MURRAYLINK
Transmission Company

on behalf of **MURRAYLINK Transmission Partnership**

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17 March 2003

Sebastian Roberts
Acting General Manager, Regulatory Affairs – Electricity
Australian Competition & Consumer Commission
GPO Box 520J
Melbourne VIC 3001

Dear Mr Roberts

Application for Conversion to a Prescribed Service and Maximum Allowable Revenue

On behalf of Murraylink Transmission Partnership, Murraylink Transmission Company ("**MTC**") appreciates the opportunity to provide additional information to address issues that have arisen during the Commission's consideration of MTC's Application of 18 October 2002.

This response is supplementary to, and should be read in conjunction with, MTC's Application. This response is not final. MTC intends to respond further to any additional submissions made to the Commission by interested parties in relation to its Application, Commission staff have confirmed that the Commission will accept any such additional response from MTC.

Accordingly, this submission deals with:

- Additional market development scenarios and sensitivities for TEUS's calculation of Murraylink's market benefits; and
- The importance of phase-shifting transformers and regulators to the alternative projects.

Additional market development scenarios and sensitivities

TEUS has completed calculations of Murraylink's market benefits under three additional market development scenarios and, as a sensitivity test, with a set of variations to its short run marginal cost ("**SRMC**") bidding case.

The market development scenarios TEUS examined are Basslink and a package of augmentations that increase the capacity of the interconnector between the Snowy and Victorian regions ("**SnoVic**").

TEUS describes its results in the paper contained in **Attachment 1**.

In relation to the market development scenarios, TEUS found as follows:

Market Development Scenario	Murraylink's Market Benefits
Base case	$214 million
Basslink in place	$229 million
SnoVic augmentations in place	$201 million

As mentioned, TEUS also considered the case that generators might bid at twice their SRMC, in that case, examined extensions of the market simulation period of 1 to 6 years. TEUS's results for these sensitivities along with others requested by Saha Energy International during its recent review are set down in TEUS's paper.

The results of TEUS's previous and more recent market development and sensitivity calculations demonstrate again that TEUS's base case calculation of Murraylink's market benefits is sound, robust and conservative.

The Importance of Phase-Shifting Transformers and Regulators

For the purpose of determining a regulatory asset of Murraylink, BRW selected and assessment alternative projects that would provide the same technical service and thereby would generate the same market benefits as Murraylink.

Essential features of the AC alternative projects are phase shifting regulators for Alternative 1 and 4, and phase shifting transformers for Alternative 3, which provide a power flow control capability that contributes substantially to Murraylink's market benefits.

In its paper contained in **Attachment 2**, BRW describe the technical benefits of the phase shifting regulators/transformers, their ability to ensure that the alternative projects can transfer power in the same manner as Murraylink and their cost impact.

In Attachment 1, TEUS also describes its calculations that indicate that the increased transfer capacity due to the phase shifting transformers/regulators contribute $25 million to the market benefits of Murraylink and its alternative projects.

As always, we would be pleased to provide further information in relation to any matter that we have raised in this letter should the Commission request it.

Yours sincerely

Stéphane Mailhot
Chief Executive Officer
Murraylink Transmission Company

Attachments
1. TransÉnergie US
2. Burns and Roe Worley

Further Comments on Murraylink Market Benefits

Prepared for

Murraylink Transmission Company

By

TransÉnergie US Ltd.

March 14, 2003

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1 Market Development Scenarios

TEUS has completed calculations of Murraylink's market benefits under two additional market development scenarios and an alternative bidding strategy scenario. As a test of the sensitivity of gross market benefits to the year in which the market simulation ends, seven variations on the alternative bidding strategy scenario are shown:

Market Development Scenarios

1. Benefits of Murraylink Incremental to Basslink
2. Benefits of Murraylink Incremental to further SnoVic Interface augmentation

Alternative Bidding Strategy Scenario

3. Benefits of Murraylink using 200% SRMC Bidding
    a. last market simulation year 2012
    b. last market simulation year 2013
    c. last market simulation year 2014
    d. last market simulation year 2015
    e. last market simulation year 2016
    f. last market simulation year 2017
    g. last market simulation year 2018

All market benefit estimates are based on market simulation modeling of the appropriate assumptions over 2003-2012, except as indicated for the 200% SRMC bidding strategy cases.

The simulation methodology is identical to that used for the Base Case in MTC's Application. Results for years beyond the last market simulation year are assumed to replicate the last market simulation year.

