Murraylink Transmission Company Pty Ltd

Contingent Project Proposal

May 2012
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Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Contingent Murraylink Interconnector Expansion*
Project type	*Capex and Opex*
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Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	May 2012

PURPOSE

To present a contingent project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal, for years 2013 to 2023.

BACKGROUND

A number of options to strengthen the interconnection between South Australia and Victoria/NSW are currently under consideration by AEMO, Electranet and the other TNSPs[1]. The options currently being investigated do not include upgrade of the Murraylink capacity and APA has made a submission to AEMO, drawing attention to this omission. In addition, Murraylink has commenced a dialogue with AEMO and the TNSPs, in order to ensure that the potential capabilities of the link are fully explored.

The capability of Murraylink is approximately 220 MW in either direction. However, its capacity to provide support to the NEM is currently limited by the capacity of the two regional transmission networks in South Australia and Victoria, to which it is connected. Near times of peak loading, the capacity of the link can be limited to less than 50 MW by voltage collapse constraint equations applied to Victoria[2]. Runback schemes are used to control the link flow, in the event of critical transmission

[1] ElectraNet-and AEMO, Joint Feasibility Study - South Australian Interconnector Feasibility Study, February 2011; http://www.electranet.com.au/assets/Uploads/interconnectorfeasibilitystudyfinalnetworkmodellingreport.pdf.

[2] ElectraNet-and AEMO, Joint Feasibility Study, p.23.

contingency. These schemes, and their proposed enhancement, are described in the Murraylink proposal.

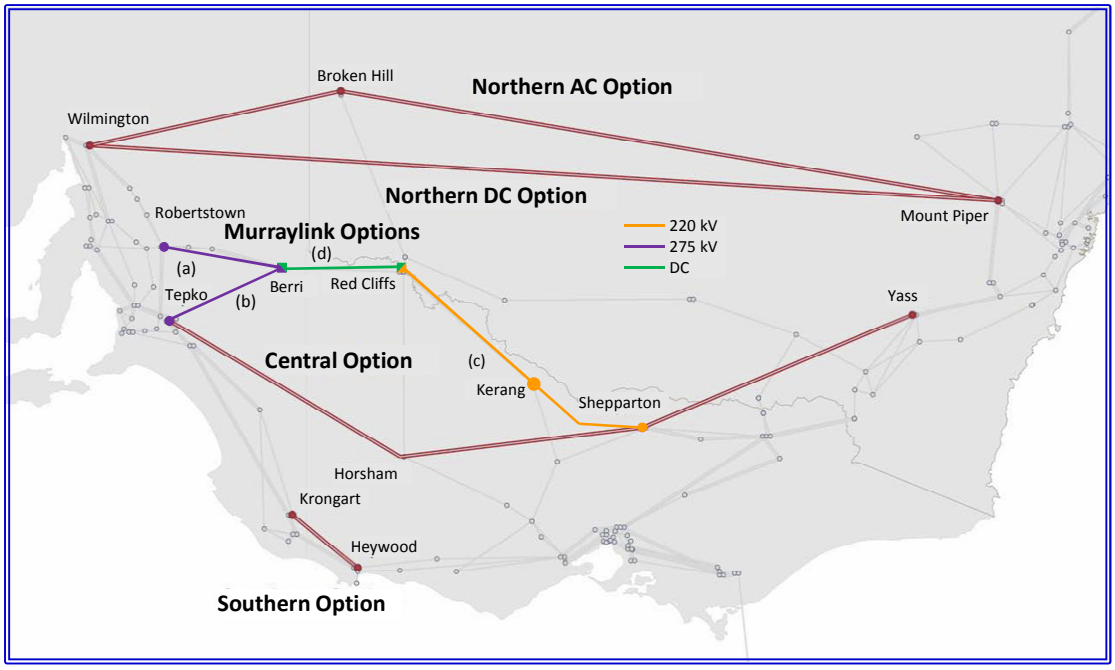
The South Australian Riverland area, the north-western Victorian and the south-western NSW regional transmission networks are all nearing the time when they need to be reinforced to meet growing load, as well as to provide for the continued effective contribution of Murraylink. The Annual Planning Reports for Electranet, AEMO (Victoria) and TransGrid all describe plans for the staged reinforcement of these regional portions of their networks [3],[4],[5].

