

Coal Bed Methane in China

(31 August, 2009)

Analysis: What is Coal bed Methane (CBM)

Coalbed Methane (CBM) is methane extracted from coal beds. CBM fields have coal seams flooded with water. Methane attaches itself to coal due to water pressure. To produce CBM, the water must be drawn out, lowering the pressure so that the methane can detach from the coal and flow to the wellhead. CBM is considered an unconventional natural gas production technique. CBM is attractive because production declines are low and finding costs are low as coal deposit locations are known. The downside is that lifting costs are often unpredictable as well operation is often a trial and error process of de-watering and “teasing” the well to release its methane.

Environmental and safety benefits of CBM

CBM production has many environmental benefits. The purity of CBM methane is superior to that of conventional natural gas and does not emit sulphur dioxide or particulates. Extracting CBM prevents the release of methane, a greenhouse gas, into the atmosphere from subsequent mining extraction of the coal. Removing methane from coal seams also improves mine safety as it reduces risks of mine explosion. One environmental concern of CBM production is disposal of extracted water which can contain high degree of contaminants. Water reinjection and tailing pond processing are possible water disposal techniques.

China has extensive resources of CBM

China has estimated CBM resources in place of ~1,250 Tcf. Currently, production from CBM in China is negligible as it is still an unconventional natural gas extraction method. The US, with ~850 Tcf of CBM resources produces ~5.8 Bcf/d (~10%) of its natural gas from CBM. This is 75% of China’s total natural gas production. Clearly, CBM represents significant potential for natural gas production in China. Whether it makes sense to produce CBM in scale depends on China’s CBM production costs and China’s natural gas prices (which will be driven by price reform) and volumes from conventional natural gas production.

Green Dragon Gas, pure play China CBM

Green Dragon Gas (AIM: GDG) is a pioneering CBM company in China. It has CBM PSC fields in the inland provinces of Shanxi, Jiangxi, Anhui, and Guizhou with an estimated 25 Tcf of gas in place. The company also distributes gas to CNG stations and through town gas pipelines. The company is on the cusp of ramping up drilling to commence commercial production after many years of pilot drilling. On August 24th, 2009, Green Dragon Gas announced that ConocoPhillips has agreed to pay US\$20 million to GDG and fund US\$30 million in capex. ConocoPhillips can elect to pay US\$120 million to acquire 50% of Green Dragon’s interest in three PSC contracts. Based on gas in place, Green Dragon’s years of extensive work, and ConocoPhillips’ interest, we believe Green Dragon Gas clearly has potential – all will depend on natural gas prices in China and Green Dragon’s costs of developing and operating its CBM projects.

Laban Yu

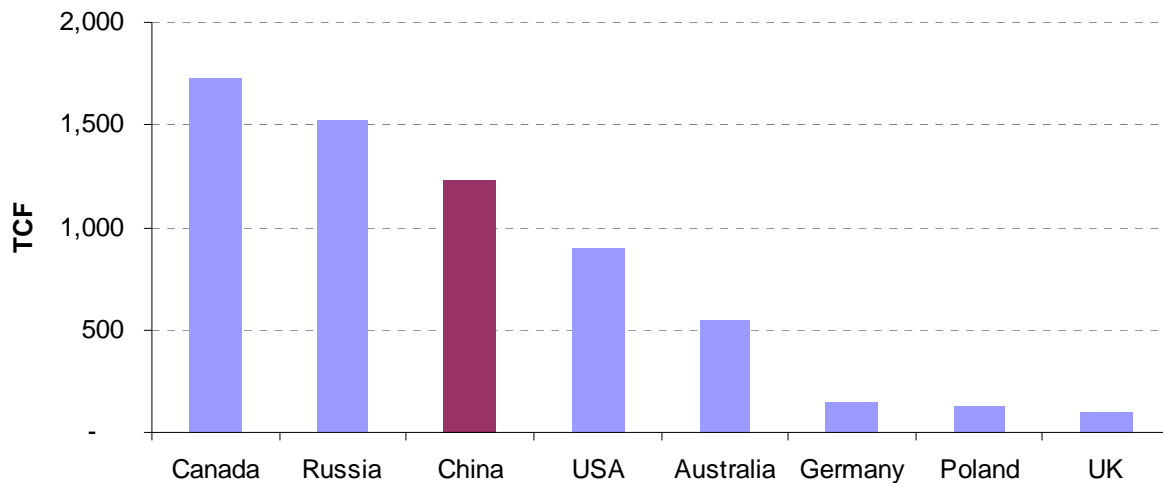
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Figure 1: CBM resources in place



