

# EAST COAST GAS WILL WE BE SHORT OF GAS or SHORT OF CHEAP GAS? Grahame Baker

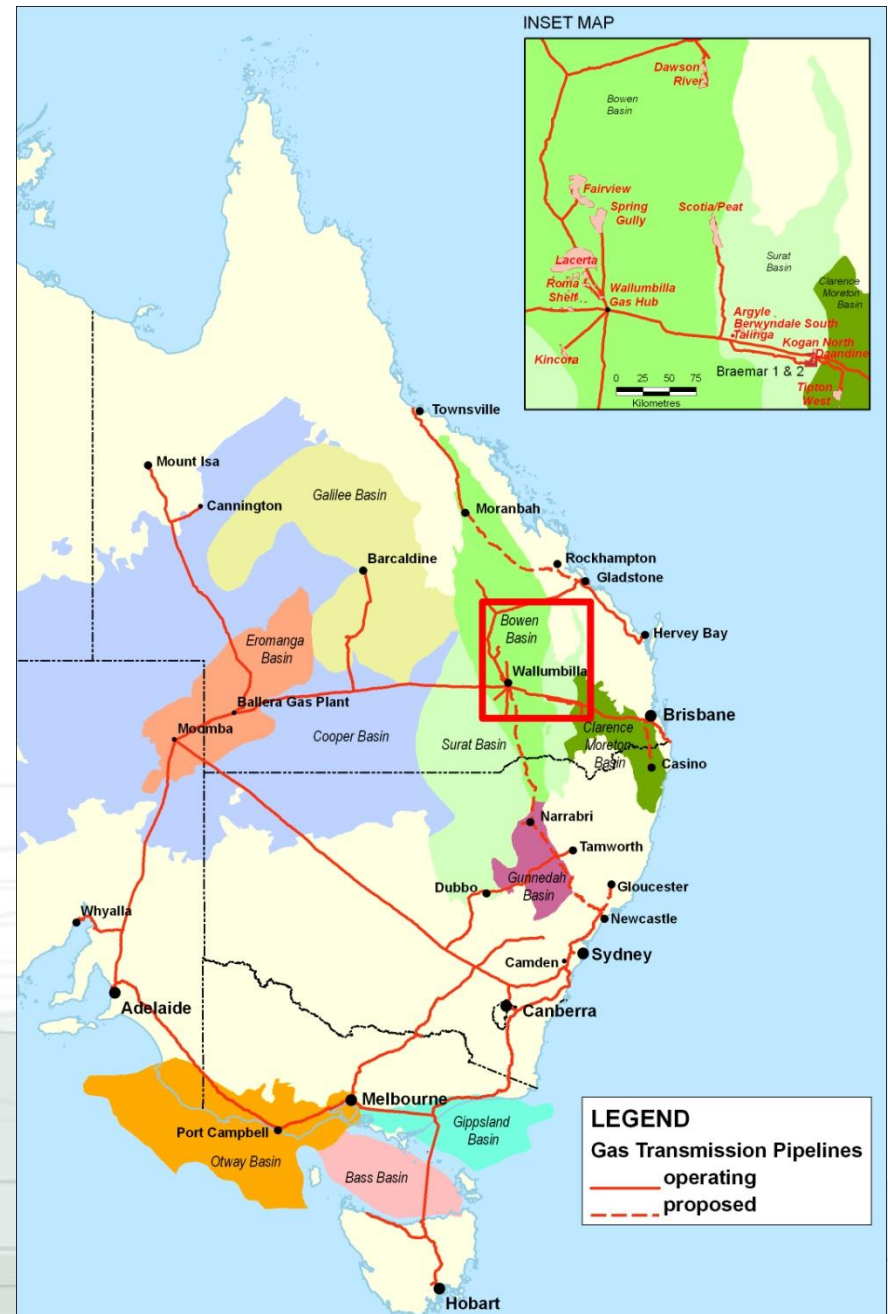


# Information Sources

- This presentation utilises information and figures published in:
  - Annual reports
  - Quarterly activity reports
  - Reserve statements
  - Company presentations
  - Other ASX releases
- Estimates are based on many sources of published data adjusted for both production and reserve changes, activity statements from JV partners, major gas customers and operational reports from government agencies

# Natural Gas in Eastern Australia

- Conventional gas reserves and production is from gas fields off-shore Victoria and from the Cooper Basin in Central Australia
- Significant CSG reserves and production is centred on the Bowen and Surat Basins in Queensland
- There is modest CSG production from the Sydney Basin in NSW
- There is a significant unconventional gas resource, particularly in the Cooper Basin
- All major gas fields, except for the Moranbah Gas Project, are interconnected but with capacity constraints



