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## China's reliance on Australian LNG exports

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## Abbreviations

bcm	billion cubic metres
CNOOC	China National Offshore Oil Company
CSG	Coal-seam gas
LNG	Liquefied natural gas
mBtu	million British thermal units
MOU	Memorandum of understanding
mtpa	million tonnes per annum
PDA	Project development agreement
QCLNG	Queensland Curtis LNG
SPA	Sale and purchase agreement

## Key Terms

clean energy	energy that is produced with less greenhouse gas emissions than other fossil fuels (coal and oil)
British thermal unit	the amount of heat required to raise the temperature of 1 lb. (0.4 kg) of water one degree Fahrenheit
take or pay contract	a contract obliging the buyer to take any product that is offered (and pay the purchase price) and pay a specified amount if the product is not taken
oil parity	the LNG price that would be equivalent to that of crude oil on a barrel of oil equivalent
oil price link formula	the LNG price formula indexed to the average import price of crude oil in Japan (the Japanese Crude Cocktail or “JCC”) which includes an S-curve where the price formula is above and below a certain oil price

## Introduction

Australia is an important supplier of raw materials and energy to China. In 2008, resources (minerals and fuels) exports accounted for more than 70 per cent of Australia's exports to China, primarily iron ore, lead, zinc, copper ores, nickel ores, manganese and other ores, coal and crude petroleum.

Australia's liquefied natural gas (LNG) exports to China commenced in May 2006, with the opening of China's first LNG receiving terminal at Dapeng in Guangdong Province under a 25-year supply agreement. Australia's first shipment of LNG to China was from the North West Shelf project operated by Woodside.

Since then, LNG trade between Australia and China has expanded rapidly with new supply agreements signed in 2008 and 2009 for the long term supply of LNG from the Gorgon gas project. The most recent contract signed in Beijing on 19 August 2009 propelled Australia as the largest supplier of LNG to China.

In the context of the current world climate change debate, a steady supply of LNG becomes a cornerstone for sustainable economic development, in particular for China which is seeking to diversify its energy sources and develop a downstream LNG industry in parallel.

This Background Note examines the current and potential supply agreements with China and its reliance on LNG supplies from Australia to meet its goal of doubling the use of LNG by 2010 and have it account for 10 per cent of China's energy consumption by 2020.

## North West Shelf Australia LNG – Guangdong LNG Supply Agreement

### Sales and purchase agreement

A conditional sale and purchase agreement between Australia LNG Pty Ltd., the joint venture company formed to market North West Shelf gas overseas, and China National Offshore Oil Company Ltd. (CNOOC Ltd.), a state-owned oil and gas exploration company, for a 25-year supply of 3.3 million tonnes per annum (mtpa) of LNG was signed on 18 October 2002.

The supply agreement followed the selection of Australia LNG as the preferred gas supplier to China's first LNG project, the purpose-built LNG receiving terminal and infrastructure facility at Dapeng in Guangdong Province. At the time the agreement was also Australia's largest ever export deal valued at up to A\$25 billion.<sup>1</sup>

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1. It was estimated that LNG trade would increase the value of exports to China by 15 per cent annually. See China-Australia Chamber of Commerce, 'Australian Success Stories', AustCham Beijing website, viewed 17 November 2009, <http://www.austcham.org/page/china-business/doing-business-in-china/australian-success-stories>

A fully effective sale and purchase agreement (SPA) between North West Shelf LNG, the marketing agency established by the North West Shelf Venture, and Guangdong Dapeng LNG Co., the gas supplier to Guangdong Province and Hong Kong, was signed on 12 December 2004.

The SPA cleared the way for other components of the deal to come into effect. This included the establishment of a A\$25 million Australia Gas Technology Partnership Fund to foster closer co-operation between China and Australia in the energy sector.<sup>2</sup>

A component of the overall commercial deal negotiated with CNOOC Ltd. included equity participation in the North West Shelf project. Through its subsidiary CNOOC International, CNOOC Ltd. acquired a 5.3 per cent share in the North West Shelf Venture for US\$348 million and made an upfront payment of US\$180 million for certain LNG processing facilities.<sup>3</sup>

### Pricing and supply

The SPA oversees Woodside's supply of 3.3 million tonnes of LNG a year to Guangdong Dapeng LNG Co. which is the largest buyer of LNG from the North West Shelf gas project (3.3 mtpa), followed by the Japanese power and gas utilities, Kyushu Electric (2.5 mtpa), Osaka Gas (1.5 mtpa), Tokyo Gas (1.5 mtpa), Chugoku Electric (1.4 mtpa), Chubu Electric (1.1 mtpa), Kansai Electric (1mtpa), Toho Gas (1 mtpa) and Tohoku Electric (1 mtpa).<sup>4</sup>

North West Shelf LNG is fully sold out for the long term and has reached export capacity of more than 16 million tonnes annually.<sup>5</sup> A part of the LNG destined for Guangdong Dapeng Co. will be supplied from the newly developed Browse project in the same area.