Source: Greka, MainFirst estimates

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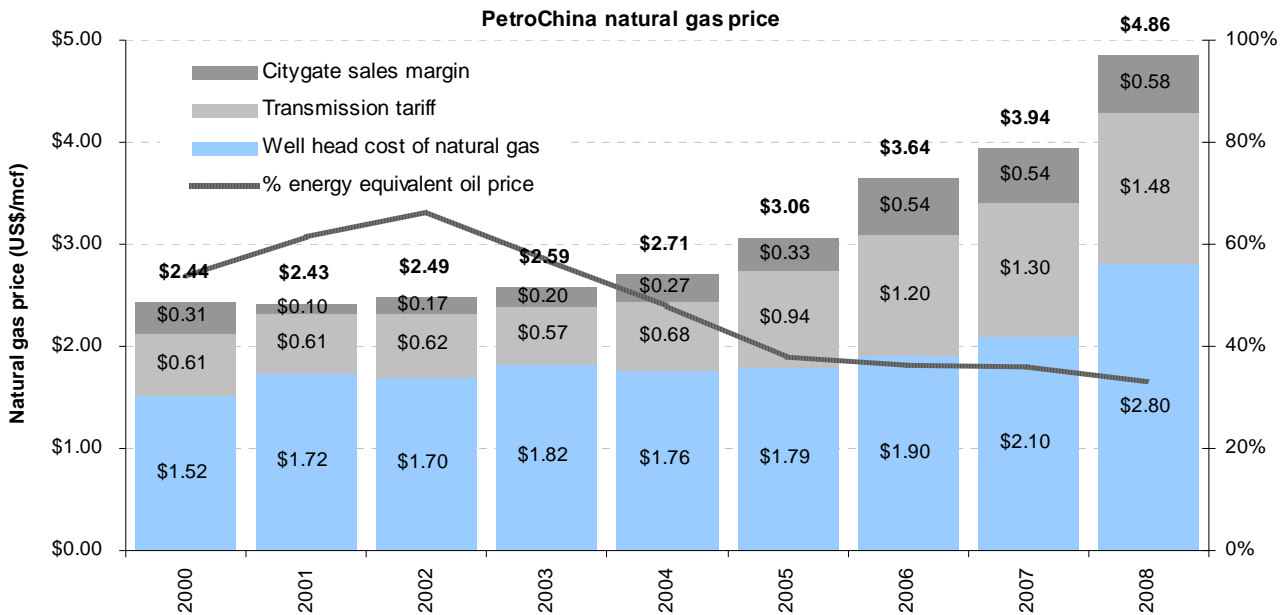
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We expect natural gas price reform by year end

The NDRC is currently considering reforming China’s regulated natural gas pricing system. The fall in oil prices and year-end start-up of the West-East pipeline supplying Southern China with Turkmenistan gas present the NDRC a window of opportunity to take a step towards market pricing of natural gas. Average city-gate natural gas prices are currently ~40% of the energy equivalent oil price, significantly above the trough of ~12% when oil peaked in 2008. US natural gas averaged ~80% of the energy equivalent oil price over the last 10 years. We believe the new pricing regime will attempt to peg natural gas prices to a percentage of its energy equivalent oil price – probably not the ~80% seen in the US but certainly above the ~30% averaged over 2008.