# Gas Reserves and Resources

## 31 December 2012

- Eastern Australia has significant gas reserves and resources. At 31 December 2012 they were, in PJ's:

Reserve	Conv.	CSG	Other Unconv	Total
2P	6,851	44,442	-	51,293
3P	6,851+	68,916	-	75,767+
2C	1,847+	31,853	4,678+	38,378+
2P + 2C	8,698+	76,295	4,678+	89,671+



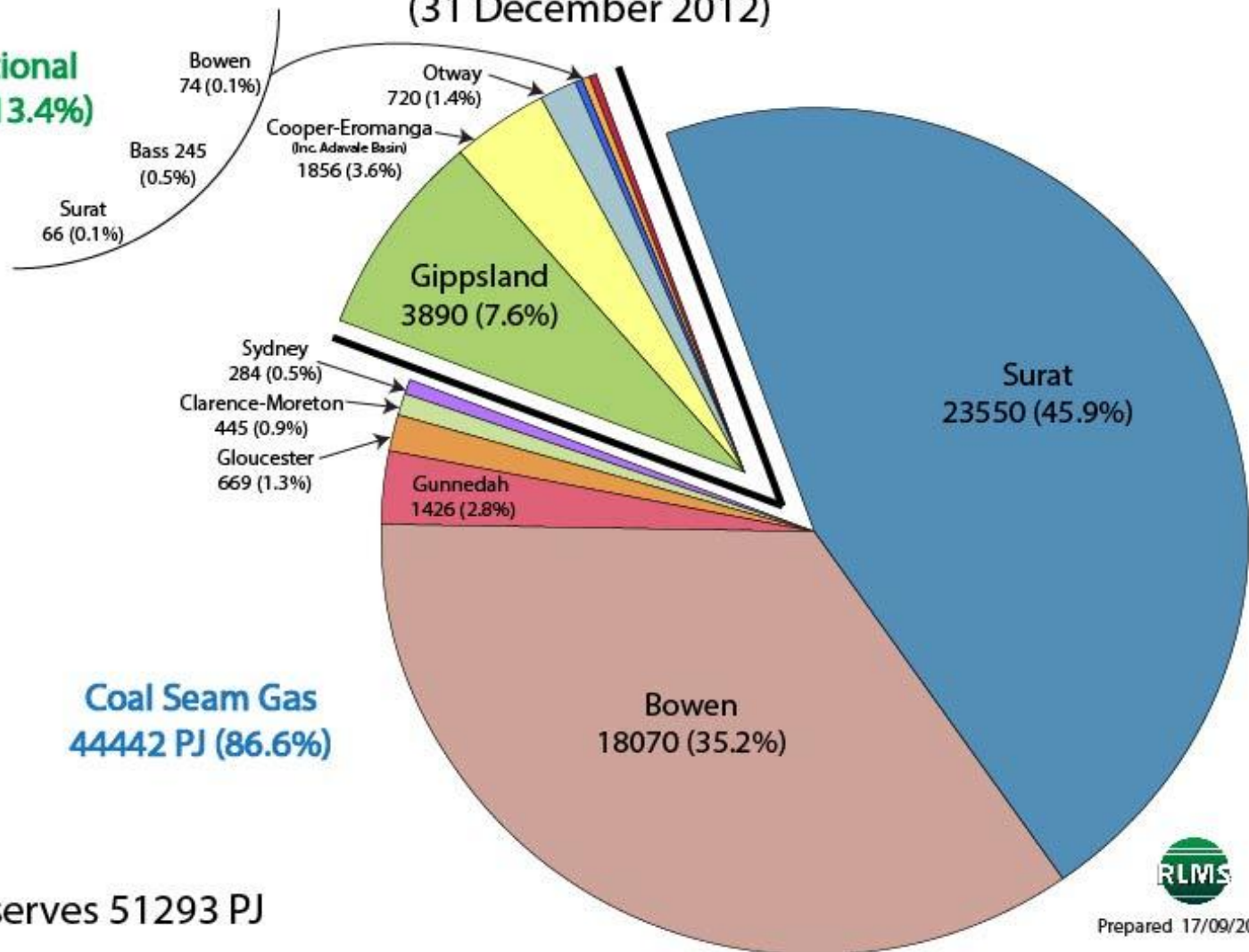
# Eastern Australia 2P Gas Reserves

Eastern Australia 2P Gas Reserves by Basin in PJ  
(31 December 2012)