TEUS has defined the respective market developments scenarios as shown in the following table:

Scenario	Summary of Significant Assumptions
Basslink	Modeled as a pumped storage facility in Victoria with 300 MW pumping capacity, 600 MW generating capacity, and 10% efficiency loss in both pumping and generating modes. In-Service date assumed Jan 1, 2005.
SnoVic Area Augmentations	SnoVic interface increased by 200 MW. In-Service date assumed Jan 1, 2005.
200% SRMC Bidding	Generator SRMC bids from Stage 1 Report assumed to be doubled. Interruptible loads and VoLL remain the

Gross market benefits for the alternative market development scenarios are shown in the table below. The gross market benefits are shown as the cumulative present worth over the period 2003-2042 using a discount rate of 9.25%. Note that the benefits of different scenarios will not necessarily add to produce the total benefit of a combination scenario. This occurs because there is a degree of overlap in the benefits provided by the different scenarios.

Scenario	Description	Gross Market Benefit (CPW $m)
	Base Case	214,240
1	Murraylink Incremental to Basslink	228,734
2	ML Incremental to SnoVic Augmentations	200,596
3a	200% SRMC - Last Yr Mkt Simulation 2012	201,807
3b	200% SRMC - Last Yr Mkt Simulation 2013	218,488
3c	200% SRMC - Last Yr Mkt Simulation 2014	308,637
3d	200% SRMC - Last Yr Mkt Simulation 2015	219,829
3e	200% SRMC - Last Yr Mkt Simulation 2016	219,044
3f	200% SRMC - Last Yr Mkt Simulation 2017	182,357
3g	200% SRMC - Last Yr Mkt Simulation 2018	225,680

The merchant entry schedules that were developed, and the annual cashflows that support the gross market benefit estimates, both by benefit category and in total, are shown in the section "Market Development Scenarios – Supporting Details" at the end of this document.

2 Value of Benefits Enabled by Phase Shifting Transformers

BRW has developed four alternative projects, each of which has been designed to replicate the technical service provided by Murraylink. The three AC alternatives incorporate phase shifting transformers (PSTs) to allow power flow to be controlled such that the alternatives will be able to deliver 220 MW of power as Murraylink does. Without the PSTs, analysis by TEA indicates flows over the AC alternatives into South Australia might be as low as 70 MW, and under more normal conditions might only be able to reach 190 MW.

Using Prosym and MARS analyses with interface limits modified to approximate these conditions, TEUS estimates that the benefits that would be provided by the AC alternatives configured without PSTs would be approximately $20-25m lower than those provided by Murraylink.

3 Sensitivity Tests

SEIL observed in their review of Murraylink's market benefits that sensitivity tests for a number of modeling parameters would provide useful insights. TEUS has evaluated the impact on Murraylink's Gross Market Benefits (GMB) of a number of parameters identified in the SEIL report as "key sensitivities" (see page 79 of the SEIL report). These findings are described and summarized below. Some of the results are drawn from additional analysis conducted by TEUS at SEIL's request, and the remainder are alternative assumptions applied to the original Base Case model results.

The table on the following page presents the summary of results. Further discussion of particular sensitivities appears immediately following the table. The discussion is important to a full understanding of the sensitivity results.

Sensitivity No.	Issue	Sensitivity Description	Gross Market Benefits Estimate $m
1		Base Case	214
	SRMC of Energy Production	Generators bid at 200% of SRMC	
2		Last Year of Modeled Results - 2012	202
3		Last Year of Modeled Results - 2018	226
4	Indexing	VoLL treated as $10,000/MWH in 2003 nominal dollar	199
5	Demand	High Growth	226
6	Demand	Low growth	136
7	O&M Costs	10% increase in merchant plant O&M	215
	Riverland Deferral	Timing	
8		Deferred 8 years	211
9		Deferred 9 years	213
10		Deferred 11 years	216
11		Deferred 12 years	217
		Cost	
12		High Cost of Riverland Augmentation	217
13		Low Cost of Riverland Augmentation	211
		O&M	
14		100% increase in deferred Riverland O&M	216
15		100% decrease in deferred Riverland O&M	212
	Long Run Equilibrium	Year in which model results are assumed to represent long run equilibrium	
16		2012	214
17		2013	246
18		2014	239
19		2015	270
20		2016	244
21		2017	262
22		2018	218
	Discount Factor	Discount factor used to calculate cumulative present Worth of Gross Market Benefits	
23		8.25%	234
24		9.25%	214
25		10.25%	198

Sensitivities 2-3 - SRMC of energy production
Generators are assumed to bid at 200% of the short run marginal costs provided by the Stage 1 Report. These sensitivities were designed, at SEIL's request, to create energy prices high enough to attract baseload merchant entry. The Gross Market Benefits (GMB), based on model runs through 2012 (i.e. long run equilibrium assumed to be achieved in 2012) were $202m. GMB based on model runs through 2018 amount to $226m.

Sensitivity 4 - Indexing
Indexing refers to the implicit assumption made by TEUS that VoLL will increase with inflation. TEUS has not studied in detail the alternative case where VoLL remains constant at $10,000/MWH in nominal dollars, and therefore declines in real dollars. This slow decline in the value of VoLL would not significantly change the energy benefits, market entry, or amount of unserved energy, but it would cause a reduction of approximately $15m in the value of unserved energy. Ignoring any other secondary impacts, this results in GMB of $199m.

