle manufacturers will introduce a range of electric or plug-in hybrid vehicles. An uptake in electric vehicles will shift energy consumption from petrol to the electricity grid. In the short term, electric vehicles will almost certainly lead to an increase in demand, both peak and off-peak. This will require addition investment in the transmission network.

Long term, vehicle-to-grid technologies could provide many benefits to the grid, similar to the utility scale storage benefits discussed above. Estimates of when this may occur and the availability of this storage to the grid are highly speculative. ElectraNet and AEMO are therefore not proposing to include this option as part of the RIT-T assessment.

Non-network option: Additional generation in South Australia

ElectraNet and AEMO note that new scheduled generation investment in South Australia may also provide a subset of the market benefits identified in section 2.2. Specifically, a scheduled generator could assist to meet peak demand, and may result in competition benefits and a reduction in involuntary load shedding.

[17] AER, Final Regulatory Investment Test for Transmission Application Guidelines, June 2010, p.6. ElectraNet and AEMO consider that the terms 'economically feasible' and 'commercially feasible' are synonymous in this context.

However a new scheduled generator in South Australia would not generate any market benefits from the increased use of low cost wind generation, which is a key source of the market benefit associated with the interconnector expansion options and potential demand-shifting options.

Expected generation developments in South Australia and in the wider NEM will be included as part of the reasonable scenarios adopted in conducting the RIT-T analysis. ElectraNet and AEMO do not intend to consider options involving additional generation as an alternative in the RIT-T assessment itself. Rather, additional South Australian generation is included in the Base Case against which the market benefits of alternative options are compared.

4 Materiality of market benefits for this RIT-T assessment

ElectraNet and AEMO note the NER requirement that all categories of market benefit identified in relation to the RIT-T are included in the RIT-T assessment, unless the TNSP can demonstrate that a specific class (or classes) of market benefit are unlikely to be material in relation to the RIT-T assessment for a specific option.

At this stage of the consultation, ElectraNet and AEMO consider that the following market benefits are not material for the RIT-T assessment for all credible options:

- Changes in ancillary services costs.
- Option value.

The reasons for this assessment are set out below.

4.1 Changes in ancillary services costs

The cost of Frequency Control Ancillary Services (FCAS) may rise as a result of increased wind generation associated with the network options. However, the cost of frequency control services is not likely to be material in the selection of the preferred option[18].

FCAS costs are typically less than one per cent of the electricity market. Further, the inclusion of all, or some, of the FCAS markets as part of the market modelling under the RIT-T would lead to substantial increase in the complexity and cost of the RIT-T assessment. Such increased complexity is not warranted given that changes in FCAS costs will not have a role in determining the preferred option.

There is no expected change to the costs of Network Control Ancillary Services (NCAS) and System Restart Ancillary Services (SRAS) as a result of the options being considered. These costs are therefore not material to the outcome of the RIT-T assessment.

4.2 Option value

ElectraNet and AEMO note the AER's view that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change and the credible options considered by the TNSP are sufficiently flexible to respond to that change[19].

[18] NER 5.6.6(c)(6)(iii)

[19] AER, Final Regulatory Investment Test for Transmission Application Guidelines, June 2010, p.39 and p. 75

ElectraNet and AEMO also note the AER's view that appropriate identification of credible options and reasonable scenarios captures any option value, thereby meeting the NER requirement to consider option value as a class of market benefit under the RIT-T.

For this RIT-T assessment, the estimation of any option value benefit over and above that already captured via the scenario analysis in the RIT-T would require a significant modelling assessment, which would be disproportionate to any additional option value benefit that may be identified for this specific RIT-T assessment. ElectraNet and AEMO do not therefore propose to estimate any additional option value market benefit for this RIT-T assessment.

5 Definitions

Applicable regulatory instruments	All laws, regulations, orders, licences, codes, determinations and other regulatory instruments (other than the Rules) which apply to Registered Participants from time to time, including those applicable in each participating jurisdiction as listed below, to the extent that they regulate or contain terms and conditions relating to access to a network, connection to a network, the provision of network services, network service price or augmentation of a network.
AEMO	Australian Energy Market Operator
Base Case	A situation in which no option is implemented by, on behalf of the transmission network service provider.
Commercially feasible	An option is commercially feasible under clause 5.6.5D(a)(2) of the Electricity Rules if a reasonable and objective operator, acting rationally in accordance with the requirements of the RIT-T, would be prepared to develop or provide the option in isolation of any substitute options[20]. This is taken to be synonymous with 'economically feasible'.
Costs	Costs are the present value of the direct costs of a credible option.
Credible option	A credible option is an option (or group of options) that:[21] ▪ address the identified need ▪ is (or are) commercially and technically feasible ▪ can be implemented in sufficient time to meet the identified need.
Economically feasible	An option is likely to be economically feasible where its estimated costs are comparable to other credible options which address the identified need. One important exception to this general guidance applies where it is expected that a credible option or options are likely to deliver materially higher market benefits. In these circumstances the option may be "economically feasible" despite the higher expected cost[22].

[20] AER, Final Regulatory Investment Test for Transmission Guidelines, June 2010, version 1, page 10

[21] NER 5.6.5D(a)

[22] AER, Final Regulatory Investment Test for Transmission Guidelines, June 2010, version 1, page 6

	This is taken to be synonymous with 'commercially feasible'.
Identified need	The reason why the Transmission Network Service Provider proposes that a particular investment be undertaken in respect of its transmission network[23].
Market benefit	Market benefit must be:[24] (a) the present value of the benefits of a credible option calculated by: i. comparing, for each relevant reasonable scenario: (A) the state of the world with the credible option in place to (B) the state of the world in the Base Case, And ii. weighting the benefits derived in sub-paragraph (i) by the probability of each relevant reasonable scenario occurring. (b) a benefit to those who consume, produce and transport electricity in the market, that is, the change in producer plus consumer surplus.
Net economic benefit	Net economic benefit equals the market benefit less costs.[25]
Preferred option	The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options. Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost)[26].
Reasonable scenario	Reasonable scenario means a set of variables or parameters that are not expected to change across each of the credible options or the Base Case[27].
Reliability corrective action	Investment by a Transmission Network Service Provider in respect of its transmission network for the purpose of meeting

[23] NER, Glossary

[24] AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph (4), page 3

[25] AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph (1), page 1

[26] NER 5.6.5B(b);and AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph (1), page 1

[27] AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph 15, page 6

	the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments and which may consist of network or non-network options[28].
State of the world	State of the world means a reasonable and mutually consistent description of all of the relevant market supply and demand characteristics and conditions that may affect the calculation of market benefits over the period of the assessments[29].

[28] NER, Glossary

[29] AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph 17, page 7