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Dear Sebastian

ACCC Preliminary View on Murraylink Transmission Company's Application for Conversion and Maximum Allowed Revenue

The ACCC has invited submissions from interested parties on its Preliminary View on Murraylink Transmission Company's Application for Conversion and Maximum Allowed Revenue, issued on 14 May 2003. This letter sets out VENCorp's comments on the ACCC's Preliminary View, which covers the following:

1. Power Transfer Levels;
2. Augmentations to the Victorian Transmission Network;
3. Basis for recovery of regulated revenues through transmission prices; and
4. Defining the alternatives to Murraylink.

1. Power Transfer Levels

A key determinant of the market benefits of Murraylink is its power transfer capability. VENCorp has undertaken analysis of the transfer levels of both the existing Murraylink interconnector and the alternative 3 which represents the Commission's least cost alternative.

(A) Power Transfer Capability of Murraylink

VENCorp's analysis shows that in order to achieve levels of 220MW transfer from Victoria to South Australia under peak demand conditions for summer 2003/04, a number of augmentations are required to be undertaken on the Victorian transmission network. While these augmentations represent those required in Victoria, VENCorp has not undertaken a detailed review of any network issues in neighbouring regions that may impact on achieving the target transfer levels. Such review is the responsibility of the relevant TNSPs.

VENCorp has undertaken comprehensive feasibility studies to provide an assessment of Murraylink's transfer capability and augmentations required to support its maximum transfer capability at peak demand. These studies have identified that due to the weakness of the Victorian system where Murraylink connects, serious quality of supply issues require additional works to mitigate harmonic levels to within Australian Standards. Additionally, an alternate augmentation proposal has been identified that will achieve the same transfer capability on Murraylink and address some practical implementation issues.

Should these augmentations be required to be undertaken, VENCorp will undertake full design studies to finalise design parameters. These studies are unlikely to lead to new augmentation requirements, i.e. amount of reactive power from capacitor banks, but rather items such as series reactor sizes and runback scheme specifications. There may also be some requirement to include additional monitoring of other elements not listed in this submission.

Attachment 1 to this submission details two augmentation proposals, and modification works required to existing plant for either option. The listing below summarises the requirements:

Table 1: Summary of Modification Works

Station	Works
Ballarat	Replace series reactors on two 66kV capacitor banks with larger reactors
Horsham	Replace series reactor on 66kV capacitor banks with larger reactors and replace capacitor cans
Redcliffs	Replace series reactors on two 66kV capacitor banks with larger reactors

Table 2: Summary of Augmentation Works for Option 1

Station	Works
Redcliffs	2 x 40 MVAr capacitor banks switched at 220kV
Kerang	2 x 30 MVAr capacitor banks switched at 220kV
Horsham	2 x 30 MVAr capacitor banks switched at 220kV
Various	Runback schemes listed in Table 4

Table 3: Summary of Augmentation Works for Option 2

Station	Works
Redcliffs	2 x 40 MVAr capacitor banks switched at 220kV
Kerang	2 x 15 MVAr capacitor banks switched at 66kV
Horsham	2 x 15 MVAr capacitor banks switched at 66kV
Ballarat	2 x 25 MVAr capacitor banks switched at 66kV
Various	Runback schemes listed in Table 4

Table 4: Runback Schemes for both Options

Transmission Element	Indicative Operating Time
Shepparton to Bendigo	Commence within ~100ms, Complete within 300 ~ 1000ms
Bendigo to Kerang	As above
Kerang to Redcliffs	As above
Ballarat to Horsham	As above
Ballarat to Bendigo	As above
Horsham to Redcliffs	As above
Murray to Dederang	As above, or alternatively, upgrade LTSS-WAGGA as for SNI
Moorabool transformer	Commence within ~500ms, Complete within ~ 1500ms
Moorabool Ballarat No1	As above
Moorabool Ballarat No2	As above
Dederang transformers	Requirement yet to be decided
Lower Tumut to Wagga **	Commence within 100~200ms, Complete within 300 ~ 1000ms
Wagga to Darlington Point **	As above
Darlington Point to Balranald **	As above
Balranald to Buronga **	As above
Buronga to Redcliffs **	As above

**NSW based scheme is being developed in consultation with TransGrid

The nature of the power system is such that interdependencies exist between flows on other interconnectors and on system conditions prevailing at that time. These interdependencies already exist for example between Vic/Snowy and Vic/SA interconnectors, and Vic/Snowy and QNI interconnectors. Murraylink is also dependent and contributes to these interdependencies. In this case, Murraylink's transfer capability can be impacted on, amongst other things, by the level of import from Snowy into Victoria, and the amount of Victorian hydro generation and load levels, as set out below.