**Conventional**  
6851 PJ (13.4%)

**Coal Seam Gas**  
44442 PJ (86.6%)

Total Reserves 51293 PJ



Prepared 17/09/2013



# Coal Seam Gas [CSG]

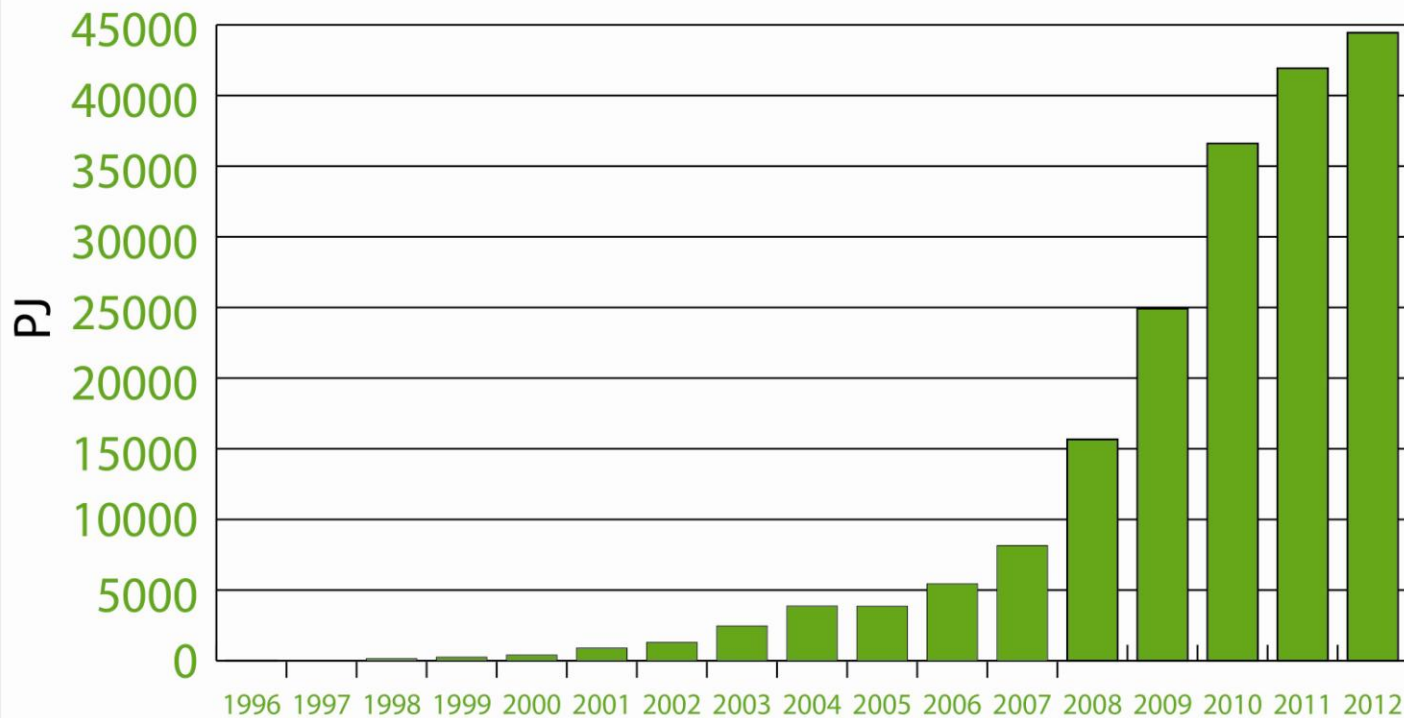
- CSG has had a remarkable growth history in eastern Australia, particularly in Queensland over the last 15 years
- The industry has moved through
  - proof of concept
  - establishing itself as a credible gas supplier
  - commercial growth to become a major source of domestic gas
  - currently undergoing significant expansion to underpin LNG export from Curtis Island near Gladstone

# CSG Reserve Growth

- CSG reserves have been increasing steadily since 1996 when first 2P reserves of 5PJ were posted
- At 31 December 2012, 2P CSG reserves for eastern Australia were 44,442 PJ
- At the same date, the 3P CSG reserves were 68,916 PJ while the 2C resources were an additional 31,853 PJ.
- The Permian to Jurassic coal sequences in eastern Australia contain an estimated CSG resource in excess of 400,000 PJ including over 240,000 PJ in the Surat and Bowen Basins
- Preliminary estimates of the CSG resource the Galilee Basin are 120,000 PJ with the Gunnedah Basin having >50,000 PJ