Specific pricing terms of the SPA are confidential, although it is reported that CNOOC Ltd. was able to obtain an advantageous LNG price under a take or pay contract due to a buyer's market prevailing at that time.<sup>6</sup>

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2. North West Shelf Australia LNG, 'Guangdong LNG Agreement', Australia LNG website, 13 December 2004, viewed 17 November 2009, <http://www.nwsalng.com.au/news/2004/GUANGDONG-LNG-AGREEMENT>; the Australian Government will contribute \$7.5 million to the Fund over nine years from 2006–07 to 2014–15.
  3. China National Offshore Oil Corporation (CNOOC), 'Cooperation worldwide: Australia', CNOOC website, viewed 19 November 2009, <http://newtest.cnooc.com.cn/yyww/hzsy/dwhz/242019.shtml>
  4. Markets also include long term customers in South Korea and spot buyers in India and Taiwan.
  5. The 4.4 mtpa Train 5 production facility at the Karratha gas plant was brought on line in September 2008 increasing export capacity to 16.3 mtpa. More than 15 mtpa are currently shipped to markets overseas.

Estimates of prices range from US\$2.50 per million British thermal units (mBtu) to a flat ceiling of US\$3.16 per mBtu.<sup>7</sup> An additional factor influencing pricing was the competitive tendering by the short-listed suppliers (Australia, Indonesia and Qatar) to supply China's first LNG receiving terminal.

## Woodside Energy Ltd – PetroChina Co. Ltd. Terms Agreement

A binding 'key terms agreement' between Woodside Energy Ltd., Woodside's North West Shelf Venture company, and PetroChina Co. Ltd., China's largest oil and gas producer, for the supply of 2 to 3 mtpa of LNG for 15 to 20 years was signed on 6 September 2007.

Woodside has a 16.67 per cent share in North West Shelf LNG production and is the project operator. In the three Browse gas fields, it holds a 47 per cent equity share which provides a greater level of participation in the sale of gas. Other joint venturers in the Browse project include BHP Billiton Ltd., BP Plc, Chevron Corp. and Shell.

The terms agreement is subject to investment and regulatory approvals, and includes pricing.<sup>8</sup> The estimate of US\$7 to US\$9 per mBtu for LNG from the Browse project is more than double the ceiling price under the North West Shelf LNG agreement.<sup>9</sup> A full sale and purchase agreement is valued at A\$35 to A\$45 billion.<sup>10</sup>

Price terms nevertheless appear less favourable than the price negotiated by Shell, a joint venture partner in the Gorgon project, with PetroChina Co. Ltd. under a Heads of Agreement signed on 4 September 2007. The reported US\$10 per mBtu price paid by PetroChina Co.

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6. N Higashi, *Natural Gas in China: Market evolution and strategy*, International Energy Agency (IEA), June 2009, p. 17, viewed 19 November 2009, [http://www.iea.org/Papers/2009/nat\\_gas\\_china.pdf](http://www.iea.org/Papers/2009/nat_gas_china.pdf); US\$3.16 per mBtu is the landed price: 'China', *Platts LNG Daily Terminal Tracker Asia*, 19 June 2007.
  7. BusinessIntelligence – Middle East, 'China oil group in 25-year deal for Qatar's LNG', *BI-ME*, 30 May 2008, viewed 19 November 2009, <http://www.bi-me.com/main.php?id=20833&t=1>
  8. J Yang, 'PetroChina Inks Initial Agreement with Woodside in LNG Supply Deal', *Resource Investor*, 6 September 2007, viewed 19 November 2009, <http://www.resourceinvestor.com/News/2007/9/Pages/PetroChina-Inks-Initial-Agreement-With-Woodside-in.aspx>
  9. 'PetroChina may have agreed to pay US\$7-US9 per million BTU for LNG in 15 to 20 year deal with Woodside Browse', *Erisk.net*, 13 September 2007, viewed 18 November 2009, [http://www.erisk.net/erisk7/article/499497/petrochina\\_may\\_have\\_agreed\\_to\\_pay/](http://www.erisk.net/erisk7/article/499497/petrochina_may_have_agreed_to_pay/); other media reports suggest the price was closer to US\$9 per mBtu: L Geng, 'PetroChina Adds LNG', *Energy Tribune*, 30 November 2007, viewed 14 December 2009, <http://www.energytribune.com/articles.cfm?aid=709&idli=3>
  10. J Yang, 'PetroChina Inks Initial Agreement with Woodside in LNG Supply Deal', op. cit.