- A reduction of import from Snowy will increase loading on the Victorian State Grid transmission lines but this is not expected to impact on Murraylink transfer capability until Snowy to Victoria flow has reduced to approximately 1100 MW.
- Snowy to Victoria import is dependent on Victorian hydro generation as this generation governs the loading on the Dederang transformers. These transformers can be the limiting element for Snowy to Victoria import. This will also limit Murraylink transfer capability, as Murraylink will provide additional loading on the Dederang transformers. Provided sufficient Southern hydro generation is in service, Murraylink will not be limited by this element.
- Installation of capacitor banks will address the influence of load levels on transfer capability.

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(B) Power Transfer Capability of Alternative 3 (as modified by the Commission)

The Commission has identified a modified version of "Alternative 3" as the least cost alternative to Murraylink. This alternative consists of a Redcliffs to Monash 220kV AC line (and SVCs), but does not include the phase shifting transformers included in MTC's application. In our previous submission, VENCorp raised questions as to the need for phase shifting transformers given that controllability is not a requirement for regulated AC interconnectors. Since then, MTC has provided additional evidence that shows that significant additional transfer capability is achievable with the use of Phase Shifting transformers. VENCorp has undertaken analysis and has found that:

- An assessment of the capability of the modified Alternative 3 is 130MW.

  The modified Alternative 3 consists of line works between Redcliffs and Monash without a Phase Shifting Transformer (PST). The assessment is based on existing Victoria to South Australia transfer capability without Murraylink of 500 MW, and of the 130 MW increase, 20-30 MW is carried through Heywood. The capability is defined by thermal limits at Heywood and Snowy lines. We also note that the SVC that is included at Monash as part of this option is not required to achieve the 130MW capability.

- In order to achieve a 220MW capability with the modified Alternative 3, the following additional augmentations would be required:

  - Phase Shifting Transformer.

    To achieve a 220MW increase in South Australian import, a PST, with an approximate 35 degree phase shift, is required in order to increase flow on the Redcliffs to Monash line. This results in 20 MW of the 220 MW increase transported through Heywood. The capability is defined by thermal limits at Heywood and Snowy lines. We believe that the requirement for a spare PST should be assessed against the additional benefits that this may provide.

  - An additional 180 MVAr of reactive plant is required in Victoria.

    Approximately 180 MVAr of capacitor banks are required in the Victorian state grid to overcome thermal and voltage limits.

  - An SVC is required at Monash

    VENCorp's view is that an SVC is required at Monash when transferring 200 MW (for 220 MW net increase to South Australia) to maintain acceptable voltage control for loss of the Redcliffs to Monash line and also during stepping of the PST.

  - Tripping scheme

    A tripping scheme would be required to reduce loading on Victorian elements and to avoid exceeding voltage limits when Victorian elements, particularly in the Victorian state grid, are lost. The scheme would require high speed communications to Redcliffs.

- Location of equipment.

  While the location of the plant is not specific, there are advantages of locating the equipment at one location. In establishing this Alternative 3, a transformer would be required to connect the 220kV system in Victoria with the 132kV system in South Australia. To minimise losses, the transformer should be located at the lower voltage end, i.e. Monash. While the PST is not location specific and can be at either end of the line, locating it with other infrastructure, i.e. the transformer, would minimise installation costs. Additionally, it is preferred to locate the SVC with the PST so that voltage steps created by the PST can be directly compensated for by the SVC. This would suggest the transformer, PST and SVC should be located at the South Australian end of the line.

In summary, the Alternative 3 interconnector, as modified by the Commission, will not support 220MW increase into South Australia unless a PST is included in the AC link, approximately 180 MVAr of capacitor banks are included in Victoria, a tripping scheme to trip the AC link for loss of selected Victorian elements, and an SVC is included at Monash.

(C) Power Transfer Capabilities of various options

VENCorp notes that there has been discussion regarding the transfer capabilities of various interconnection options being considered in the NEM. We have undertaken some analysis on a number of these options and provide a range of indicative transfer levels in Attachment 2, based on peak demand conditions with all elements in service.