APA has developed two conceptual proposals, each of which would be capable of addressing the capacity constraints in the regional transmission networks as well as providing increased South Australian interconnection capacity. These are described below.

1. Murraylink AC and DC option

The diagram in Figure 1 has been adapted from that published in the Interconnector Feasibility Study[6]. It shows the interconnections that were initially considered for further analysis by AEMO and Electranet. Superimposed on Figure 1 are a number of transmission elements that would restore or reinforce the Murraylink interconnection, using a combination of conventional AC and DC transmission.

Figure 1 – Interconnection options for South Australia – AC and DC



[3] Electranet, South Australian Annual Planning Report 2011 Version 1.0, June 2011, http://www.electranet.com.au/assets/Uploads/2011-Annual-Planning-Report.pdf.

[4] AEMO, 2011 Victorian Annual Planning Report - Electricity and Gas Transmission Network Planning for Victoria, p.79, http://www.aemo.com.au/planning/VAPR2011/chapters.html.

[5] TransGrid, New South Wales Annual Planning Report 2011, http://www.transgrid.com.au/network/np/Documents/Annual%20Planning%20Report%202011.pdf.

[6] ElectraNet-and AEMO, Joint Feasibility Study - South Australian Interconnector Feasibility Study, Figure 1, p.7.

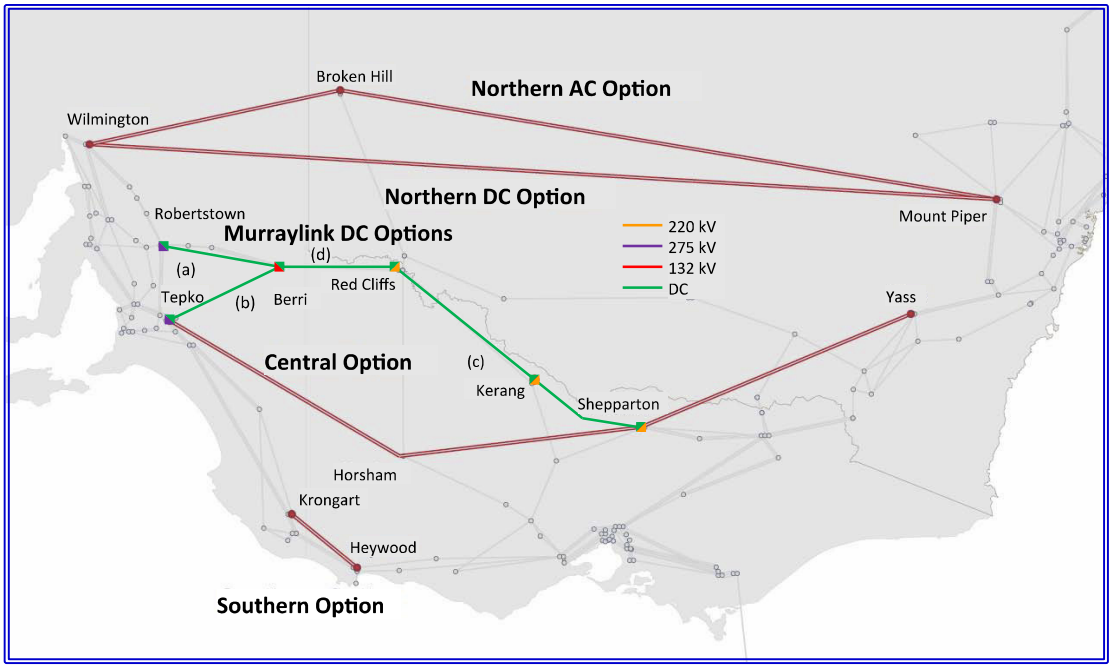
This AC and DC option:

- Reinforces the South Australian transmission system in the Riverland area by a 275 kV double circuit extension from Robertstown or Tepko to Berri - (a) or (b);
- Reinforces the Victorian north-western and NSW south-western regional transmission systems, using a conventional 220 kV double circuit line from Shepparton to Red Cliffs via Kerang – (c);
- These options would restore the full capacity of the existing Murraylink interconnector to 220 MW. The duplication of this interconnector, with a higher capacity link of around 400 MW, would increase interconnection capacity – (d).

2. Murraylink DC option

The diagram in Figure 2 shows an alternative approach to interconnection reinforcement using DC transmission.