Ltd. for Gorgon gas is close to oil parity and, at a 14 per cent linkage, is within the 10 to 15 per cent oil price link formula.<sup>11</sup>

## **Royal Dutch Shell – PetroChina Co. Ltd. Supply Agreement**

An SPA between Royal Dutch Shell Plc and PetroChina Co. Ltd. for the supply of up to 2 mtpa of LNG for 20 years was signed on 24 November 2008.

The SPA exceeds the 1 mtpa of LNG under the Heads of Agreement between Shell and PetroChina Co. Ltd. in 2007 and provides for Shell to sell up to 2 mtpa to PetroChina International Co., a subsidiary of PetroChina Co. Ltd.

The increased supply to PetroChina Co. Ltd., mainly from the Gorgon project, indicates the difficulty for China in obtaining new LNG supplies at advantageous prices. Since 2006, LNG prices in long term supply agreements reflect gas prices close to oil parity.<sup>12</sup>

Based on the reported US\$10 per mBtu paid by PetroChina Co. Ltd<sup>13</sup> for Gorgon gas, the value of the supply agreement is more than A\$33 billion.

## **China National Offshore Oil Ltd. – BG Group Project Development Agreement**

### **Project Development Agreement**

A Project Development Agreement (PDA) between CNOOC Ltd., and the UK-based gas exploration and production company, BG Group Plc, for the supply of 3.6 mtpa of LNG was signed on 12 May 2009.<sup>14</sup>

The PDA is the most far reaching overall commercial deal negotiated with China involving development of the Queensland Curtis LNG project and, in terms of LNG supply, BG Group will become the largest supplier to CNOOC Ltd.

Under the PDA, BG Group will supply 3.6 mtpa of LNG for 20 years from the start-up of its Queensland Curtis LNG project (QCLNG) which is being developed by QGC Ltd., a BG

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11. J Mukul, 'Sify.com: Lessons from Shell, PetroChina deal', Royal Dutch Shell Plc website, 11 September 2007, viewed 18 November 2009

<http://royaldutchshellplc.com/2007/09/11/sifycom-lessons-from-shell-petrochina-deal/>

12. N Higashi, *Natural Gas in China: Market evolution and strategy*, op. cit., p. 18.

13. F Wong, 'Update 3-PetroChina agrees second Australian LNG deal', *Reutersfinance*, 6 September 2009, viewed 19 November 2009, <http://au.biz.yahoo.com/070906/19/p/1dwq8.html>

14. BG Group Plc emerged from the former British Gas when it was demerged.

Group business formed after a friendly takeover of Queensland Gas Company Ltd. The PDA also sets out the basis for:

- the purchase by CNOOC Ltd. of 5 per cent of BG Group's interest in the reserves and resources of certain BG Group's tenements in the Walloons Fairway of the Surat Basin in Queensland
- a 10 per cent equity participation by CNOOC Ltd. in one QCLNG liquefaction train at the Gladstone plant, and
- the joint participation by CNOOC Ltd. and BG Group in a consortium to construct two LNG ships in China which will be owned by the consortium.<sup>15</sup>

#### Pricing and supply

The PDA underpins the development of the QCLNG project which will be fed by coal-seam gas (CSG).<sup>16</sup> Three separate groups are working to convert CSG into LNG for export and are based in the port of Gladstone in Queensland. BG Group's potential gas supply represents about 5.3 billion cubic metres (bcm) of gas a year or 8 per cent of current Chinese demand.<sup>17</sup>

A fully-termed sale and purchase agreement is expected to be signed prior to BG Group's final investment decision which is expected in 2010 with first shipments of LNG scheduled for 2014.