The table summarises capabilities for a number of options and combination of these options including:

- Existing network
- With Murraylink optimised
- With full and unbundled SNI
- Alternate 3 option
- Heywood upgrade, and
- Horsham upgrade

Some of the salient points from the table are summarised below for clarity:

- Existing Murraylink capability to South Australia at peak load and full import is 70 MW.
- Only those options that contain SNI or parts of SNI will provide any improvement to the combined Victorian and South Australian import capability from Snowy.

2. Augmentations to the Victorian transmission network

In relation to the augmentations required to ensure that 220MW transfer capability is available on Murraylink, VENCorp notes that the Commission has included the augmentation capital costs in MTC's regulated asset base. VENCorp's view is that as these constitute augmentations to the shared transmission network in Victoria that will be funded by TUOS customers, the normal processes for

procuring such augmentations should be followed. These obligations are set out VENCorp's electricity transmission licence issued by the Essential Services Commission (ESC).

Under these arrangements, augmentations will be undertaken by a contestable process run by VENCorp. The successful tenderer would typically build, own and operate the assets and enter into a long term agreement with VENCorp for provision of the network services. In the event that VENCorp believes that a project is not contestable, it may apply to the ESC for an exemption and approval to negotiate with SPI PowerNet (as the incumbent asset owner) for the works to be undertaken on a non-contestable basis. VENCorp would then recover the annual costs of the network services through TUOS charges to Victorian customers.

We therefore believe that the ACCC's preliminary view should not include the augmentations in MTC's asset base. Rather, the ACCC should determine a MAR for these augmentations, which will be added to the existing MAR the ACCC has approved for VENCorp in its decision on the Victoria Transmission Revenue cap for 2003-2008.

VENCorp is in the process of determining estimates for these works which we will provide to the Commission when available. Our understanding at this stage is that at least 14 months should be allowed to install these works from the approval date.

We believe that VENCorp would be in a position to commence the procurement process when:

- The ACCC issues a final determination including accepting Murraylink as a prescribed service, including a MAR (and timing) for VENCorp for the Victorian augmentations;
- Murraylink Transmission Company formally converts to a prescribed service; and
- VENCorp Board approval is received.

3. Basis for recovery of regulated revenues through transmission prices

MTC's application states that it proposes to recover regulated revenue from the South Australian and Victorian regions on the basis of the geographic location of the Murraylink assets in each region. This is understood to be consistent with present arrangements for recovery of regulated interconnector costs under the National Electricity Code.

Under these arrangements, VENCorp understands that this would result in approximately 70% of the Murraylink regulated revenue being recovered from Victorian network users, resulting in an increase of approximately 4% in their TUOS charges. VENCorp regards this as a major issue, because the allocation of costs under the Code's present provisions is unlikely to be consistent with the distribution of Murraylink's expected benefits[1].

In view of this, VENCorp submits that the ACCC's acceptance of MTC's Application should be conditional on:

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1 It is apparent from MTP's application that the likely beneficiaries of Murraylink will be consumers in South Australia and generators in the New South Wales, Snowy and Victorian regions.

- the implementation of appropriate inter-regional TUoS settlements between the regional coordinating TNSPs, to align the TUoS charges paid by users in each region more closely with the benefits that are expected to be provided by Murraylink; or

- the implementation of reasonably foreseeable Code amendments (eg "beneficiary pays") that would provide a more equitable basis for allocation of Murraylink's costs.

We note that the Commission's preliminary view is silent on this issue. We submit that the Commission should, given the size of the issue, address this issue.

4. Defining the alternatives to Murraylink

VENCorp is of the view that the alternatives considered as part of the regulatory test do not need to provide identical level of functionality to the market as Murraylink does. We therefore believe that there may be other alternatives which should be considered.

One alternative that was suggested in VENCorp's previous submission was the so called "Horsham A[2]" option, which is an interconnection between Horsham and Tailem Bend, which has been assessed as having a transfer level of 220 MW at an estimated capital cost of $135M.

Another alternative which has been raised is the so called Heywood A option which involves the provision of a third 500/275 kV transformer at Heywood and series compensation of the South East to Tailem Bend 275 kV lines in South Australia. This has been assessed as having as adding an additional 130MW at an estimated cost of $65M.

Should you have any queries in relation to this submission, please contact VENCorp's Executive Manager Energy Infrastructure John Howarth (03) 8664 6565.