TEUS has reviewed and discussed with SEIL aspects of a $20,000/MWH VoLL case. TEUS found that VoLL at $20,000/MWH was insufficient to cause baseload merchant entry, and hence, the case was not pursued further.

Sensitivities 5-6 - Demand
MTC's original application included three load growth scenarios drawn directly from the IRPC Stage 1 Report – base, high and low. The GMB, respectively, for these cases were:

	GMB	Compound Annual Load Growth
Base	$214m	2.2%
High	$226m	3.2%
Low	$136m	1.3%

Sensitivity 7 - O&M Costs
With higher O&M costs, merchant entry will be less attractive. However, TEUS expects changes in this assumption would affect the With and Without Murraylink cases equivalently, resulting in little or no change in the amount of deferred capacity. However, the value of each deferred MW would increase. Increasing O&M costs by 10% would raise the base case GBM by $0.5m to $214.7m.

Sensitivity 8-15 - Timing and Requirements of Riverland Deferral
No further comment.

Sensitivity 16-22 - Assumptions on Long Run Equilibrium & Length of Benefits Stream
TEUS provided an extended Base Case (out to 2018) to SEIL to address their concerns about the assumption made by TEUS that equilibrium was reached in 2012. The results of that analysis, shown on page 31 of SEIL's Report, indicate that GMB would have been

as much as $5-60m higher if market development and market balancing had been extended for several additional years.

Sensitivity 23-25 - Discount Factor

TEUS notes that a different discount rate would presumably go hand-in-hand with a different WACC. An increase in GMB due to a lower discount rate would not necessarily translate into an increase in Murraylink revenues.

Market Development Scenarios – Supporting Details

	Base Case Market Entry Schedule							
	With Murraylink Cumulative Additions				Without Murraylink Cumulative Additions			
	CC MW	OCGT MW	Black Coal MW	Brown Coal MW	CC MW	OCGT MW	Black Coal MW	Brown Coal MW
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	50	0	0
2010	0	150	0	0	0	300	0	0
2011	0	500	0	0	0	700	0	0
2012	0	750	0	0	0	900	0	0

	Murraylink Incremental to Basslink Market Entry Schedule							
	With Murraylink Cumulative Additions				Without Murraylink Cumulative Additions			
	CC MW	OCGT MW	Black Coal MW	Brown Coal MW	CC MW	OCGT MW	Black Coal MW	Brown Coal MW
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	50	0	0
2011	0	50	0	0	0	350	0	0
2012	0	350	0	0	0	650	0	0

	Murraylink Incremental to SnoVic Interface Augmentations Market Entry Schedule							
	With Murraylink Cumulative Additions				Without Murraylink Cumulative Additions			
	CC MW	OCGT MW	Black Coal MW	Brown Coal MW	CC MW	OCGT MW	Black Coal MW	Brown Coal MW
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	100	0	0	0	300	0	0
2011	0	400	0	0	0	600	0	0
2012	0	700	0	0	0	850	0	0

	200% SRMC Bidding Market Entry Schedule							
	With Murraylink Cumulative Additions				Without Murraylink Cumulative Additions			
	CC MW	OCGT MW	Black Coal MW	Brown Coal MW	CC MW	OCGT MW	Black Coal MW	Brown Coal MW
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	450	0	0	0	450	0
2007	0	0	900	0	0	0	900	0
2008	0	0	900	0	0	0	900	0
2009	0	0	1350	0	0	0	1350	0
2010	0	0	1350	500	180	0	1350	0
2011	0	50	1800	500	180	100	1800	500
2012	180	250	1800	500	180	400	1800	500
2013	180	250	2250	500	180	400	2250	500
2014	180	300	2250	1000	360	400	2700	500
2015	360	300	3150	1000	360	400	3150	1000
2016	360	400	3600	1000	360	500	3600	1000
2017	360	400	4050	1500	540	500	4050	1000
2018	540	400	4500	1500	540	500	4500	1500