With a lower heating value than conventional LNG, pricing terms are uncertain, although it is reported that LNG produced from CSG for export markets will be priced at a 10 per cent discount to traditional LNG from natural gas.<sup>18</sup>

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15. Queensland Curtis LNG, 'BG Group signs LNG agreement with CNOOC', Queensland Curtis LNG website, 13 May 2009, viewed 16 November 2009, <http://qclng.com.au/news/9/25/BG-Group-signs-LNG-agreement-with-CNOOC/>
  16. M Chambers, 'Shell joins coal seam gas race', *The Australian*, 3 June 2008, p. 19, viewed 16 November 2009, [http://www.arrowenergy.com.au/icms\\_docs/29478\\_Shell\\_joins\\_coal\\_seam\\_gas\\_race.pdf](http://www.arrowenergy.com.au/icms_docs/29478_Shell_joins_coal_seam_gas_race.pdf)
  17. E Crooks, 'CNOOC signs 20-year BG deal', *Financial Times*, 14 May 2009.
  18. R Kelly, 'ConocoPhillips concedes coal-seam gas price lag', *The Australian*, 14 October 2009, viewed 16 November 2009, <http://www.theaustralian.com.au/business/mining-energy/conocophillips-concedes-coal-seam-gas-price-lag/story-e6frg9e6-1225786449993>

## ExxonMobil – PetroChina Co. Supply Agreement

### Sale and purchase agreement

An SPA between ExxonMobil, a joint venture partner in the Gorgon project, and PetroChina Co. Ltd was signed on 18 August 2009. It provides for the supply of 2.25 mtpa of LNG for 20 years for a reported A\$50 billion.<sup>19</sup>

The Gorgon gas fields contain 40 trillion cubic feet of gas deposits and may have a lifespan of as long as 60 years.<sup>20</sup> The first phase of the Gorgon project includes three production trains with a combined capacity of 15 mtpa. At current prices, the gas is worth A\$500 billion and it is expected that LNG prices will continue to increase over the next few years as oil prices rise.<sup>21</sup> The reported A\$50 billion export deal brings total LNG sales from the Gorgon project to A\$200 billion.<sup>22</sup>

### Pricing and supply

The announcement of the SPA followed soon after the signing of a supply agreement with Petronet LNG Ltd., a joint venture formed by the Indian Government to import LNG, for the supply of 1.5 mtpa of LNG on 10 August 2009.

ExxonMobil has a 25 per cent share in the Gorgon project. The SPA brings its supply commitments to 3.75 mtpa and secures markets for all its share of LNG production from the project. The first shipment of LNG to the Shenzhen terminal in Guangdong Province is scheduled for 2015.

The timing of both long term sales which were negotiated concurrently suggests that LNG pricing was based on the unit cost of ExxonMobil's share of output. Pricing terms negotiated for the LNG sale to PetroChina Co. Ltd. are closer to US\$10 per mBtu (the price reportedly paid by Petronet LNG Ltd.) than US\$16 per mBtu, which is the price averaged out over the total delivered amount of LNG valued at US\$41.1 billion.

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19. 'Australia signs \$50 billion gas deal with China', *News.com.au*, 19 August 2009, viewed 18 November 2009,

<http://www.news.com.au/story/0,,25949872-2,00.html>

20. 'Exxon to Ship Gorgon LNG to PetroChina from 2014–15', *Bloomberg.com*, 20 August 2009, viewed 18 November 2009,

<http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aDPdYYPg0QkX0>

21. 'Gorgon field development project clears another hurdle', Cyba Recruitment website, 16 September 2009, viewed 18 November 2009,

[http://www.cybarecruitment.com/news.php?subaction=showfull&id=1255417852&archive=&start\\_from=&ucat=1&](http://www.cybarecruitment.com/news.php?subaction=showfull&id=1255417852&archive=&start_from=&ucat=1&)

22. F Wong, 'Chevron signs \$60 billion Australian LNG export deal', *Reuters*, 10 September 2009, viewed 18 November 2009,

<http://www.reuters.com/article/innovationNews/idUSTRE58914E20090910>



PetroChina Co. Ltd. has sought to minimise the reported value of the deal to moderate price expectations given that similar volumes were negotiated with Shell which also has a 25 per cent share in output.<sup>23</sup>

## China's demand for natural gas and long term LNG supply

### Natural gas consumption

China's economic development has been fuelled by coal and its energy consumption has been increasing by 8 per cent per year for the past decade. With the economic development and improvement in living standards, demand for natural gas has increased as well. In the last five years, natural gas consumption has more than doubled, rising from 33.9 bcm in 2003 to 80.7 bcm in 2008 (Table 1). Underlying demand for natural gas is influenced by the rising environmental cost of coal consumption and is likely to grow even more.