Figure 2: PetroChina natural gas price realization vs oil equivalent price



Source: Company accounts, Bloomberg, MainFirst estimates

Current pricing mechanism causing discrepancies

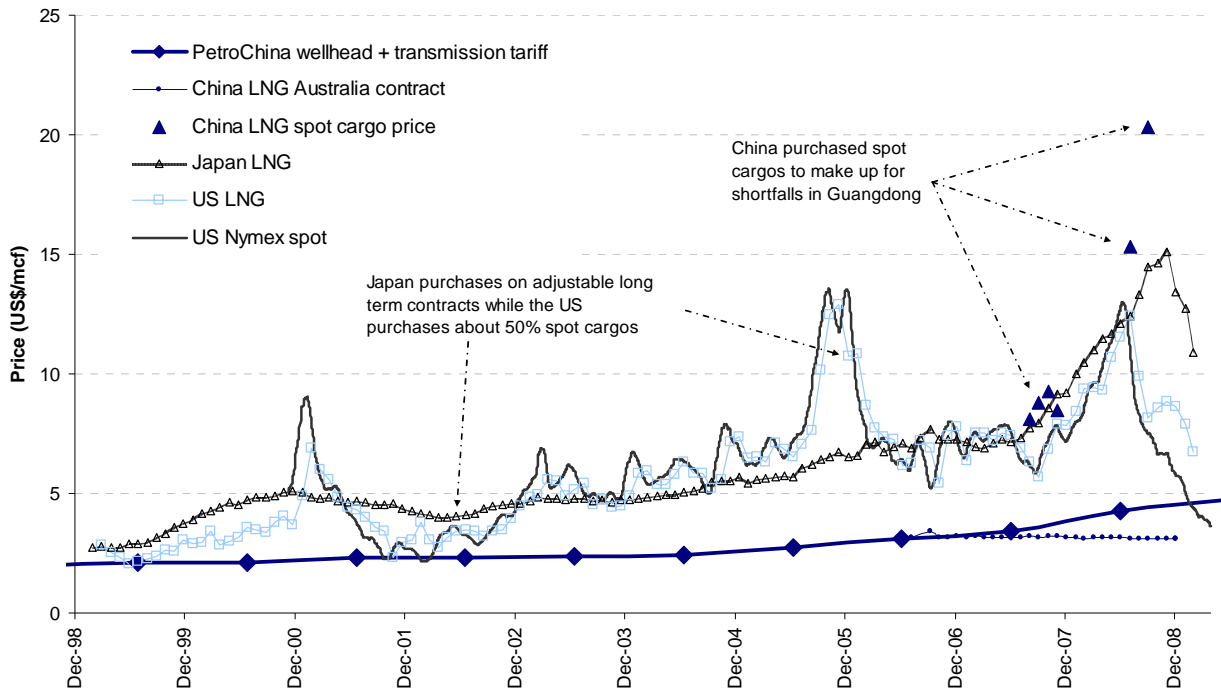
Government price caps on natural are responsible for price discrepancies. Many Chinese industrial users are willing to pay higher prices but protection of residential consumers and fertilizer manufacturers are government priorities.

China has been liberalizing natural gas prices in small increments. The government has been raising prices by about 8-12% per year. Prices used to be fixed for tier one priority users but are now allowed to swing 10% up or down. Tier two users for which the government sets higher prices are allowed to swing 10% up and 100% down. The present plan is to converge prices for both tiers of end users in three to five years. In addition to this, the government also allows different pricing to buy imported natural gas – a necessity if China expects to import any natural gas at all. We believe, like refined product prices, the government will take one large step towards market pricing probably around year end 2009.