# Growth in CSG Reserves

Growth of 2P CSG Reserves in Eastern Australia in PJ  
(31 December 2012)

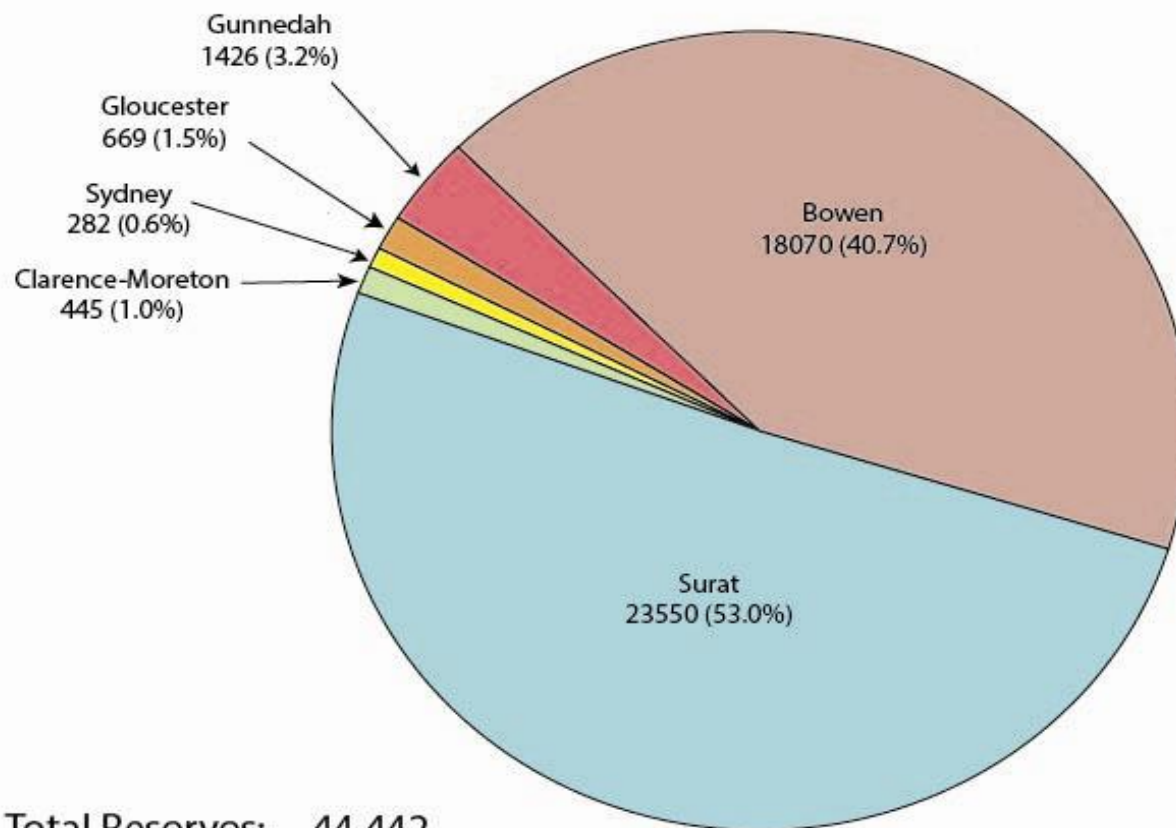


Prepared 23/04/2013



# Eastern Australian 2P CSG Reserves by Basin

Eastern Australia 2P CSG Reserves by Basin in PJ  
(31 December 2012)