Yours sincerely

M. Zema.

Matt Zema
Chief Executive Officer

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2 The Horsham A option consists of a 275kV line between Horsham and Tailem Bend; 220kV lines between Moorabool and Ballarat, and Ballarat and Horsham; and station works at Moorabool, Ballarat, Horsham and Tailem Bend

Attachment 1: Augmentation Works required for 220 MW transfer capability

Introduction

The following is a summary of works required for 220MW transfer capability on Murraylink at 9600MW load and 1900MW import in Snowy to Victoria interconnector, which apply for summer 2003/04.

These works have been defined on extensive feasibility studies to determine reactive requirements and runback requirements. It is considered that while the studies have been extensive, when detailed design studies are undertaken, there may be some expansion of the runback scheme to protect those elements not assessed in the feasibility studies. This is not likely to result in additional reactive requirements.

References to reactor sizes in the remainder of the attachment are to be considered as indicative only. Some of these sizes may need to be refined following extensive studies to be undertaken in the design phase.

Prices are being prepared but are unavailable at this time.

Augmentation Works for Existing Plant

Harmonics issues have required considerable review of the proposal and some additional augmentation works are required to overcome them. Inclusion of additional capacitor banks in the Victorian state grid will cause harmonic resonances and tuning points that will be unacceptable and which will not comply with Australian Standard in quality of supply, predominantly at the 5th and 7th harmonics. Modification of existing capacitor banks (as set out in Table A1) at a number of locations by replacing the series reactors with larger reactors is required and will modify the harmonic profile sufficiently to allow additional capacitor banks to be installed.

Table A1: Modifications required to existing plant.

Station	Works	Other comments
BATS	The series reactors on the two 66kV capacitor banks are to be replaced with 11 mH and 30 mH reactors.	Recent upgrade works on these banks had their capacitor cans replaced. The cans are sufficiently rated to accommodate the use of larger reactors. No can replacement is required.
HOTS	The series reactor on the 66kV capacitor bank is to be replaced with a 25 mH reactor.	The existing capacitor cans are not sufficiently rated to accommodate the larger series reactor and must therefore be replaced.
RCTS	The series reactors on the two 66kV capacitor banks are to be replaced with 70 mH reactors.	The status of the existing capacitor cans is unknown at this stage.

Reactive Augmentation Proposals

Two options have been identified for the installation of capacitor banks to support Murraylink transfer capacity. Both options require the augmentation works for existing plant identified in Table A1 to be undertaken to achieve acceptable quality of supply performance.

Option 1 - Capacitor banks installed at 220kV

This is consistent with VENCorp's published report on 4 July 2003.

Table A2: Option 1 – New Capacitor Bank Requirements

Station	Works	Series Reactors
RCTS	2 x 40 MVAr capacitor banks switched at 220kV	Both at 225 mH
KGTS	2 x 30 MVAr capacitor banks switched at 220kV	172 mH and 750 mH
HOTS	2 x 30 MVAr capacitor banks switched at 220kV	172 mH and 750 mH

Issues:

- Two reactors are very large but are required to meet harmonic limits and not cause interaction between the capacitor banks.
- Switching of the capacitor banks causes voltage step changes near the limits of acceptability and this relies on dynamic reactive plant to be in-service, ie SVCs. If the SVCs are out of service then switching of the capacitor banks would violate voltage step change limits. This has the potential to unnecessarily erode Murraylink transfer capability.

Option 2 - Capacitor Banks installed at 66kV

To over come the issues defined above, an alternate reactive proposal is made that still permits 220 MW transfer.

Table A3: Option 2 – New Capacitor Bank Requirements

Station	Works	Series Reactors
RCTS	2 x 40 MVAr capacitor banks switched at 220kV	Both at 225 mH
KGTS	2 x 15 MVAr capacitor banks switched at 66kV	55 mH and 140 mH
HOTS	2 x 15 MVAr capacitor banks switched at 66kV	55 mH and 140 mH
BATS	2 x 25 MVAr capacitor banks switched at 66kV	30 mH and 95 mH
MLTS (Note 1)	1 x 100 MVAr capacitor bank switched at 220kV	80 mH

Note 1: This would be required from 2004/05 .

Runback Schemes

No fundamental changes to the runback schemes proposed in our document of 4 July 2003 are required. We are currently liaising with SPI PowerNet to determine viability and cost of required runback schemes. The tables below identify Victorian and New South Wales runback scheme requirements.

Please note that assessment is being based on feasibility with some basic design parameters and that design of the runback schemes is not being undertaken at this time. Assumptions include:

- All runback commands will cause Murraylink to runback to zero.
- Detection of runback conditions occur by either a) line current sensing or b) trip circuit detection.