Base Case Gross Market Benefit Annual Cashflow							
Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3309	0	0	15	40500	192	44016
2004	5946	0	0	55	0	288	6290
2005	5765	0	0	199	0	288	6253
2006	6283	0	0	415	0	288	6987
2007	7000	0	0	1092	0	288	8381
2008	8132	0	0	3050	-500	288	10970
2009	9418	26760	268	4275	0	288	41009
2010	9119	53520	803	6835	0	288	70564
2011	5183	26760	1070	6355	0	288	39656
2012	7602	-26760	803	9407	0	288	-8660
2013	7602	0	803	9407	-40000	0	-22188
2014	7602	0	803	9407	0	0	17812
2015	7602	0	803	9407	0	0	17812
2016	7602	0	803	9407	0	0	17812
2017	7602	0	803	9407	0	0	17812
2018	7602	0	803	9407	0	0	17812
2019	7602	0	803	9407	0	0	17812
2020	7602	0	803	9407	0	0	17812
2021	7602	0	803	9407	0	0	17812
2022	7602	0	803	9407	0	0	17812
2023	7602	0	803	9407	0	0	17812
2024	7602	0	803	9407	0	0	17812
2025	7602	0	803	9407	0	0	17812
2026	7602	0	803	9407	0	0	17812
2027	7602	0	803	9407	0	0	17812
2028	7602	0	803	9407	0	0	17812
2029	7602	0	803	9407	0	0	17812
2030	7602	0	803	9407	0	0	17812
2031	7602	0	803	9407	0	0	17812
2032	7602	0	803	9407	0	0	17812
2033	7602	0	803	9407	0	0	17812
2034	7602	0	803	9407	0	0	17812
2035	7602	0	803	9407	0	0	17812
2036	7602	0	803	9407	0	0	17812
2037	7602	0	803	9407	0	0	17812
2038	7602	0	803	9407	0	0	17812
2039	7602	0	803	9407	0	0	17812
2040	7602	0	803	9407	0	0	17812
2041	7602	0	803	9407	0	0	17812
2042	6981	0	602	3674	0	0	11257

1. Murraylink Incremental to Basslink Gross Market Benefit Annual Cashflow							
Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3309	0	0	15	40500	192	44016
2004	5946	0	0	55	0	288	6290
2005	5736	0	0	159	0	288	6184
2006	5781	0	0	386	0	288	6456
2007	6493	0	0	869	0	288	7650
2008	7674	0	0	1898	-500	288	9360
2009	10167	0	0	3787	0	288	14242
2010	14208	26760	268	5939	0	288	47464
2011	5751	133800	1606	7460	0	288	148905
2012	3221	0	1606	8408	0	288	13522
2013	3221	0	1606	8408	-40000	0	-26766
2014	3221	0	1606	8408	0	0	13234
2015	3221	0	1606	8408	0	0	13234
2016	3221	0	1606	8408	0	0	13234
2017	3221	0	1606	8408	0	0	13234
2018	3221	0	1606	8408	0	0	13234
2019	3221	0	1606	8408	0	0	13234
2020	3221	0	1606	8408	0	0	13234
2021	3221	0	1606	8408	0	0	13234
2022	3221	0	1606	8408	0	0	13234
2023	3221	0	1606	8408	0	0	13234
2024	3221	0	1606	8408	0	0	13234
2025	3221	0	1606	8408	0	0	13234
2026	3221	0	1606	8408	0	0	13234
2027	3221	0	1606	8408	0	0	13234
2028	3221	0	1606	8408	0	0	13234
2029	3221	0	1606	8408	0	0	13234
2030	3221	0	1606	8408	0	0	13234
2031	3221	0	1606	8408	0	0	13234
2032	3221	0	1606	8408	0	0	13234
2033	3221	0	1606	8408	0	0	13234
2034	3221	0	1606	8408	0	0	13234
2035	3221	0	1606	8408	0	0	13234
2036	3221	0	1606	8408	0	0	13234
2037	3221	0	1606	8408	0	0	13234
2038	3221	0	1606	8408	0	0	13234
2039	3221	0	1606	8408	0	0	13234
2040	3221	0	1606	8408	0	0	13234
2041	3221	0	1606	8408	0	0	13234
2042	5688	0	1204	3476	0	0	10368

2. Murraylink Incremental to SnoVic Interface Augmentations

Gross Market Benefit Annual Cashflow

Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3309	0	0	15	40500	192	44016
2004	5946	0	0	55	0	288	6290
2005	5772	0	0	183	0	288	6243
2006	6217	0	0	421	0	288	6926
2007	6740	0	0	1006	0	288	8035
2008	8109	0	0	2274	-500	288	10172
2009	10845	0	0	3906	0	288	15040
2010	7140	107040	1070	5932	0	288	121470
2011	8548	0	1070	7598	0	288	17505
2012	7553	-26760	803	6485	0	288	-11631
2013	7553	0	803	6485	-40000	0	-25159
2014	7553	0	803	6485	0	0	14841
2015	7553	0	803	6485	0	0	14841
2016	7553	0	803	6485	0	0	14841
2017	7553	0	803	6485	0	0	14841
2018	7553	0	803	6485	0	0	14841
2019	7553	0	803	6485	0	0	14841
2020	7553	0	803	6485	0	0	14841
2021	7553	0	803	6485	0	0	14841
2022	7553	0	803	6485	0	0	14841
2023	7553	0	803	6485	0	0	14841
2024	7553	0	803	6485	0	0	14841
2025	7553	0	803	6485	0	0	14841
2026	7553	0	803	6485	0	0	14841
2027	7553	0	803	6485	0	0	14841
2028	7553	0	803	6485	0	0	14841
2029	7553	0	803	6485	0	0	14841
2030	7553	0	803	6485	0	0	14841
2031	7553	0	803	6485	0	0	14841
2032	7553	0	803	6485	0	0	14841
2033	7553	0	803	6485	0	0	14841
2034	7553	0	803	6485	0	0	14841
2035	7553	0	803	6485	0	0	14841
2036	7553	0	803	6485	0	0	14841
2037	7553	0	803	6485	0	0	14841
2038	7553	0	803	6485	0	0	14841
2039	7553	0	803	6485	0	0	14841
2040	7553	0	803	6485	0	0	14841
2041	7553	0	803	6485	0	0	14841
2042	5045	0	602	2906	0	0	8553