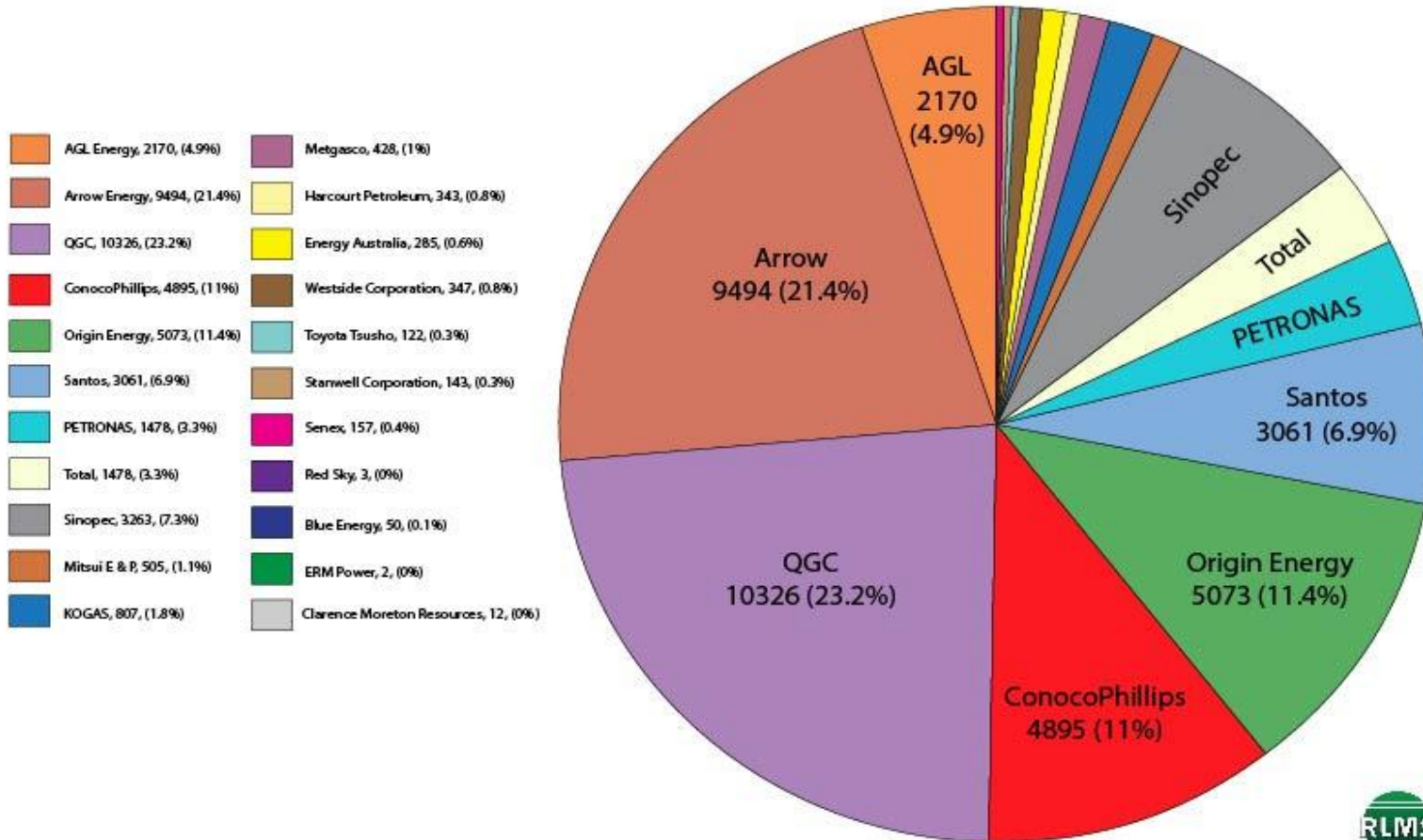
Total Reserves: 44,442

Queensland: 41,620 PJ - 93.7%

New South Wales: 2,822 PJ - 6.3%

# Eastern Australia 2P CSG Reserves by Company

Eastern Australia 2P CSG Reserves by Company in PJ  
 Total Reserves: 44 442 PJ (31 December 2012)



Prepared 17/09/2013



# CSG Reserves by Activity Groups

## 31 December 2012

■ Activity Group	2P [PJ]	%
LNG	38,249	86.1
Power Gen/Utilities	4,226	9.5
International Ownership [Other than LNG interests]	970	2.2
Independents	997	2.2
TOTAL	44,442	100.0