Table A4: Victorian Based Runback Schemes

Monitored transmission element	Operating Time (indicative)
Shepparton to Bendigo	Commence within ~100ms, Complete within 300 ~ 1000ms
Bendigo to Kerang	As above
Kerang to Redcliffs	As above
Ballarat to Horsham	As above
Horsham to Redcliffs	As above
Ballarat to Bendigo	As above
Moorabool transformer	Commence within ~500ms, Complete within ~ 1500ms
Moorabool Ballarat No1	As above
Moorabool Ballarat No2	As above
DDTS Transformers	Requirement yet to be decided

Table A5: New South Wales Based Runback Schemes

Monitored transmission element	Operating Time (indicative)
Lower Tumut to Wagga	Commence within 100~200ms, Complete within 300 ~ 1000ms
Wagga to Darlington Point	As above
Darlington Point to Balranald	As above
Balranald to Buronga	As above
Buronga to Redcliffs	As above

**NSW based scheme is being developed in consultation with TransGrid

ATTACHMENT 2: INDICATIVE TRANSFER CAPABILIES FOR MURRAYLINK OPTIMISATION AND ALTERNATIVE AUGMENTATIONS

The following is a guide to transfer capabilities based on a number of alternatives presently being considered in the NEM. These are all based on a number of assumptions set out in the notes and the following:

- Summer 2003/04 Peak Demand; and
- System Normal (i.e. all elements in service)

The following critical contingencies / thermal limits apply in all cases unless noted in the table:

- HYTS Transfer – loss of MLTS-HYTS-APD / HYTS transformer loading
- Snowy->Vic – loss of MSS-DDTS line / loading on parallel line

Table A6: Capacity Assessment of Interconnection Development Options

Case	Condition / Option	Snowy – Vic (MW)	Vic – SA (MW)		Snowy – SA (MW)	Net import into Vic/SA from Snowy (MW)	Net import into SA (MW)	Defining contingencies for Murraylink
			HYTS	Mlink				
1a	Existing Network	1900	500	70	N/A	1900	570	Moorabool 500/220kV transformer (long term reactive margin)
1b	Existing Network + fast Murraylink run-back for loss of MLTS trans	1900	500	90	N/A	1900	590	BETS-KGTS (Eq MLV2) (long term reactive margin)
2a	Existing Network + Murraylink optimised with LTSS-WAGGA upgraded as for SNI	1920	500	220	N/A	1920	720	MLTS-HYTS-APD (long term reactive margin)
2b	Existing Network + Murraylink optimised with run-back for loss of MSS-DDTS	1900	500	220	N/A	1900	720	MLTS-HYTS-APD (long term reactive margin) Snowy->Vic: LTSS-WAGGA (Thermal)

Case	Condition / Option	Snowy – Vic (MW)	Vic – SA (MW)		Snowy – SA (MW)	Net import into Vic/SA from Snowy (MW)	Net import into SA (MW)	Defining contingencies for Murraylink
			HYTS	Mlink				
3a	Existing Network + Full SNI	1990~1980	~510	~80	~130	2100	720	Moorabool 500/220kV transformer (long term reactive margin)
3b	Existing Network + Full SNI + fast Murraylink run-back for loss of MLTS trans	1990~1980	530~540	~100	110~120	2100	750	DLPT-BLND-BUGA (long term reactive margin)
4	Existing Network + Murraylink optimised + Full SNI	1990~1980	530~540	~100	110~120	2100	750	DLPT-BLND-BUGA (long term reactive margin)
5a	Existing Network + Unbundled SNI	2080	500	100	N/A	2080	600	Moorabool 500/220kV transformer (long term reactive margin)
5b	Existing Network + Unbundled SNI + fast Murraylink run-back for loss of MLTS trans	2080	500	170	N/A	2080	670	MLTS-HYTS-APD BETS-KGTS (long term reactive margin)
6	Existing Network + Murraylink optimised + Unbundled SNI	2090	500	220	N/A	2090	720	MLTS-HYTS-APD (long term reactive margin)

Alternatives being considered as part of the Murraylink regulated Application.