Table 1: Natural gas consumption and production, 1998-2008

Billion cubic metres	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Consumption	20.3	21.5	24.5	27.4	29.2	33.9	39.7	46.8	56.1	69.5	80.7
Production	23.3	25.2	27.2	30.3	32.7	35.0	41.5	49.3	58.6	69.2	76.1

Source: BP Statistical Review of World Energy June 2009.<sup>24</sup>

To meet the increasing demand for natural gas, domestic production has increased twofold since 2003. Despite a 20 per cent increase in domestic gas production in the last two years, demand exceeded domestic supply in 2007 and 2008. With domestic supply limited to production areas and transportation difficulties from source to the eastern demand centres, there is a growing shortfall in the domestic supply of natural gas.

### Demand for natural gas

Almost 60 per cent of natural gas consumption in China is used as a feed stock to produce fertilizer, to raise production at oil fields by injecting gas into oil wells and to heat oil in various conversion processes.<sup>25</sup> A smaller percentage (25.9 per cent) is used for residential

23. M Murphy, 'Chevron refuses to back Canberra's figures', *BusinessDay*, 15 September 2009, viewed 19 November 2009, <http://www.businessday.com.au/business/chevron-refuses-to-back-canberras-figures-20090914-fnx4.html>

24. Viewed 14 December 2009, [http://www.bp.com/liveassets/bp\\_internet/globalbp/globalbp\\_uk\\_english/reports\\_and\\_publications/statistical\\_energy\\_review\\_2008/STAGING/local\\_assets/2009\\_downloads/statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2009.pdf](http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2009_downloads/statistical_review_of_world_energy_full_report_2009.pdf)

25. N Higashi, *Natural Gas in China: Market evolution and strategy*, op. cit., pp. 14–15.

consumption and only 11.6 per cent for power generation.<sup>26</sup> By channelling more natural gas into industrial development particularly power generation and residential consumption, China would be able to diversify its energy sources and develop a downstream LNG industry.<sup>27</sup>

Consumption of natural gas is still only a small percentage of the total primary energy consumed (2.5 per cent in 2005, increasing to 3.6 per cent in 2008) and is expected to reach 5.3 per cent by 2010.<sup>28</sup> Natural gas demand will reach 100 to 120 bcm in 2010 and, by 2020, will reach 210 to 250 bcm annually, or 10 per cent of the total primary energy consumed.<sup>29</sup>

Increased demand for natural gas will be met through increased domestic production, cross-border pipelines through Russia and Kazakhstan, coal-bed methane and imported LNG. China's natural gas production is forecast at around 150 bcm by 2020. To meet the expected annual demand of 210 to 250 bcm of natural gas, China will need to import LNG at the level of more than 60 bcm per year by 2020.

### Contracted and potential long term LNG supply

Although China has only recently begun importing LNG, it has established itself as a major buyer. Most current and future LNG supplies have been purchased on a bilateral basis under long term SPAs extending over twenty or more years. China has also entered into other supply arrangements with LNG sellers, such as Memorandums of Understanding (MOUs) and terms agreements that are expected to lead to long term SPAs.

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26. *ibid.*

27. Information Office of the State Council of the People's Republic of China, *China's Energy Conditions and Policies*, National Development and Reform Commission (NDRC), December 2007, p. 12, viewed 30 November 2009, <http://en.ndrc.gov.cn/policyrelease/P020071227502260511798.pdf>

28. Interfax-China, 'China to Import 260Mt of Oil and 20 Bcm of Natural Gas by 2010', *ResourceInvestor*, 3 July 2007, viewed 27 November 2009, <http://www.resourceinvestor.com/News/2007/7/Pages/China-to-Import-260Mt-of-Oil-and-20Bcm-of-Natural.aspx>

29. 'China natural gas demand to top 210–250 bln cubic meters by 2020', ChinaMining.org, 25 September 2008, viewed 14 December 2009, <http://www.chinamining.org/News/2008-09-25/1222321648d17598.html> See also N Higashi, *Natural Gas in China: Market evolution and strategy*, *op. cit.*, p. 23.