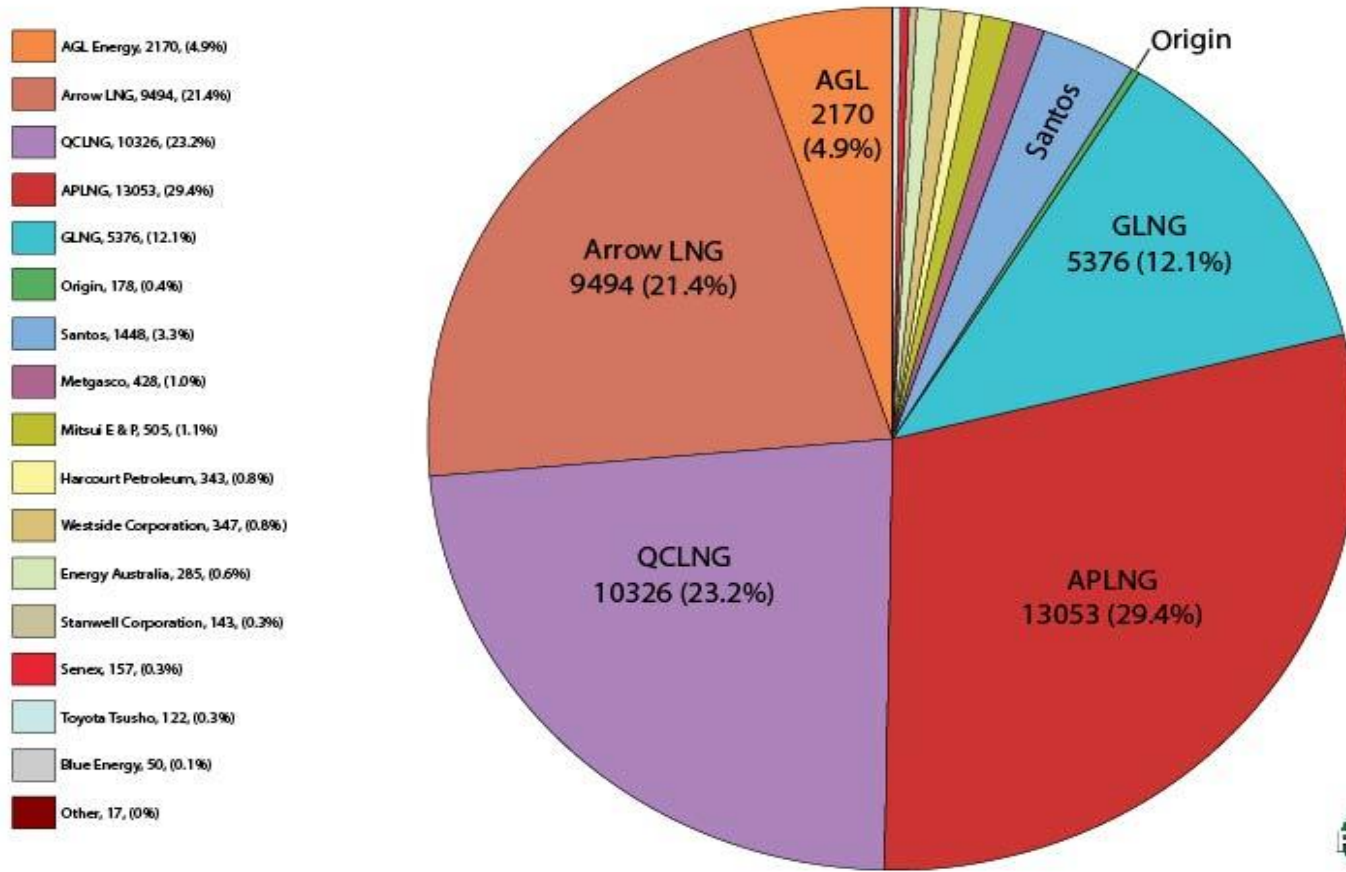
# Eastern Australia 2P Gas Reserves

31 December 2012

- Conventional 6,851PJ [13.4%]
- CSG 44,442 PJ [86.6%]
- Total 2P reserves 51,293 PJ
- The four Curtis Island focused LNG proponents control 86.1% of the CSG 2P reserves and 74.6% of the overall Eastern Australian 2P gas reserves.

# Eastern Australia 2P CSG Reserves by LNG Proponents and other Groups

Eastern Australia 2P CSG Reserves by LNG Proponents and Others in PJ  
 Total Reserves: 44 442 PJ (31 December 2012)