Figure 2 – Interconnection options for South Australia – DC



This alternative comprises three separate DC links:

- Reinforcing the South Australian transmission system in the Riverland area by DC links from Robertstown or Tepko to Berri - (a) or (b);
- Reinforcing the Victorian north-western regional transmission system, using a DC link from Shepparton to Red Cliffs – (c);
- As before, these options would restore the full capacity of the existing Murraylink interconnector to 220 MW. The duplication of this interconnector, with a higher capacity link of around 400 MW, would substantially increase the interconnection capacity – (d).

It has been assumed that all DC links would use underground transmission, in similar manner to Murraylink. However, overhead DC structures would also be feasible and would have a significantly lower visual impact than a double-circuit AC transmission line.

This alternative assumes there would be a single convertor station at each intermediate location, similar to those on Murraylink. This would enable flexible support to the regional transmission systems at Red Cliffs and Berri.

Isolation of the DC cable would be provided at Red Cliffs and Berri. In the event of a cable fault, the whole link between Shepparton and Robertstown would initially be de-energised, then the section of faulted cable would be isolated and the healthy sections restored within automatic switching times.

The selection of the economic option for reinforcement of the South Australian interconnector and its timing are subject to the application of the RIT-T. So too, is the augmentation of the regional transmission networks. APA believes that the interconnection options described in this Contingent Project warrant further investigation and may well prove economic.

APA's concern is that the works described in this Contingent Project may prove to be the preferred option but could not be developed by Murraylink, if not approved by the AER as a contingent project as part of the Murraylink proposal.

APA recognises that with the AC and DC option, some elements of the contingent project are of conventional AC transmission and lie within the boundaries of the existing networks owned and operated by the adjacent TNSPs. The ownership of these assets, if developed, would be the subject of future investment decisions.

Given the recent development of multi-terminal DC links using similar technology to Murraylink, it is also possible that an economic solution to enhance the interconnection capacity and provide regional support could involve the development of a multi-ended DC link.

IDENTIFICATION OF NEED

This project is capable of satisfying three identified capacity constraints that are currently under investigation by AEMO and the TNSPs. It can be developed in stages, as necessary, to maximise the benefit to the consumers of electricity in the NEM. This contingent project is capable of providing:

- Support to the regional transmission system supplying the Berri area in South Australia, which is at the limit of its capacity. This may be achieved by developing lines (a) or (b) on Figure 1. Lines (a) and (b) are alternatives that would be subject to more detailed cost-benefit assessment;
- Support to the regional transmission system in the North-west of Victoria, which is also nearing the limit of its capacity – line (c);
- Increased interconnection capacity to South Australia, through the restoration of Murraylink capability, and also through the installation of a second, parallel link using similar 'DC light' technology – line (d);

ADDITIONAL BENEFITS OF DC TRANSMISSION

The DC link is capable of providing additional market benefits, which do not apply to any AC interconnection option:

- The link flow is completely adjustable and may be varied from its full capacity in one direction to full capacity in the reverse direction within milliseconds. It can reduce costs in the market by optimising generation dispatch;
- The link is capable of supporting the transmission system on a dynamic basis;
- The voltage compensation equipment at the link terminal stations may also be used to support the transmission system;
- The link is also capable of delivering a controlled level of black-start capability between the market regions.

The technology used by Murraylink is termed 'HV DC Light' and is more economic than the DC systems used for high power, long distance transmission. This technology has been developed since Murraylink's installation to permit capacities of up to 1,200 MW, with continuous active and reactive power control. It is also capable of being developed into the multi-terminal configuration described in the Murraylink DC interconnection option[7].

The principal need for the South Australian interconnection capacity upgrade is to enable the export of large scale wind powered generation from South Australia [8].

Wind generation not scheduled and is characterised by having a fluctuating output, as wind speeds vary. This fluctuating output causes power and voltage swings on the network, which need to be controlled to within acceptable technical limits. A DC light interconnection is the ideal design for the current circumstance, as it is capable of controlling both voltage and power flows as well as providing the necessary interconnection capability. The DC link may supplant other voltage stabilisation equipment that is required and its dynamic characteristics would make maximum use of the interconnection capability.

INDICATIVE COSTS AND BENEFITS

To determine the approximate capital costs for elements of this contingent project, APA has used the same approach and cost basis as AEMO, for its South Australian Interconnector Feasibility studies[9]. These costs were developed by SKM and are based on average unit rates, with a number of simplifying assumptions. Nonetheless, APA considers they are sufficiently accurate for the purpose of this contingent project application and would be refined during later, more detailed investigations.