Table 2. Current and potential LNG sale and purchase agreements (SPAs) with China

Buyer	Supplier (country and project)	Volume (mtpa)	Term (years)	Signing date	Destination terminal (capacity – mtpa and operational date)	First LNG shipm	Value	Price
CNOOC Ltd	North West Shelf LNG Australia (Browse)	3.3	25	12 December 2004	Dapeng, Guangdong Province (3.7 in Phase 1 increasing to 6.6 in Phase 2) 2006	26 May 2006	US\$13.75 Billion (A\$25 billion)	US\$3.16 per mBtu reports as low as US\$2.50-US\$2.70 per mBtu
	BP Migas Indonesia (Tangguh)	2.6	25	21 September 2006	Xiuyu, Fujian Province (2.6 in Phase 1 increasing to 5.2 in Phase 2) 2009	15 May 2009	na	US\$2.40 per mBtu under old contract signed in 2002 and revised to US\$3.80 per mBtu US\$4.54 per mBtu under SPA in 2006 US\$5.93 per mBtu in 2008
	Malaysia LNG Tiga Malaysia (Tiga)	3.0	25	31 July 2006	Yangshan, Shanghai City (3.0 in Phase 1 - projected expansion to 10.0 on hold) 2009	11 October 2009	na	US\$5-US\$7 per mBtu
	Qatargas Operating Co. Qatar (Qatargas 2)	2.0	25	10 April 2008	Dapeng, Guangdong Province (3.7 in Phase 1 increasing to 6.6 in Phase 2) 2006	19 October 2009	na	Negotiated at market value
		3-5	25	13 November 2009*	Multi-destination	2013	na	na
	Total Gas & Power (sourced from Total's global LNG portfolio)	1.0	15	16 June 2008	Dapeng, Guangdong Province (3.7 in Phase 1 increasing to 6.6 in Phase 2) 2006	2010	na	na
	Qalhat LNG Oman (QLNG)	na	na	21 September 2008	na	na	na	US\$12 per mBtu
	BG Group Australia (QLNG)	3.6	20	12 May 2009 <sup>#</sup>	Yangshan, Shanghai City (3.0 in Phase 1 - projected expansion to 10.0 on hold) 2009	2014	na	Reportedly to be priced at a 10 per cent discount to traditional LNG from natural gas

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Buyer	Supplier (country and project)	Volume (mtpa)	Term (years)	Signing date	Destination terminal (capacity – mtpa and operational date)	First LNG shipm	Value	Price
<b>Petrochina Co. Ltd</b>	Pars LNG Iran (South Pars phase 11)	3.0	25	28 November 2006	Tangshan, Hebei Province (3.0 in Phase 1 increasing to 6.0 in Phase 2) 2009	2011	na	Indexed to average oil price
	Woodside Energy Australia (Browse)	2-3	15-20	6 September 2007**	Rudong, Jiangsu Province (3.5 in Phase 1 increasing to 6.5 in Phase 2) 2011	2014	US\$37 billion (A\$45 billion)	US\$7-US\$9 per mBtu
	Qatargas Operating Co. Qatar (Qatargas 4)	3.0	25	10 April 2008	Dalian, Liaoning Province (3.0 in Phase 1 increasing to 6.0 in Phase 2) 2011	2011	na	na
		2.0	25	13 November 2009*	na	2015	na	na
	Shell Eastern LNG Australia (Gorgon)	2.0	20	24 November 2008	Rudong, Jiangsu, Province (3.5 in Phase 1 increasing to 6.5 in Phase 2) 2011	2015	US\$27 billion (A\$33 billion)	US\$10 per mBtu
	ExxonMobil Australia Australia (Gorgon)	2.5	20	18 August 2009	Shenzhen, Guangdong Province (3.0 in Phase 1 increasing to 6.0 in Phase 2) 2011	2015	US\$41.1 billion (A\$50 billion)	US\$10 per mBtu
<b>Sinopec Corp</b>	National Iranian Oil Co. Iran (sourced from Iran's gas fields )	10	25	28 October 2004*	Multi-destination	na	na	na
	Esso Highlands Papua New Guinea (PNG LNG)	2.0	na	4 November 2009 <sup>##</sup>	Qingdao, Shandong Province (3.0 in Phase 1 increasing to 5.0 in Phase 2) 2014	na	na	US\$9-US\$10 per mBtu
<b>Total</b>		<b>48</b>						

Notes: \* Memorandum of Understanding; # Project Development Agreement; \*\* Terms Agreement; ## Preliminary Agreement.

Source: Prepared by the Parliamentary Library from media reports

Table 2 lists the current SPAs, MOUs and initial agreements China has signed for the long term supply of LNG. The total volume of LNG under long term contracts is 22.4 mtpa with a further potential supply of 25.6 mtpa or greater. The total contracted and potential supply of LNG has reached 48 mtpa or approximately 66 bcm of natural gas. If all MOUs and initial agreements are successfully concluded and come into operation by 2020, total LNG import volume will meet 40 per cent of China's estimated natural gas consumption, and of the total import volume, 14.4 mtpa or approximately 20 bcm of natural gas (30 per cent) will be imported from Australia.