Over the long term, US natural gas trades ~80% of oil equivalent price

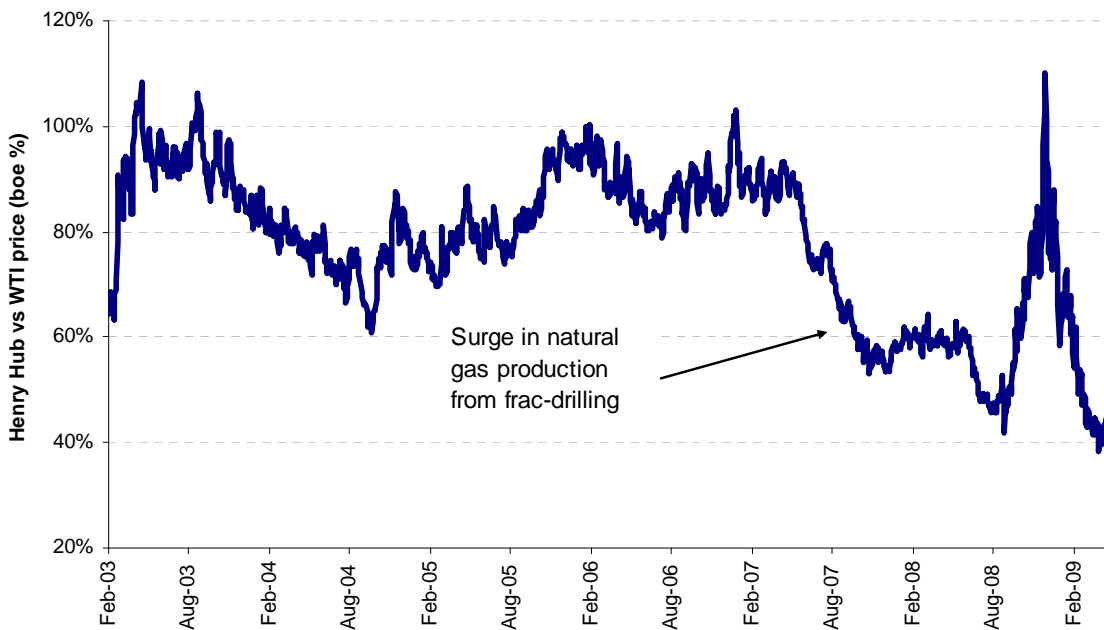
Natural gas prices in the US collapsed in 2008, even more so than oil. This is due to seasonal factors as well as a surge in natural gas production from technological improvements in shale frac-drilling. Over the past 10 years, Henry Hub natural gas has traded at ~80% of the oil equivalent price. We believe US prices will return to those levels in the medium term as fuel switching occurs (homes will replace oil fired boilers with natural gas furnaces).

