

Western Australian Gas Supply: A 2008 Perspective



Policy developments over the past 15 months in the Federal and State Government arenas have been directed at concerns over the shortage of gas being developed for the domestic gas market in Western Australia, amid claims that gas resource owners have been warehousing their resources for export markets. The Federal Government is reported as being prepared to apply tougher conditions on the renewal of the 27 retention leases due this year, while the WA Government has introduced a domestic gas reservation policy on LNG projects.

RISC is releasing a comprehensive report at the 2008 APPEA Conference which investigates opportunities for commercialisation of potential gas projects in Western Australia through export or domestic gas markets over the next decade.

The RISC study also seeks to determine the producer gas price envelope, for resources to be developed or committed to the domestic market, that would be applied in a commerciality test for the granting or rejection of a retention lease application.

www.riscpl.com

Integrity ♦ Experience ♦ Advice

The report will provide West Australian gas industry participants with an appreciation of the boundaries of the price envelope within which successful negotiated outcomes for gas supply can be realised.



The study looks at:

- WA gas supply and demand
- the price that consumers may be prepared to pay for their gas
- the breakeven price of supply of gas developed for the domestic gas market
- the netback price of gas and the opportunity cost of this gas that LNG project proponents could have achieved if this gas were sold as LNG
- recent publicized realised market prices.

In addition to the distribution of this study which is specific to WA, RISC often performs gas market studies and analyses for both gas suppliers and buyers.

Sales enquiries:

Robbie Sworder +61 8 94206660 or

Email: robbies@riscpl.com



Strictly Confidential
April 2008

Western Australian Gas Supply:
A 2008 Perspective



About the Authors

RISC (Resource Investment Strategy Consultants) was founded in 1994 to provide advice to the oil and gas industry on the acquisition, development, management and sale of assets. Based in Perth, Australia, the company has to date completed over one thousand assignments for over 350 clients in Australia, New Zealand, PNG, Malaysia, Thailand, Iraq, Indonesia, Vietnam, China, Myanmar, Philippines, Columbia, Nigeria, Mauritania, Cote D'Ivoire, Dubai, Qatar, Oman, Libya, Sudan and India. Since January 2000, RISC has been the principle technical and economic advisor on transactions whose total value has exceeded US\$140 billion.

The principals of RISC have also had responsible charge for the preparation of reserves statements, the preparation, evaluation and implementation of oil and gas field development plans, gas and LNG contracting, joint venture negotiations and evaluation of new business opportunities during their careers with major organisations such as Shell, BP, Arco, Santos, Mobil, Petrofina and Woodside. Further corporate information about RISC can be found on our website <http://www.riscpl.com>

As almost all of our work is highly confidential and commercially sensitive, we have a policy not to name clients or discuss current assignments unless knowledge of our involvement is already in the public domain, or where our clients have given specific consent to disclosure.

RISC's experience with gas related projects include:

- Multi-client and privately commissioned gas supply and demand studies of domestic markets in the Eastern States and Western Australia.
- Independent expert witness testimony in gas price arbitration and contract disputes, including technical and commercial support to the development of legal argument.
- Independent Technical Specialist assessment of gas reserves and project development plans for fields and downstream gas infrastructure for IPO's or for certification purposes.
- Independent valuation, including technical and commercial due diligence assessment of projects supplying domestic and LNG markets for equity acquisition.
- Advice to government in relation to the fiscal impact on commercial terms and conditions proposed between common upstream and downstream parties of a green-fields offshore gas project and onshore LNG plant.
- Development of gas sales contracting/marketing strategies for both buyers and sellers.

Further details on RISC's capabilities and past experience can be found on our web site: www.riscpl.com

Contact

Perth: Ph: +61 8 9420 6660

Fax: +61 8 9420 6690

About this Document

This document has been compiled by **RISC (Resource Investment Strategy Consultants)** to provide information to industry participants on the issues and opportunities for the commercialisation of potential Western Australian gas resource projects through export or domestic energy markets particularly over the next decade.

The **Western Australian Gas Supply 2008** report is an invaluable resource for market participants, incorporating an evaluation of current and future supply and demand for gas in the Western Australian gas market.