3. 200% SRMC Bidding - Last Year 2012 Gross Market Benefit Annual Cashflow							
Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9022	0	803	5630	-40000	0	-24545
2014	9022	0	803	5630	0	0	15455
2015	9022	0	803	5630	0	0	15455
2016	9022	0	803	5630	0	0	15455
2017	9022	0	803	5630	0	0	15455
2018	9022	0	803	5630	0	0	15455
2019	9022	0	803	5630	0	0	15455
2020	9022	0	803	5630	0	0	15455
2021	9022	0	803	5630	0	0	15455
2022	9022	0	803	5630	0	0	15455
2023	9022	0	803	5630	0	0	15455
2024	9022	0	803	5630	0	0	15455
2025	9022	0	803	5630	0	0	15455
2026	9022	0	803	5630	0	0	15455
2027	9022	0	803	5630	0	0	15455
2028	9022	0	803	5630	0	0	15455
2029	9022	0	803	5630	0	0	15455
2030	9022	0	803	5630	0	0	15455
2031	9022	0	803	5630	0	0	15455
2032	9022	0	803	5630	0	0	15455
2033	9022	0	803	5630	0	0	15455
2034	9022	0	803	5630	0	0	15455
2035	9022	0	803	5630	0	0	15455
2036	9022	0	803	5630	0	0	15455
2037	9022	0	803	5630	0	0	15455
2038	9022	0	803	5630	0	0	15455
2039	9022	0	803	5630	0	0	15455
2040	9022	0	803	5630	0	0	15455
2041	9022	0	803	5630	0	0	15455
2042	8327	0	602	2509	0	0	11437

3. 200% SRMC Bidding - Last Year 2013

Gross Market Benefit Annual Cashflow

Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	9445	0	803	9000	0	0	19248
2015	9445	0	803	9000	0	0	19248
2016	9445	0	803	9000	0	0	19248
2017	9445	0	803	9000	0	0	19248
2018	9445	0	803	9000	0	0	19248
2019	9445	0	803	9000	0	0	19248
2020	9445	0	803	9000	0	0	19248
2021	9445	0	803	9000	0	0	19248
2022	9445	0	803	9000	0	0	19248
2023	9445	0	803	9000	0	0	19248
2024	9445	0	803	9000	0	0	19248
2025	9445	0	803	9000	0	0	19248
2026	9445	0	803	9000	0	0	19248
2027	9445	0	803	9000	0	0	19248
2028	9445	0	803	9000	0	0	19248
2029	9445	0	803	9000	0	0	19248
2030	9445	0	803	9000	0	0	19248
2031	9445	0	803	9000	0	0	19248
2032	9445	0	803	9000	0	0	19248
2033	9445	0	803	9000	0	0	19248
2034	9445	0	803	9000	0	0	19248
2035	9445	0	803	9000	0	0	19248
2036	9445	0	803	9000	0	0	19248
2037	9445	0	803	9000	0	0	19248
2038	9445	0	803	9000	0	0	19248
2039	9445	0	803	9000	0	0	19248
2040	9445	0	803	9000	0	0	19248
2041	9445	0	803	9000	0	0	19248
2042	8241	0	602	3825	0	0	12668

3. 200% SRMC Bidding - Last Year 2014 Gross Market Benefit Annual Cashflow							
Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	38178	-52899	274	8429	0	0	-6018
2015	38178	0	274	8429	0	0	46881
2016	38178	0	274	8429	0	0	46881
2017	38178	0	274	8429	0	0	46881
2018	38178	0	274	8429	0	0	46881
2019	38178	0	274	8429	0	0	46881
2020	38178	0	274	8429	0	0	46881
2021	38178	0	274	8429	0	0	46881
2022	38178	0	274	8429	0	0	46881
2023	38178	0	274	8429	0	0	46881
2024	38178	0	274	8429	0	0	46881
2025	38178	0	274	8429	0	0	46881
2026	38178	0	274	8429	0	0	46881
2027	38178	0	274	8429	0	0	46881
2028	38178	0	274	8429	0	0	46881
2029	38178	0	274	8429	0	0	46881
2030	38178	0	274	8429	0	0	46881
2031	38178	0	274	8429	0	0	46881
2032	38178	0	274	8429	0	0	46881
2033	38178	0	274	8429	0	0	46881
2034	38178	0	274	8429	0	0	46881
2035	38178	0	274	8429	0	0	46881
2036	38178	0	274	8429	0	0	46881
2037	38178	0	274	8429	0	0	46881
2038	38178	0	274	8429	0	0	46881
2039	38178	0	274	8429	0	0	46881
2040	38178	0	274	8429	0	0	46881
2041	38178	0	274	8429	0	0	46881
2042	24726	0	205	4110	0	0	29041