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7 Gunnar Persson, HVDC Converter Operations and Performance, Classic and VSC - Dhaka, September 2011, http://www.sari-energy.org/.

8 AEMO, ElectraNet-AEMO Joint Feasibility Study South Australian Interconnector Feasibility Study, February 2012, p.9.

9 SKM (for AEMO), Feasibility Study Estimates for Transmission Network Extensions Final Rev.2.1, 16 November 2010, http://www.aemo.com.au/planning/0179-0176.pdf.

1. *Murraylink AC and DC option*

The indicative costs of the transmission elements (a) to (d) are set out in Table 1. Note that elements (a) and (b) are alternative connections, subject to further investigation.

Table 1 – Indicative costs of contingent project elements – AC and DC interconnection

Transmission Element		Cost, $ M			
	km	Line	Easement	Terminal	**Total**
(a) Berri to Robertstown 275 kV double circuit	200	158	8	25	191
(b) Berri to Tepko 275 kV double circuit	220	174	9	25	207
(c) Red Cliffs to Shepparton 220 kV double circuit	450	320	18	22	360
(d) Murraylink - second 400 MVA parallel link	180	135	0	130	265
Total for items (a), (c) and (d)		**613**	**26**	**177**	**816**
Total for items (b), (c) and (d)		**629**	**27**	**177**	**833**

2. *Murraylink DC option*

The indicative costs of the transmission elements (a) to (d) are set out in Table 1. Note that elements (a) and (b) are alternative connections, subject to further investigation.

Table 2 – Indicative costs of contingent project elements – DC interconnection

Transmission Element		Cost, $ M			
	km	Line	Easement	Terminal	**Total**
(a) Berri to Robertstown DC	200	150	0	130	280
(b) Berri to Tepko DC	220	165	0	130	295
(c) Red Cliffs to Shepparton 220 kV double circuit	450	338	0	130	468
(d) Murraylink - second 400 MVA parallel link	180	135	0	20	155
Total for items (a), (c) and (d)		**623**	**0**	**280**	**903**
Total for items (b), (c) and (d)		**638**	**0**	**280**	**918**

Regardless of the options evaluated, to determine the market benefits of an interconnection proposal, complex modelling must be undertaken for a number of feasible scenarios. This is the process that is currently being undertaken by AEMO and the TNSPs for the evaluation of the South Australian interconnection options.

APA has not carried out market benefit modelling for the purposes of proposing this contingent project. Such detailed analysis would be undertaken as part of the RIT process, to determine the project details and the optimal timing.

Some indication of the project benefits may be gained by comparing the cost per MW of interconnection capability with the interconnection options being investigated by AEMO. This comparison is set out in Table 3.

Table 3 – Cost of interconnection capability

Option	Cost $ M	Capacity MW	Relative cost $M/MW	Rank
Northern AC Wilmington - Mount Piper 2000 MW 500 kV AC double circuit routed via Broken Hill	3,750	2,000	1.88	6
Northern DC Wilmington - Mount Piper 2000 MW 500 kV HVDC bi-pole	3,000	2,000	1.50	4
Southern Krongart - Heywood 2000 MW 500 kV AC double circuit	530	2,000	0.27	1
Central Tepko - Yass 2000 MW 500 kV double circuit routed via Horsham and Shepparton	3,500	2,000	1.75	5
Murraylink AC and DC Shepparton - Red Cliffs 220 kV, Red Cliffs - Berri DC, Berri - Robertstown 275 kV	816	600	1.26	2
Murraylink DC Shepparton - Red Cliffs DC, Red Cliffs - Berri DC, Berri - Robertstown DC	903	600	1.39	3

Whilst it is acknowledged that the above cost comparison is simplistic, it is apparent that the both the AC/DC and DC Murraylink options provide a benefit/cost ratio that compares very favourably with most of the other interconnection options currently being investigated.

It should also be noted that the Murraylink options are the only interconnection options that would also deliver substantial benefits through needed support to the regional transmission systems in South Australia, Victoria and NSW. When these benefits are factored into the analysis, the Murraylink options certainly warrant further detailed consideration, to upgrade the capacity of the South Australian interconnection.