Disclaimer

Material contained in this publication is based solely on data sourced from the public domain. The data used is believed to be reliable and accurate. Whilst all due care has been exercised in preparing this document, no representation is given, warranty made, or responsibility taken as to the accuracy, timeliness or completeness of any information contained in this document, and neither RISC Pty Ltd, their servants or agents will be liable to the reader in contract or tort (including in negligence) or otherwise for any loss or damage arising as a result of the reader relying on any information, forecast or recommendation (except in so far as any statutory liability cannot be excluded).

Confidentiality

The information, i.e. the interpretation of public domain data, contained in this document is strictly confidential. The purchaser agrees not to appropriate, copy or in any other manner reproduce or otherwise disclose any of the information contained in this document to any other person (other than the employees or servants of the purchaser acting in the course of their employment with the purchaser).

Copyright

This document is protected by copyright laws and is intended for the use of the purchaser only. Any unauthorised reproduction or distribution of the document or any portion of it may entitle a claim for damages.

Table of Contents

About the Authors.....	ii
1 EXECUTIVE SUMMARY	1
1.1 SUPPLY.....	3
1.1.1 Developed Reserves.....	5
1.1.2 Undeveloped Resources.....	6
1.1.3 Commerciality Test and Cost of Supply.....	8
1.2 DEMAND.....	13
1.3 CONSUMER GAS PRICES.....	15
1.4 SUPPLY – DEMAND BALANCE	18
1.4.1 Medium Demand Scenario	19
1.5 CONCLUSIONS.....	25
2 WESTERN AUSTRALIAN GAS SUPPLY	27
2.1 SUPPLY OVERVIEW	27
2.1.1 Developed Reserves.....	32
2.1.2 Undeveloped Resources.....	33
2.2 RETENTION LEASE POLICY	33
2.3 DOMESTIC GAS RESERVATION POLICY	37
2.3.1 Implications Of Government Policies on WA Gas Supply	37
3 WESTERN AUSTRALIAN GAS SUPPLY OPPORTUNITIES	39
3.1 ASIA-PACIFIC LNG MARKET	39
3.1.1 Demand.....	39
3.1.2 Supply	41
3.1.3 LNG Price	44
3.2 WA DOMESTIC GAS MARKET.....	47
3.2.1 Demand Overview	47
3.3 FORECAST DEMAND BY MARKET SEGMENT: TOP-DOWN.....	49
3.4 FORECAST DEMAND BY MARKET SEGMENT: BOTTOM-UP.....	51
3.4.1 Power Generation.....	51
3.4.2 Alumina.....	58
3.4.3 Iron Ore Mining & Processing.....	59
3.4.4 Other Mining.....	61
3.4.5 Manufacturing - Chemicals.....	63
3.4.6 Manufacturing – Non Mineral Products	63

3.4.7	Residential and Commercial	64
3.4.8	Overall Demand – Price Unconstrained	66
3.5	WA CONSUMER GAS PRICES	68
3.5.1	WA Consumer Prices Adjusted to Wellhead-basis	71
3.5.2	Contestable Demand – Unconstrained by Gas Supply Prices	72
4	WA GAS SUPPLY	75
4.1	COMMERCIALITY TEST AND COST OF SUPPLY	75
4.1.1	Development Cost Increases	76
4.1.2	Gas Quality	77
4.1.3	LNG Hurdle rates.....	78
4.2	SUPPLY PROJECTS - PRODUCERS.....	79
4.2.1	North West Shelf Gas Project (NWSGP)	79
4.2.2	John Brookes.....	81
4.2.3	Harriet Joint Venture (HJV).....	82
4.3	SUPPLY PROJECTS – UNDEVELOPED (DOMESTIC GAS ONLY)	83
4.3.1	Julimar/Brunello	83
4.3.2	Macedon.....	85
4.3.3	Maitland	86
4.3.4	Reindeer/Caribou	87
4.3.5	West Tryal Rocks.....	88
4.3.6	Wheatstone.....	89
4.4	SUPPLY PROJECTS – UNDEVELOPED (LNG)	91
4.4.1	GorgoN	91
4.4.2	Ichthys.....	93
4.4.3	Pluto	95
4.4.4	Scarborough (Pilbara LNG).....	97
4.4.5	Torosa / Brecknock (Browse LNG).....	98
4.5	OVERALL UNCOMMITTED DOMESTIC GAS SUPPLY.....	101
5	SUPPLY - DEMAND BALANCE.....	104
5.1	LOW DEMAND SCENARIO.....	105
5.2	MEDIUM DEMAND SCENARIO	109
5.3	HIGH DEMAND SCENARIO	114
6	CONCLUSIONS.....	119
7	LIST OF TERMS.....	121