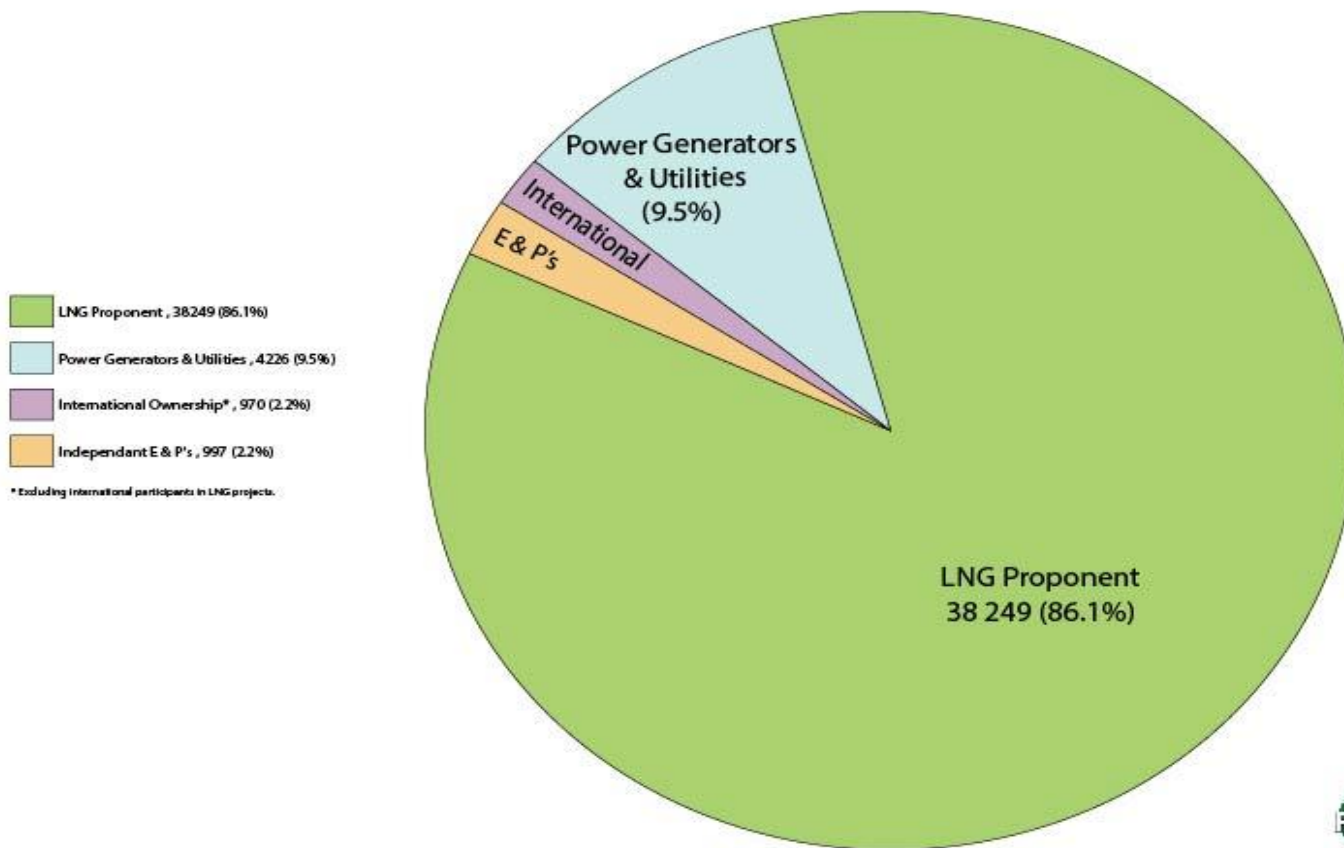
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# Eastern Australia 2P CSG Reserves by LNG Proponents and other Groups

Eastern Australia 2P CSG Reserves by Activity Group in PJ  
Total Reserves: 44 442 PJ (31 December 2012)



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# LNG Metrics

- LNG plants require approximately 60PJ of raw CSG for each 1 million tonnes of LNG exported
- Of the 60 PJ, approximately 5 PJ is needed to operate the LNG train with the remaining 55 PJ being the energy content of 1 million tonnes of LNG
- That is, 55 GJ of energy per tonne LNG.
- The three LNG projects under construction on Curtis Island have an aggregated capacity of 25 .3 million tonnes per year.
- 12.5 million tonnes of annual LNG production would result in a doubling of the current Eastern Australian gas demand.
- 1 million tonnes per year of LNG will support 800 MW of base load combined cycle power generation.

# LNG Proposals – Gladstone Region

Proposal	Proponent	LNG train capacity (MMtpa)	No. of trains	Ultimate project size (MMtpa)	Initial commissioning date
Queensland Curtis LNG	BG Group CNOOC Tokyo Gas	4.25	3	13.5	Q4-2014
Australia Pacific LNG	Origin ConocoPhillips Sinopec	4.5	4	18	Q2-2015
GLNG	Santos PETRONAS Total & KOGAS	3.9	3	12	Q1-2015
Arrow CS CSG [Australia] Pty Ltd	Shell/ PetroChina	4.0	4	16	Q2-2017
Gladstone LNG	LNG Limited	1.8	2	3.6	TBA

# LNG Project Reserve Coverage

- The four major LNG Project Proponents control 86.1% of 2P CSG reserves
- The three sanctioned projects will require 30,360 PJ for a 20 year operation
- If sanctioned, the Arrow Project will require a further 9,600 PJ for 20 years of operation
- APLNG, QCLNG and Arrow ,if sanctioned, have sufficient 2P reserves to support a two train operation
- GLNG's own 2P gas together with additional portfolio and purchased gas has sufficient gas reserves to support a two train operation for 15 years. It has access to significant 3P reserves and 2C/3C resources, potentially enough to support its operations for a full 20 years.