Case	Condition / Option	Snowy – Vic (MW)	Vic – SA (MW)		Snowy – SA (MW)	Net import into Vic/SA from Snowy (MW)	Net import into SA (MW)	Defining contingencies / comments
			HYTS	Mlink				
7	Existing Network without Murraylink	1900	500	N/A	N/A	1900	500	

Case	Condition / Option	Snowy – Vic (MW)	Vic – SA (MW)		Snowy – SA (MW)	Net import into Vic/SA from Snowy (MW)	Net import into SA (MW)	Defining contingencies for Murraylink
			HYTS	Mlink				
8a	Existing Network without Murraylink + Alternative 3 (No PSTs) + LTSS – WAGGA upgrade	1910	520~530	N/A	N/A	1910	630	Vic ->SA - loss of MLTS-HYTS-APD ▫ Transfer limited by HYTS thermal and is defined by sharing between HYTS and RCTS – Monash ties.
8b	Existing Network without Murraylink + Alternative 3 (No PSTs) + trip RCTS-Monash for loss of MSS-DDTS	1900	520~530	N/A	N/A	1900	630	Vic ->SA - loss of MLTS-HYTS-APD ▫ Transfer limited by HYTS thermal and is defined by sharing between HYTS and RCTS – Monash ties. Snowy -> Vic ▫ Thermal - LTSS-WAGGA
9a	Existing Network without Murraylink + Alternative 3 (With PSTs) + LTSS – WAGGA upgrade + 180 MVAr caps in state grid	1920	520	N/A	N/A	1920	720	Vic ->SA - loss of MLTS-HYTS-APD ▫ Thermal limit defined by HYTS and relates to sharing between HYTS and RCTS – Monash ties. ▫ Reactive margin at HYTS
9b	Existing Network without Murraylink + Alternative 3 (With PSTs) + 180 MVAr caps in state grid + trip RCTS-Monash for loss of MSS-DDTS	1900	520	N/A	N/A	1900	720	Vic ->SA - loss of MLTS-HYTS-APD ▫ Thermal limit defined by HYTS and relates to sharing between HYTS and RCTS – Monash ties. ▫ Reactive margin at HYTS Snowy -> Vic ▫ Thermal - LTSS-WAGGA
10	Existing Network without Murraylink + HYTS upgrade	1900	630	N/A	N/A	1900	630	Vic ->SA ▫ Thermal limit defined by loading on HYTS-SESS line for loss of parallel line.

Case	Condition / Option	Snowy – Vic (MW)	Vic – SA (MW)		Snowy – SA (MW)	Net import into Vic/SA from Snowy (MW)	Net import into SA (MW)	Defining contingencies for Murraylink
			HYTS	Mlink				
11	Existing Network without Murraylink + HYTS upgrade + Unbundled SNI	2080	630	N/A	N/A	2080	630	Vic ->SA ▫ Thermal limit defined by loading on HYTS-SESS line for loss of parallel line.
12	Existing Network without Murraylink + HOTS upgrade	1900	520	N/A	N/A	1900	720	Vic ->SA - loss of MLTS-HYTS-APD ▫ Thermal limit defined by HYTS and relates to sharing between HYTS and HOTS ties.

Legend:

Existing Network	Including Murraylink as an MNSP with existing run-back schemes including NSW scheme
Murraylink optimised	Includes works required on the Victorian (and NSW) network to boost the Murraylink capacity to 220MW (as set out in Attachment 1)
Full SNI	Refers to all SNI works including Buronga – Robertstown 275kV line as identified in IOWG report September 2001
Unbundled SNI	Refers to all SNI works excluding the Buronga – Robertstown 275kV line
Alternative 3 (No PSTs)	The option as modified in the ACCC preliminary view on Murraylink regulated application, which does not include Phase Shift Transformers (i.e. 220kV overhead AC line from Redcliffs to Monash)
Alternative 3 (With PSTs)	The option as modified in the ACCC preliminary view on Murraylink regulated application, including Phase Shift Transformers (i.e. 220kV overhead AC line from Redcliffs to Monash) + 180MVArs of shunt capacitors in state grid
HYTS upgrade	Third HYTS transformer & series caps.
HOTS upgrade	220MW transfer IOWG option called HOTS "A". Consists of a 275kV line between Horsham and Tailem Bend, 220kV lines between MLTS and BATS; and BATS & HOTS - will also require trip scheme for loss of MLTS trf.

Notes:

1. Full capabilities may not be available due to interdependencies between transfers. Refer to discussion in main submission.
2. Results are based on analysis of the Victorian network. Works may be required in other States and are not addressed in this submission. There is an assumption that the NSW based runback scheme is operational and effective. Additionally, loading on the LTSS – Wagga circuit is raised as an area potentially requiring attention.