3. 200% SRMC Bidding - Last Year 2015

Gross Market Benefit Annual Cashflow

Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	38178	-52899	274	8429	0	0	-6018
2015	11939	26139	535	7503	0	0	46117
2016	11939	0	535	7503	0	0	19977
2017	11939	0	535	7503	0	0	19977
2018	11939	0	535	7503	0	0	19977
2019	11939	0	535	7503	0	0	19977
2020	11939	0	535	7503	0	0	19977
2021	11939	0	535	7503	0	0	19977
2022	11939	0	535	7503	0	0	19977
2023	11939	0	535	7503	0	0	19977
2024	11939	0	535	7503	0	0	19977
2025	11939	0	535	7503	0	0	19977
2026	11939	0	535	7503	0	0	19977
2027	11939	0	535	7503	0	0	19977
2028	11939	0	535	7503	0	0	19977
2029	11939	0	535	7503	0	0	19977
2030	11939	0	535	7503	0	0	19977
2031	11939	0	535	7503	0	0	19977
2032	11939	0	535	7503	0	0	19977
2033	11939	0	535	7503	0	0	19977
2034	11939	0	535	7503	0	0	19977
2035	11939	0	535	7503	0	0	19977
2036	11939	0	535	7503	0	0	19977
2037	11939	0	535	7503	0	0	19977
2038	11939	0	535	7503	0	0	19977
2039	11939	0	535	7503	0	0	19977
2040	11939	0	535	7503	0	0	19977
2041	11939	0	535	7503	0	0	19977
2042	9454	0	401	3292	0	0	13147

3. 200% SRMC Bidding - Last Year 2016

Gross Market Benefit Annual Cashflow

Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	38178	-52899	274	8429	0	0	-6018
2015	11939	26139	535	7503	0	0	46117
2016	11897	0	535	7298	0	0	19731
2017	11897	0	535	7298	0	0	19731
2018	11897	0	535	7298	0	0	19731
2019	11897	0	535	7298	0	0	19731
2020	11897	0	535	7298	0	0	19731
2021	11897	0	535	7298	0	0	19731
2022	11897	0	535	7298	0	0	19731
2023	11897	0	535	7298	0	0	19731
2024	11897	0	535	7298	0	0	19731
2025	11897	0	535	7298	0	0	19731
2026	11897	0	535	7298	0	0	19731
2027	11897	0	535	7298	0	0	19731
2028	11897	0	535	7298	0	0	19731
2029	11897	0	535	7298	0	0	19731
2030	11897	0	535	7298	0	0	19731
2031	11897	0	535	7298	0	0	19731
2032	11897	0	535	7298	0	0	19731
2033	11897	0	535	7298	0	0	19731
2034	11897	0	535	7298	0	0	19731
2035	11897	0	535	7298	0	0	19731
2036	11897	0	535	7298	0	0	19731
2037	11897	0	535	7298	0	0	19731
2038	11897	0	535	7298	0	0	19731
2039	11897	0	535	7298	0	0	19731
2040	11897	0	535	7298	0	0	19731
2041	11897	0	535	7298	0	0	19731
2042	9399	0	401	3368	0	0	13169

3. 200% SRMC Bidding - Last Year 2017

Gross Market Benefit Annual Cashflow

Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	38178	-52899	274	8429	0	0	-6018
2015	11939	26139	535	7503	0	0	46117
2016	11897	0	535	7298	0	0	19731
2017	63994	-604155	-5506	8854	0	0	-536814
2018	63994	0	-5506	8854	0	0	67341
2019	63994	0	-5506	8854	0	0	67341
2020	63994	0	-5506	8854	0	0	67341
2021	63994	0	-5506	8854	0	0	67341
2022	63994	0	-5506	8854	0	0	67341
2023	63994	0	-5506	8854	0	0	67341
2024	63994	0	-5506	8854	0	0	67341
2025	63994	0	-5506	8854	0	0	67341
2026	63994	0	-5506	8854	0	0	67341
2027	63994	0	-5506	8854	0	0	67341
2028	63994	0	-5506	8854	0	0	67341
2029	63994	0	-5506	8854	0	0	67341
2030	63994	0	-5506	8854	0	0	67341
2031	63994	0	-5506	8854	0	0	67341
2032	63994	0	-5506	8854	0	0	67341
2033	63994	0	-5506	8854	0	0	67341
2034	63994	0	-5506	8854	0	0	67341
2035	63994	0	-5506	8854	0	0	67341
2036	63994	0	-5506	8854	0	0	67341
2037	63994	0	-5506	8854	0	0	67341
2038	63994	0	-5506	8854	0	0	67341
2039	63994	0	-5506	8854	0	0	67341
2040	63994	0	-5506	8854	0	0	67341
2041	63994	0	-5506	8854	0	0	67341
2042	43381	0	-4130	3811	0	0	43062