There are currently three SPAs in operation delivering China with an annual supply of up to 10.9 mtpa or approximately 15 bcm of natural gas. LNG shipments from BP's Tangguh project in Indonesia, Petronas' Tiga project in Malaysia and Qatargas' Qatargas 2 project commenced in 2009, adding 7.6 mtpa of LNG to the 3.3 mtpa already supplied from the North West Shelf. With the start-up of additional long term supplies, 15 per cent of China's natural gas consumption and more than 75 per cent of China's estimated annual growth in gas consumption will be met by LNG imported from Australia, Indonesia and Qatar.

In addition, three SPAs for the supply of a total of 7 mtpa of LNG will have started operation by 2011 bringing the total volume of imported LNG to 17.9 mtpa or approximately 25 bcm of natural gas, which is equivalent to 25 per cent of China's total consumption in 2008.

## **China's LNG imports**

China imported its first shipment of LNG (95 000 tonnes or 127 000 cubic metres) in May 2006 from the North West Shelf and its imports have quickly risen since then, increasing to 2.9 million tonnes (or 3.87 bcm of natural gas) in 2007 and 3.3 million tonnes (or 4.44 bcm) in 2008, mainly from Australia (Table 3).<sup>30</sup> About 65 per cent of the LNG from the North West Shelf is used for power generation with the remainder allocated to gas customers in Shenzhen and other major cities in Guangdong Province and Hong Kong.

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30. Until LNG deliveries from Indonesia's Tangguh project commenced in 2009, China relied on spot purchases to supply its second LNG terminal at Xiuyu in Fujian Province. The Dapeng LNG terminal also received spot shipments in 2007 and 2008.

**Table 3. China's LNG imports, 2006-2008 (billion cubic metres)**

Supplier	2006	2007	2008	Total
Australia	1.00	3.30	3.61	7.91
Algeria		0.42	0.17	0.59
Egypt			0.25	0.25
Equatorial Guinea			0.16	0.16
Malaysia			0.01	0.01
Nigeria		0.08	0.24	0.32
Oman		0.07		0.07
<b>Total</b>	<b>1.00</b>	<b>3.87</b>	<b>4.44</b>	<b>9.31</b>

Source: BP Statistical Review of World Energy - June 2007, June 2008, June 2009.<sup>31</sup>

China's LNG imports in the first 10 months of 2009 totalled 4.4 million tonnes and may exceed 5 million tonnes by the end of 2009.<sup>32</sup>

China's share of the Asia Pacific LNG trade in 2008 was close to 3 per cent and 2 per cent of world LNG imports (Table 4).

**Table 4. World LNG trade, 2006-2008 (billion cubic metres)**

	2006	2007	2008
<b>Asia Pacific</b>	<b>135.19</b>	<b>147.98</b>	<b>155.98</b>
China	1.00	3.87	4.44
India	7.99	9.98	10.79
Japan	81.86	88.82	92.13
South Korea	34.14	34.39	36.55
Taiwan	10.20	10.92	12.07
<b>Rest of the world</b>	<b>75.89</b>	<b>78.43</b>	<b>70.53</b>
<b>Total Imports</b>	<b>211.08</b>	<b>226.41</b>	<b>226.51</b>

Source: BP Statistical Review of World Energy - June 2007, June 2008, June 2009.<sup>33</sup>

31. Available at <http://www.bp.com>

32. Energy Intelligence, 'Chinese October LNG Imports Sky Rocket Year-on-Year', *LNG Intelligence*, 30 November 2009.

33. Available at <http://www.bp.com>

World LNG demand in 2020 is projected to reach 332 to 388 mtpa<sup>34</sup> At the level of more than 48 mtpa of potential LNG supply per year by 2020, China's share of world LNG trade is likely to be around 13 per cent.

### Average import prices and city gate prices

Average LNG import prices paid by China are below the average prices of LNG imported by Japan and South Korea, reflecting the lower priced North West Shelf gas and renegotiated price for LNG from BP's Tangguh project (Table 5). Higher average prices paid by Japan and Korea, the two largest importers of LNG in the world, are indicative of the price volatility risk associated with spot LNG prices.