APPENDIX 1: WA GAS PIPELINE INFRASTRUCTURE	129
APPENDIX 2: RISC GAS MARKET ALLOCATION MODEL METHODOLOGY	135
APPENDIX 3: SECTION 38B EXTRACT FROM THE <i>PETROLEUM (SUBMERGED LANDS) ACT 1967</i>	141

List of Figures

Figure 1.1: WA P50 Gas Resource Ownership by Joint Venture at end-2006.....	4
Figure 1.2: Ownership of WA P50 and P90 Gas Resources by Company at end-2006.....	4
Figure 1.3: WA 2006 Domestic Gas Sales – 319 PJ.....	5
Figure 1.4: Resource Profile vs Acreage Renewal date.....	7
Figure 1.5: WA Uncommitted Domgas Supply (with Wheatstone dedicated to Domestic gas) – By Supplier	10
Figure 1.6: WA Uncommitted Domestic gas Supply (excluding Wheatstone) – By Supplier 11	
Figure 1.7: WA Uncommitted Domestic gas Supply (including Wheatstone) - By Producer Price	12
Figure 1.8: Western Australian Price Unconstrained Domestic Gas Demand	14
Figure 1.9: Western Australian Contracted & Contestable Gas Demand.....	15
Figure 1.10: Western Australian Contestable Gas Supply & Demand (with Wheatstone)	18
Figure 1.11: Contestable Medium Demand Scenario – Base Case Consumer Price Profiles .	19
Figure 1.12: Medium Demand Scenario- Price Constrained Contestable Demand (without Wheatstone)	21
Figure 1.13: Medium Demand Scenario - Price Constrained Uncommitted Supply (with Wheatstone)	22
Figure 1.14: Medium Demand Scenario - Price Constrained Uncommitted Supply (without Wheatstone)	23
Figure 2.1: Australian Gas Reserves at end-2006.....	27
Figure 2.2: WA P50 Gas Resource Ownership by Joint Venture at end-2006.....	31
Figure 2.3: Ownership of WA P50 and P90 Gas Resources by Company at end-2006.....	31
Figure 2.4: WA 2006 Domestic Gas Sales – 319 PJ.....	32
Figure 2.5: Resource Profile vs Acreage Renewal date.....	34
Figure 3.1: Asia-Pacific LNG Demand 2007-20	41
Figure 3.2: Asia-Pacific LNG Demand vs Supply.....	43
Figure 3.3: Asian LNG Price Trends	45
Figure 3.4: LNG and Oil Price Forecasts.....	46
Figure 3.5: Gas Consumption - Western Australia & Australia	47
Figure 3.6: Australian Total Energy Consumption 2005-06, by State & by Fuel Source	48
Figure 3.7: WA Major Fuel Sources.....	48
Figure 3.8: WA Gas Consumption 2005-06, by industry	49
Figure 3.9: WA Domestic Gas Demand	51
Figure 3.10: South West Interconnected System (SWIS).....	52

Figure 3.11: Gas Demand Forecast - Power Generation (SWIS)	53
Figure 3.12: North West Interconnected System (NWIS)	54
Figure 3.13: NIS Supply Areas	56
Figure 3.14: Power Generation - Gas Demand	58
Figure 3.15: WA Alumina Refinery capacities	58
Figure 3.16: Gas Demand – Alumina	59
Figure 3.17: BHP Billiton Iron Ore Growth Projects	60
Figure 3.18: Gas Demand Forecast - Iron Ore Mining & Processing	61
Figure 3.19: Gas Demand Forecast - Other Mining	62
Figure 3.20; Gas Demand Forecast - Non-minerals Manufacturing.....	64
Figure 3.21: Gas Demand Forecast: Residential and Commercial	65
Figure 3.22: Western Australian Price Unconstrained Domestic Gas Demand - Bottom-up Assessment.....	66
Figure 3.23: Western Australian Contracted & Contestable Gas Demand.....	67
Figure 3.24: Western Australian Contestable Gas Demand	67
Figure 3.25: Contestable Low Gas Demand - Base Case Consumer Price Profiles	72
Figure 3.26: Contestable Medium Gas Demand – Base Case Consumer Price Profiles	73
Figure 3.27: Contestable High Gas Demand - Base Case Consumer Price Profiles	74
Figure 4.1: IHS-CERA Upstream Capital Costs Index	76
Figure 4.2: Rig day rate increases.....	77
Figure 4.3: WA LNG Projects - Internal Rates of Return (RT).....	78
Figure 4.4: Remaining NWSGP Domestic Gas Commitments	80
Figure 4.5: John Brookes Domestic Gas Commitments	81
Figure 4.6: WA Uncommitted Domgas Supply (with Wheatstone dedicated to Domestic gas) – By Supplier	102
Figure 4.7: WA Uncommitted Domestic gas Supply (excluding Wheatstone) – By Supplier	102
Figure 4.8: WA Uncommitted Domestic gas Supply (excluding Wheatstone) - By Producer Price	103
Figure 5.1: Western Australian Contestable Gas Supply & Demand (with Wheatstone)	104
Figure 5.2: Contestable Low Gas Demand - Base Case Consumer Price Profiles	105
Figure 5.3: Low Demand Scenario – Price Constrained Demand (with Wheatstone)	106
Figure 5.4: Low Demand Scenario - Price Constrained Supply (with Wheatstone)	107
Figure 5.5: Low Demand Scenario - Price Constrained Supply (without Wheatstone)	108
Figure 5.6: Contestable Medium Demand Scenario – Base Case Consumer Price Profiles .	109