Figure 3: China and world natural gas prices



Source: Company accounts, Bloomberg, MainFirst estimates

Figure 4: US energy equivalent natural gas vs oil price



Source: Bloomberg

The purpose of natural gas price reform is to incentivise upstream investment

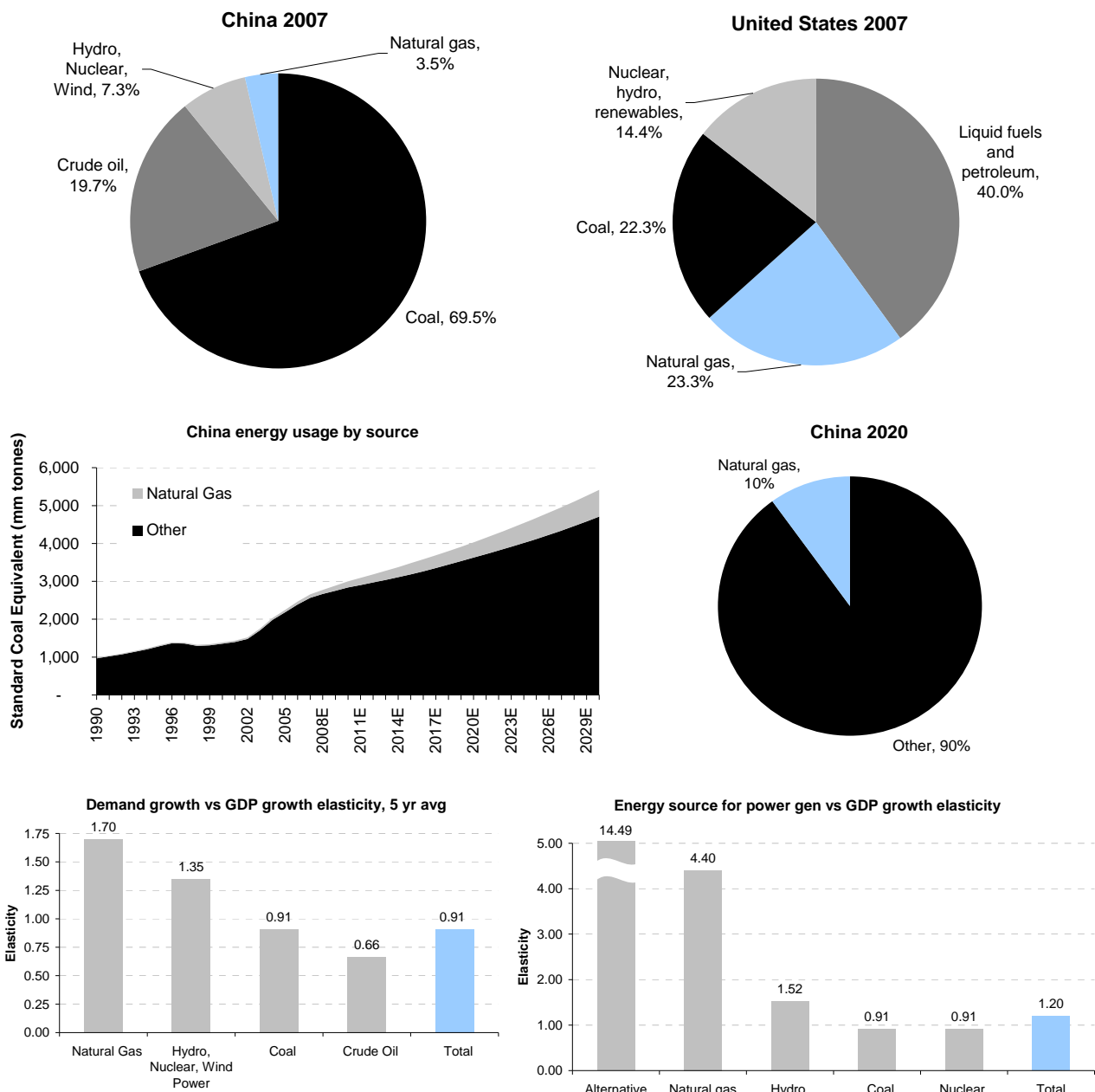
Natural gas usage in China is still in its early days. Natural gas provides just 3.5% of China’s energy compared to 23% for the United States. As the cleanest burning fossil fuel, promotion of natural gas usage is a government priority. Suppressed natural gas prices will likely hinder development of natural gas as an energy source in China. We believe the upstream producers are dragging their feet developing natural gas resources because of China’s regulated pricing system.

Natural gas is China's fastest growing major energy source

Natural gas is China's fastest growing major energy sources. In 2008, natural gas accounted for only 3.5% of China's total energy consumption compared to 23% in the US. Based on national energy development goals and our own estimates, we expect natural gas to reach 10% of China's energy consumption by 2020 and 13% by 2030 at 10.6 Tcf and 18.7 Tcf respectively.

Over the past 5 years, natural gas consumption has been growing at 170% of GDP's growth rate compared to 91% for total energy usage. Growth of natural gas for power generation has been 440% of GDP growth. We expect consumption of natural gas to grow at a ~15% CAGR over the next 5 years and 11% over the next 10 years. Growth in natural gas consumption is substituting for other fossil fuels – coal, coal gas, and liquid fuels.