3. 200% SRMC Bidding - Last Year 2018 Gross Market Benefit Annual Cashflow							
Year	Energy Savings	Merchant Entry Capital Deferral	Avoided Merchant Entry O&M	Reliability Benefit	Riverland Capital Deferral	Riverland O&M Deferral	Total
2003	3302	0	0	14	40500	192	44008
2004	5919	0	0	55	0	288	6263
2005	5706	0	0	199	0	288	6194
2006	6240	0	0	404	0	288	6933
2007	7827	0	0	980	0	288	9095
2008	7900	0	0	1830	-500	288	9518
2009	9253	0	0	4575	0	288	14116
2010	68034	-604155	-6042	5847	0	288	-536028
2011	5082	829560	2254	6617	0	288	843802
2012	9022	-145125	803	5630	0	288	-129381
2013	9445	0	803	9000	-40000	0	-20752
2014	38178	-52899	274	8429	0	0	-6018
2015	11939	26139	535	7503	0	0	46117
2016	11897	0	535	7298	0	0	19731
2017	63994	-604155	-5506	8854	0	0	-536814
2018	14276	604155	535	7870	0	0	626836
2019	14276	0	535	7870	0	0	22681
2020	14276	0	535	7870	0	0	22681
2021	14276	0	535	7870	0	0	22681
2022	14276	0	535	7870	0	0	22681
2023	14276	0	535	7870	0	0	22681
2024	14276	0	535	7870	0	0	22681
2025	14276	0	535	7870	0	0	22681
2026	14276	0	535	7870	0	0	22681
2027	14276	0	535	7870	0	0	22681
2028	14276	0	535	7870	0	0	22681
2029	14276	0	535	7870	0	0	22681
2030	14276	0	535	7870	0	0	22681
2031	14276	0	535	7870	0	0	22681
2032	14276	0	535	7870	0	0	22681
2033	14276	0	535	7870	0	0	22681
2034	14276	0	535	7870	0	0	22681
2035	14276	0	535	7870	0	0	22681
2036	14276	0	535	7870	0	0	22681
2037	14276	0	535	7870	0	0	22681
2038	14276	0	535	7870	0	0	22681
2039	14276	0	535	7870	0	0	22681
2040	14276	0	535	7870	0	0	22681
2041	14276	0	535	7870	0	0	22681
2042	11171	0	401	4172	0	0	15744

Burns and Roe Worley

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power & water expertise

14 March 2003

REF: 024/45003

Murraylink Transmission Company
GPO Box 7077
Riverside Centre
BRISBANE QLD 4001

Attention: Stephane Mailhot
Chief Executive

MURRAYLINK COMMENTS ON INCLUSION OF PHASE SHIFTING TRANSFORMERS IN ALTERNATIVE PROJECTS

Dear Stephane

Phase shifting transformers have been included in the Alternatives 1, 3 and 4 to achieve the equivalent power flow characteristics of the Murraylink project – Alternative 2 will have these characteristics as it is essentially an overhead line equivalent of the existing Murraylink DC interconnection.

The phase shifting transformers provide the ability to control power flows over the alternative AC interconnectors thus replicating the performance of Murraylink. Without the phase shifting transformers, and for a given level of dispatch for the various generators, power flows over the various Victoria, NSW and South Australian interconnections will be determined by the relative system impedances. In the case of an AC interconnector replacing Murraylink, the dominant influence will be the "path of least resistance" offered by the Heywood Victoria – South Australia interconnector ie. the power flow over the Murraylink equivalent is heavily dependant on the Heywood Victoria-South Australia power flow. The Victoria – Snowy/NSW interconnector is a lessor influence and basically controls the "spread" of the power flow on the Murraylink equivalent. This is illustrated in Figure 1.