# LNG – Reserves vs Project Requirements [2 Trains]

Project	2P PJ	3P PJ	2C PJ	LNG 20 yr Gas Demand	Av Well Productivity TJ/d
QCLNG	10,326	18,876	13,700	10,200	0.7
APLNG	13,090	16,026	3,825	10,800	1.2
Arrow	9,494	13,970	2,521+	9,600	0.6
GLNG	5,376	6,823	1,638	9,400	0.8
[Santos]	1,620	1,620+	2,345 [Cooper]		>1.0



# DOMESTIC GAS SHORTAGE?

- Overall Eastern Australia has sufficient gas reserves to support the current LNG developments as well as the needs of domestic industry
- Some short term tightness of gas supply could occur during LNG project start-up from 2015 to 2017 if projected well productivity targets are not achieved during the LNG ramp up phase.
- This is likely to be manageable through production re-scheduling and gas swaps
- The current concern about availability of domestic gas in NSW is a policy issue, not a gas reserves issue
- Gas supplied to domestic customers will not be at legacy prices but will reflect current market dynamics
- A gas reservation policy as advocated in some circles is generally considered to be unwarranted and will not deliver cheaper domestic priced gas

# Gas Pricing

- Cost of gas production has risen over the past three years as a consequence of drilling and development cost increases and as production centres move to less productive frontier gas fields
- Large scale LNG production has put pressure on domestic gas prices with LNG net back pricing determining the upper limit and cost of gas production the lower limit. These gas price limits are showing signs of converging
- New contract gas prices have increased markedly over past 18 months from circa \$4.00/GJ to reported \$6.00/GJ to \$8.00/GJ. Some estimates have a gas price of \$10.00/GJ by 2016
- Santos reported that average price received for gas in Q4/2012 was \$5.43/GJ
- Need for new investment in pipeline capacity will add to delivered gas costs
- Shale and other unconventional gas is costing significantly more to produce than traditional supplies putting further pressure on gas prices. Estimated cost of producing gas from carbonaceous shales is \$6.00/GJ

# Gas Pricing Issues

- The LNG Projects are the major drivers in internationalising gas prices through LNG net back gas pricing
- The LNG Projects hold a very significant proportion of gas reserves and contingent gas resources
- The major upstream gas suppliers into the domestic gas market are key participants in the LNG projects
- ExxonMobil and BHPB Petroleum have a history of gas price maximisation
- Uncertainty as to LNG proponents strategies about further LNG processing trains
- Current difficulties in negotiating new domestic gas contracts as well as increasing gas prices are a reflection of the use of market power

# Impact of Higher Gas Prices

- Significantly higher gas prices will impact on the international competitiveness of Australian industry
- The major impacts will be in the gas fired power generation and C & I sectors with potential contraction in the demand for gas by power generators and large gas consuming facilities
- The impact on potential new investment in value adding activities may be significant
- Higher gas prices will facilitate greater gas recoveries from existing gas fields and speed up the commercialization of the significant unconventional gas resource.

# Summary

- In aggregate there are significant natural gas reserves and resources in Eastern Australia. Some supply tightness may occur during the period of LNG ramp-up
- The gas reserve and resource ownership is highly concentrated within the existing LNG project groups
- The upstream gas producers and tradition domestic gas suppliers are critical drivers of the LNG projects and the major advocates of linking domestic gas pricing to international traded energy prices
- ExxonMobil, BHPB Petroleum and other major upstream gas suppliers strongly support domestic gas pricing having international energy price linkages
- Eastern Australia is experiencing a major structural change in gas supply through the inter-nationalization of its gas industry under an environment where the major gas reserve and resource groups are exercising their market power through a gas market with virtually no liquidity



# Summary [2]

- The development of an LNG export industry is leading to massive investment, as well as significant increases in CSG production and in infrastructure development in regional Australia
- The overall impact of the LNG developments will accrue significant macro economic benefits to Australia
- In about 2020, unconventional gas is expected to significantly add to eastern Australia's natural gas reserves and resources
- The unconventional gas resource in the Cooper Basin is very large [ $>200$  tcf or 210,000 PJ] but commercial recovery will be at costs well above historical levels.

**FINALLY**

**EASTERN AUSTRALIA IS NOT  
RUNNING OUT OF NATURAL GAS**

**HOWEVER IT HAS RUN OUT OF  
CHEAP GAS**