Figure 5: Natural gas vs other energy source

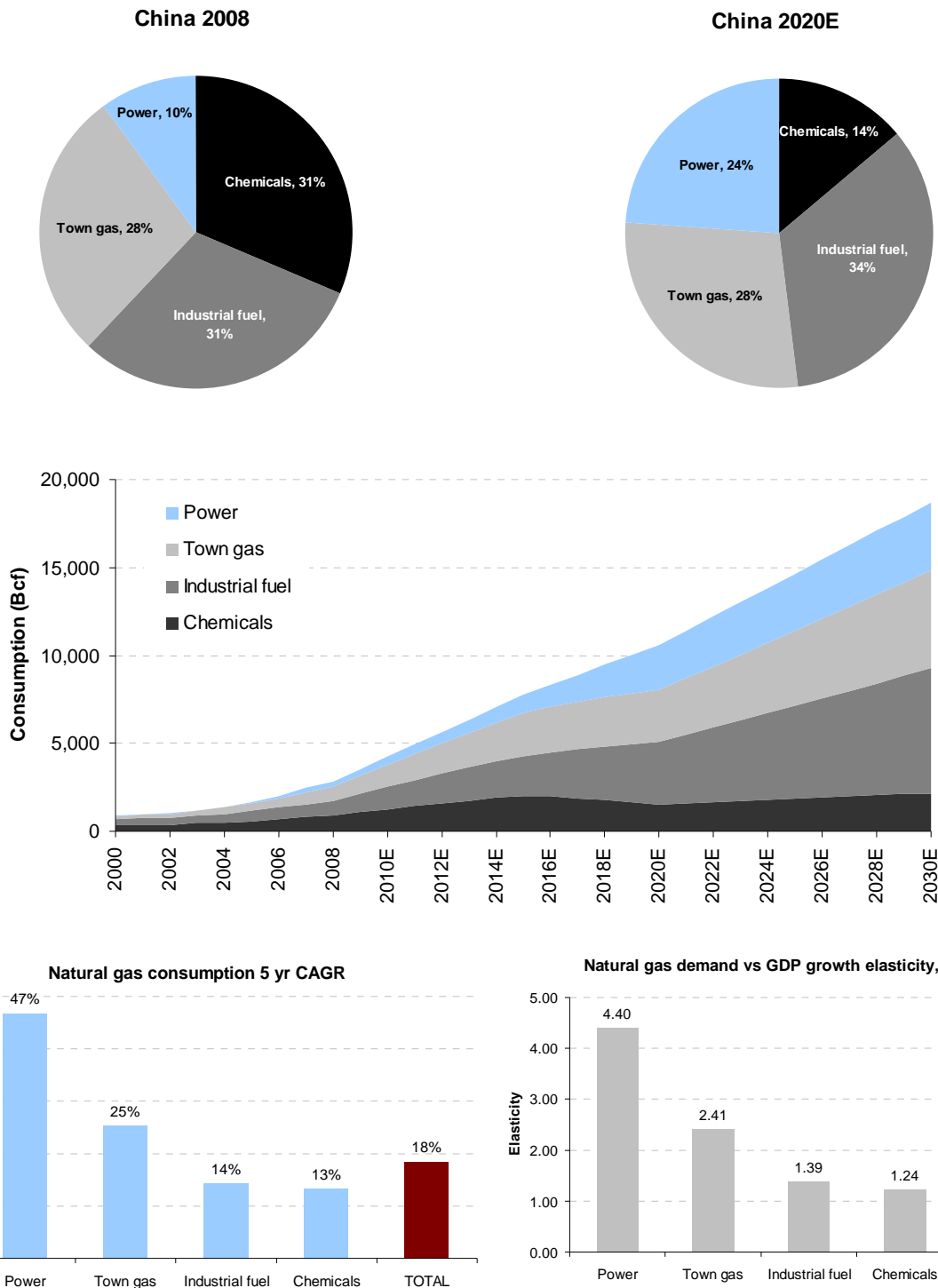


Source: China National Bureau of Statistics, DOE EIA

Environment driving the switch to natural gas

In 2008, chemical feedstock consumed the largest portion of natural gas at 31% while power generation consumed the least at 10%. In the coming years, we expect natural gas usage for power generation to experience the fastest growth while usage for chemical feedstock will likely be restricted. We believe China is becoming serious about environmental degradation especially near population centres. Switching from coal to natural gas peaking power plants can significantly reduce particulate emissions near populated areas. We believe China will suppress usage of natural gas as a raw material because chemicals products can be imported while energy generally needs to be generated locally.