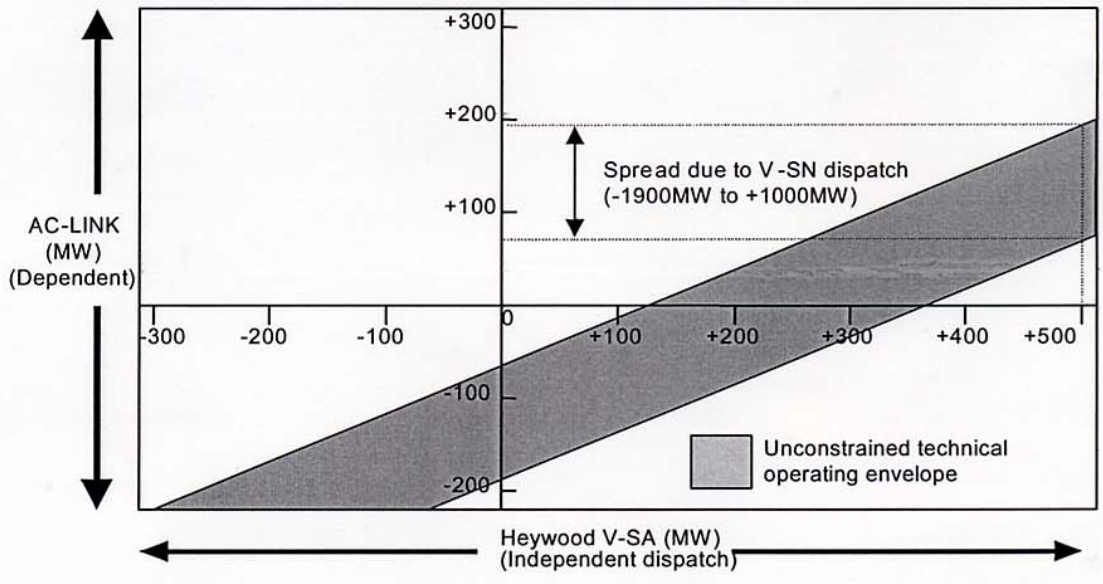


FIGURE 1. Operating envelope for an AC Interconnector in parallel with other AC Interconnectors - No Phase Shifting Transformer

The power flow over the alternative AC link without a phase shifting transformer would be between 70MW and 190MW with the Heywood interconnector dispatched at 500MW, the spread being due to the magnitude and direction of the Victoria – Snowy/NSW power flow. This is **not** equivalent to the performance of Murraylink where as for a DC link there is no dependency on the power flows on the other interconnectors.

Another important consideration is the potential for a constraint on the existing Heywood interconnector to reduce the available transfer on the alternative AC link. Inclusion of a phase shifting transformer decreases the impact of this reduction, although not to the same extent as having a fully controllable DC link such as Murraylink. For example, whenever lightning occurs in the south eastern region of South Australia, the Heywood maximum transfer is reduced to 250MW. Due to the nature of parallel AC power flows, such a reduction would also reduce the available transfer on the AC alternative. Conversely, a constraint on the AC alternative (e.g. due to network outages back within the system) would require a reduction in the Heywood transfer. The impact is lessened with a phase shifting transformer (by reduction of the phase shift and power transfer) although again not to the same extent as that offered by a fully controllable DC link. There is also the potential for undesirable market outcomes with a conventional AC link connecting South Australia to Buronga when Victoria is exporting heavily to both the Snowy and the South Australia regions. Loop flows may occur (i.e. power flow from to low priced Victorian region to South Australia via Heywood and then from South Australia to NSW via the alternative) resulting in a negative settlements residue. Such an outcome is less likely with a phase shifting transformer and not possible with a DC link.

The alternative projects have been selected and defined to provide an equivalent level of performance to that of Murraylink, i.e. a transfer capability of 220MW regardless of the state of power flows across the existing Heywood interconnector. The inclusion of phase shifting transformers enables the loading on the interconnector to be controlled by introducing a controllable phase shift across the transformer which virtually forces the power flow through it and the interconnector. The tapping and phase angle ranges of the phase shifting transformers provide for the same operating envelope as for the Murraylink DC interconnector. Without the phase shifting transformers, Alternatives 1,3 and 4 are **not** equivalent projects as a basis for determination of the regulatory asset valuation.

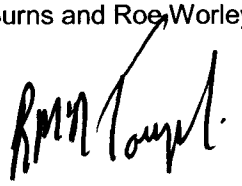
The phase shifting transformers (PSTs) have a higher capital cost than conventional transformers. The cost impact of the inclusion of phase shifting transformers in the three AC alternative projects is given in Table 1.

	Alternative 1 $ million	**Alternative 3** $ million	**Alternative 4** $ million
Base Cost with PSTs	235.5	189.4	194.9
Base Cost without PSTs	212.9	172.7	172.3
Total NPV with PSTs	285.8	240.4	241.9
Total NPV without PSTs	262.2	222.6	218.5

Table 1: Cost Impact of Phase Shifting Transformers on AC Alternatives

The variations in the cost impact of the inclusion of the phase shifting transformers are due to differences in equipment configurations and, in the case of Alternative 3, the need to include conventional transformers in place of the phase shifting types.

Yours sincerely
Burns and Roe Worley



R McD Touzel
General Manager, Consulting