THE MURRAYLINK CONTINGENT PROJECT

Clause 6A.8.1 of the Rules allows for a TNSP's revenue proposal to include contingent capital expenditure, which the Transmission Network Service Provider considers is reasonably required for the purpose of undertaking a proposed contingent project.

AEMO is currently investigating options to increase the interconnection capacity to South Australia and the regional transmission capacity in Victoria. AEMO has indicated that it will also investigate the use of DC light technology, similar to that employed at Murraylink, for these purposes.

AEMO's latest forecasting and modelling has indicated that the reinforcement of the interconnection capacity to South Australia is not likely to be required within the next five years and may possibly not be required within the next ten years. However, there is considerable uncertainty associated with these long-range predictions, particularly as the effects of the carbon price to be applied in July 2012 on the development of renewable generation are not well understood.

APA therefore proposes that the AER should include the upgrade of the capacity of the Murraylink corridor as a contingent project, which may take place during the 2013-23 regulatory control period. The project may comprise a number of elements and the construction may be staggered over a period of years, to optimise the outcomes for electricity consumers. The elements of this project are set out in Table 4.

Table 4 – Contingent project elements

Contingent Project Element	Indicative cost $M
(a) Berri to Robertstown	191 - 280
or	
(b) Berri to Tepko	207 - 295
and	
(c) Red Cliffs to Shepparton (or another equivalent Victorian location)	360 - 468
and	
(d) Murraylink - second 400 MVA parallel link	155 - 265

The above contingent capital expenditure amounts:

- Are of uncertain timing, but may reasonably take place during the 2013-23 regulatory control period;
- Are indicative, being based on preliminary costing data;
- Are in excess of $10 million and in excess of 5% of Murraylink's revenue requirement; and

- Have not been included in the forecasts of capital expenditure that form part of the Murraylink Proposal.

It is proposed that the trigger event for this contingent project would have four conditions that must be filled:

- The completion of a RIT-T consultation and cost–benefit analysis framework that maximises net economic benefit to the market must justify any one, or more than one element of the project to upgrade the capacity of the Murraylink corridor;
- As required under the RIT-T assessment, available network and non-network solutions capable of meeting the identified limitation set out in the Project Assessment Draft Report are considered;
- Murraylink is successful in tendering to develop an element of the contingent project, under the transmission procurement arrangements that currently apply in Victoria tor those that may in future apply to other jurisdictions or across the NEM;
- A financial commitment is made by the board of Energy Infrastructure Investments Pty Limited to undertake an element of the project.

This arrangement would ensure that any expenditure committed at the time would reasonably reflect the capital expenditure criteria, and take into account the capital expenditure factors.

COMPLIANCE WITH THE RULES AND AER SUBMISSION GUIDELINES

This section demonstrates that this Murraylink contingent project complies with the Rules and the AER's submission guidelines. The relevant Rules requirement covering the AER acceptance of a contingent project is clause 6A.8.1(b).

(1) *the proposed contingent project is reasonably required to be undertaken in order to achieve any of the capital expenditure objectives;*

The Murraylink contingent project is required to meet the following capital expenditure objective set out in clause 6A.6.7 of the Rules.

(1) The Murraylink contingent project would arise from an increasing demand for prescribed transmission services, for the following purposes:

- Increased interconnection capability to South Australia;
- Augmentation of the capacity of the regional transmission system in the Riverland area; and
- Augmentation of the capacity of the regional transmission system to north-western Victoria.
- Augmentation of the capacity of the regional transmission system to south-western NSW.

Each of these augmentation needs is the subject of current investigations by AEMO and the relevant TNSPs.

(3) By providing an additional transmission path between the regional areas above, the Murraylink contingent project would maintain the reliability and security of supply of prescribed transmission services; and

(4) By providing an additional transmission path between the regional areas above, the Murraylink contingent project would maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

(2) *the proposed contingent capital expenditure:*

(i) *is not otherwise provided for (either in part or in whole) in the total of the forecast capital expenditure for the relevant regulatory control period which is accepted in accordance with clause 6A.6.7(c) or substituted in accordance with clauses 6A.13.2(b)(4) and (5) (as the case may be);*

This contingent project is not included in the Murraylink capital expenditure proposal.