The ex-plant price of each gas field is determined by the central government in China which sets different prices by end-user.<sup>35</sup> Sellers and buyers are able nevertheless to negotiate actual prices within the 10 per cent allowable variation to the price set by the government. For the industrial sector, the average ex-plant price was US\$4.57 per mBtu in 2008 and close to US\$3 per mBtu for the residential sector.<sup>36</sup>

Because of the distance between major gas fields and coastal cities, city gate prices in these cities are relatively high, reaching US\$7.37 per mBtu in the coastal provinces and US\$8.00 to US\$8.50 per mBtu in the industrialized southern provinces in 2008.<sup>37</sup>

Average LNG import prices, assisted by the price for North West Shelf gas which does not exceed US\$3.16 per mBtu, have been competitive with city gate prices.

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34. T Morikawa, *Natural Gas and LNG Supply/Demand Trends in Asia Pacific and Atlantic Markets*, Institute of Energy Economics, Japan (IEEJ), July 2008, viewed 1 December 2009, <http://eneken.ieej.or.jp/data/en/data/pdf/447.pdf>

35. N Higashi, *Natural Gas in China: Market evolution and strategy*, op. cit., p. 24.

36. *ibid.*

37. *ibid.*, p. 26, Table 14. West-East Pipeline Gas (2008). See also eResearch, 'Appendix 3: Natural Gas Markets in China', *Primeline Energy Holdings Inc.*, initiating report, Independent Equity Research Corp., 10 April 2008, p. 19, viewed 1 December 2009, [http://investorideas.com/Research/PDFs/PEH\\_041008-I.pdf](http://investorideas.com/Research/PDFs/PEH_041008-I.pdf)

Table 5. Average LNG import prices: China, Japan and Korea, 2007-2009 (\$/mBtu)

Year (month)	China	Japan	Korea
<b>2007</b>	<b>4.0</b>	<b>7.7</b>	<b>9.5</b>
<b>2008</b>	<b>5.4</b>	<b>12.5</b>	<b>13.8</b>
October	3.1	15.0	16.6
November	3.7	15.1	16.6
December	3.1	13.8	16.5
<b>2009</b>			
January	3.9	12.7	15.1
February	3.5	10.5	12.8
March	4.5	9.5	12.8
April	3.9	8.1	8.7
May	3.6	7.5	7.6
June	3.7	7.2	7.4
July	3.6	7.6	7.2
August	4.5	7.8	8.0
September	4.1	8.4	8.4

Source: OAPEC, Monthly Report on Petroleum Developments in World Markets and Member Countries, November 2009.<sup>38</sup>

## Conclusions

China's reliance on LNG supplied by Australia to meet its current and future demand for natural gas has important implications for energy trade between China and Australia. China's natural gas consumption has increased faster in recent years and domestic supply is not increasing fast enough to meet demand, which will maintain a 9 to 11 per cent growth rate. Demand for natural gas will reach 100 to 120 bcm in 2010 of which 5 bcm, or 25 per cent of the gap between domestic production and consumption of natural gas, will be met by LNG from the North West Shelf. By 2020, China's demand is expected to reach 210 to 250 bcm of natural gas and LNG from Australia will supply around 10 per cent of China's natural gas needs.

With growing concern in China over the environmental impact of coal consumption and the pledge by China's leadership to limit carbon emissions, there is strong pressure on China's energy industries to diversify energy consumption and resort to cleaner energy sources. But

38. Viewed 14 December 2009, <http://www.oapec.org/publications/Economic%20Monthly%20Reports/English/November%202009.pdf>



in order to achieve a lower carbon, clean energy mix China will need to create a transparent and competitive energy market to encourage investment. Imported LNG from the North West Shelf and the Tangguh project in Indonesia is critical for developing the initial supply phase of a competitive energy market because of its relative low cost. At the same time China has been able to secure long term LNG supply to meet the expected growth in demand for natural gas. The present high LNG prices paid by China cannot compete with cheaper domestic coal and natural gas, although on a non-inflated dollar adjusted basis, the US\$10 per mBtu for Gorgon gas is likely to fall to less than half that figure in 20 years.

## Postscript

A 'key terms agreement' between Woodside Energy Ltd. and PetroChina Co. Ltd. signed in 2007 for the supply of 2 to 3 mtpa of LNG expired on 31 December 2009.<sup>39</sup> The agreement envisaged production from the Browse project commencing in 2013–15, a timeframe that will not be met.

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39. A Wilson, 'Chinese LNG Move Sets Back Woodside', *WSJ.com*, 5 January 2010, viewed 5 January 2010, <http://online.wsj.com/article/SB10001424052748704065404574637002766599422.html>