Figure 5.7: Medium Demand Scenario- Price Constrained Demand (without Wheatstone). 110

Figure 5.8: Medium Demand Scenario - Price Constrained Supply (with Wheatstone)..... 111

Figure 5.9: Medium Demand Scenario - Price Constrained Supply (without Wheatstone).. 112

Figure 5.10: Contestable High Gas Demand - Base Case Consumer Price Profiles 114

Figure 5.11: High Demand Scenario - Price Constrained Demand (with Wheatstone) 115

Figure 5.12: High Demand Scenario - Price Constrained Demand (without Wheatstone) ... 116

Figure 5.13: High Demand Scenario - Price Constrained Supply (with Wheatstone)..... 117

Figure 5.14: High Demand Scenario - Price Constrained Supply (without Wheatstone) 117

List of Tables

Table 1.1 WA Remaining Gas Resources at end-2006.....	3
Table 1.2: WA Contestable Domestic Gas Supply Assumptions	9
Table 1.3: Western Australian Primary Energy Gas Demand, 2006-07 & 2029-30	13
Table 1.4: Base Case WA Consumer Delivered & Wellhead Gas Prices, A\$/GJ.....	17
Table 2.1: Distribution of WA P50 Gas Resources by Petroleum Basin at end-2006.....	28
Table 2.2: Distribution of WA P50 Gas Resources Permit Holder JVs at end-2006	30
Table 2.3: Retention Leases and Resources due for renewal by 31 December 2008	36
Table 3.1: Planned/Proposed LNG Projects targeting the Asia-Pacific Region.....	42
Table 3.2: Western Australian Primary Energy Gas Demand, 2006-07 & 2029-30	50
Table 3.3: SWIS Generation Capacity	52
Table 3.4: NWIS Gas-fired Generation Capacity	55
Table 3.5: NIS Generating Capacity	57
Table 3.6: US Gas Prices 2004-07	68
Table 3.7: Base Case WA Consumer Delivered Gas Prices, A\$/GJ	70
Table 3.8: WA Consumer Gas Prices adjusted to Wellhead-basis	71
Table 4.1: NWSGP Ownership Interests	79
Table 4.2: Summary of capital and operating costs for Julimar	84
Table 4.3: Summary of capital and operating costs for Brunello	84
Table 4.4: Summary capital and operating costs for Macedon.....	86
Table 4.5: Summary of capital and operating costs for Maitland.....	87
Table 4.6: Summary of capital and operating costs for Reindeer/Caribou.....	88
Table 4.7: Summary of capital and operating costs for West Tryal Rocks	89
Table 4.8: Summary capital and operating costs for Wheatstone.....	90
Table 4.9: Gorgon Capital Cost Estimates.....	93
Table 4.10: Summary of capital and operating costs for Ichthys	95
Table 4.11: Summary of capital and operating costs for Pluto/Xena	96
Table 4.12: Summary of capital and operating costs for Scarborough and Pilbara LNG	98
Table 4.13: Browse LNG Joint Venture Permits' Ownership Interests	98
Table 4.14: Summary of capital and operating costs for Browse LNG.....	100
Table 4.15: WA Contestable Domestic Gas Supply Assumptions	101