(ii) *reasonably reflects the capital expenditure criteria, taking into account the capital expenditure factors, in the context of the proposed contingent project as described in the Revenue Proposal; and*

The indicative costs that have been included within this contingent expenditure proposal would be the subject of detailed estimates before an application is made to the AER to proceed with the Murraylink contingent project. The estimated expenditure that would form the basis of a submission to the AER to proceed would align with the capital expenditure criteria in clause Rules 6A.6.7(c):

(1) Being based upon competitive tenders for the construction of the project by specialist suppliers, the costs would be efficient;

(2) The competitively sourced cost of the Murraylink contingent project is the cost that a prudent TNSP would require to achieve the capital expenditure objectives; and

(3) The project would only proceed if, upon the completion of investigations by AEMO and the TNSPs using their demand forecasts, the Murraylink contingent project was determined to provide the greatest market benefit.

(iii) exceeds either $10 million or 5% of the value of the maximum allowed revenue for the relevant Transmission Network Service Provider for the first year of the relevant regulatory control period whichever is the larger amount;

The value of the project would be well in excess of $10 million or 55 of Murraylink's maximum allowed revenue.

(3) the proposed contingent project and the proposed contingent capital expenditure, as described or set out in the Revenue Proposal, and the information provided in relation to these matters, complies with the requirements of submission guidelines made under clause 6A.10.2; and

Section 4.3.14 of the AER's submission guidelines deals with proposed contingent projects. This section requires the TNSP's revenue proposal to contain:

(a) a description of the proposed contingent project, including reasons why the TNSP considers the project should be accepted as a contingent project for the regulatory control period

This document forms an attachment to the Murraylink revenue proposal and contains an explanation of why Murraylink considers the contingent project should be accepted as a contingent project for the 2013-23 regulatory control period.

(b) a forecast of the capital expenditure which the TNSP considers is reasonably required for the purpose of undertaking the proposed contingent project

The capital expenditure forecast in this document is indicative and an application to proceed with the contingent project would be accompanied by a more detailed estimate based upon competitively sourced quotations.

The indicative forecast of costs is based on the costs for the South Australian interconnector study used by AEMO.

(c) the methodology used for developing that forecast and the key assumptions that underlie it

Murraylink has placed reliance on the demand forecasts prepared by AEMO and the TNSPs.

(d) information that demonstrates that the undertaking of the proposed contingent project is reasonably required to meet one or more of the objectives referred to in clause 6A.8.1(b)(1) of the NER

See above.

(e) information that demonstrates that the proposed contingent capital expenditure for the proposed contingent project complies with requirements set out in clause 6A.8.1(b)(2) of the NER

See above.

(f) the proposed trigger events relating to the proposed contingent project and an explanation of how each of those conditions or events addresses the matters referred to in clause 6A.8.1(c) of the NER.

This document contains a description of the proposed trigger mechanism for the contingent project. The manner in which this addresses clauses 6A.8.1(b)(4) and 6A.8.1.(c) is set out below.

(4) the trigger events in relation to the proposed contingent project which are proposed by the Transmission Network Service Provider in its Revenue Proposal are appropriate.

Murraylink has proposed that the trigger event for this contingent project will have four conditions:

- The completion of a RIT-T consultation and cost–benefit analysis framework that maximises net economic benefit to the market must justify any one, or more than one element of the project to upgrade the capacity of the Murraylink corridor;
- As required under the RIT-T assessment, available network and non-network solutions capable of meeting the identified limitation set out in the Project Assessment Draft Report are considered;
- Murraylink is successful in tendering to develop an element of the contingent project, under the transmission procurement arrangements that currently apply in Victoria tor those that may in future apply to other jurisdictions or across the NEM;
- A financial commitment is made by the board of Energy Infrastructure Investments Pty Limited to undertake an element of the project.

This proposed trigger event:

(1) is reasonably specific and capable of objective verification;

(2) would make the undertaking of the proposed contingent project reasonably necessary in order to achieve the capital expenditure objectives listed above;

(3) would generate increased costs relating to a specific location rather than affecting the transmission network as a whole;

(4) if it occurs, is all that is required for the revenue determination to be amended under clause 6A.8.2; and

(5) the inclusion of capital expenditure in relation to the trigger event in the Murraylink capex forecast under clause 6A.6.7 is not appropriate because:

(i) it is not sufficiently certain that the event will occur during the regulatory control period or at all, as it may not turn out to be the option that generates the greatest market benefits; and

(ii) the costs associated with the event are not sufficiently certain at this stage to be included in the capex forecast.