Figure 6: Natural consumption by sector

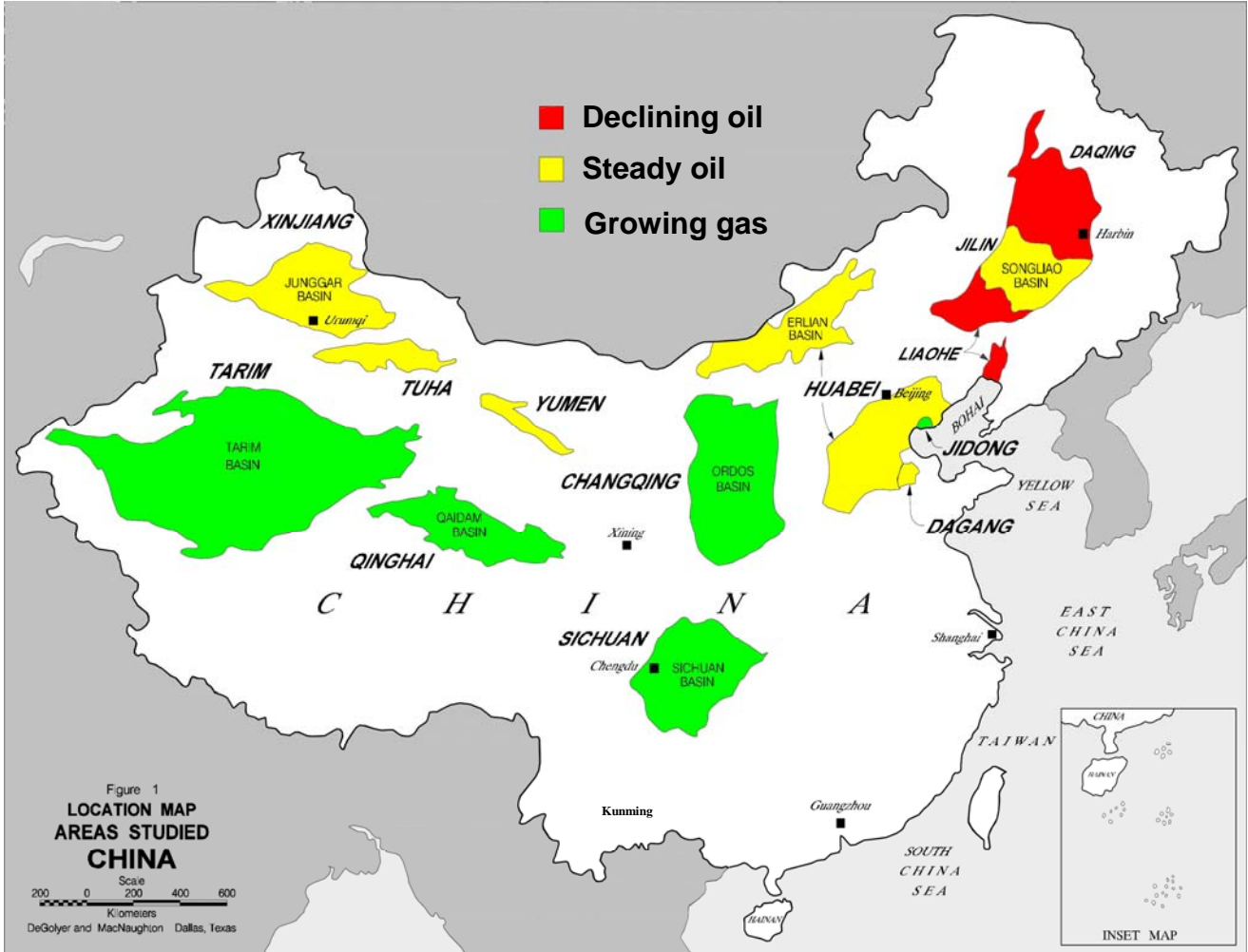


Source: China National Bureau of Statistics, MainFirst estimates

Natural gas fields far from population and economic centres

China’s large onshore natural gas fields – Tarim, Ordos, Qadam, and Sichuan – are located far inland, away from coastal populations and economic centres. Sichuan, luckily, is heavily populated, economically vibrant, and awash in natural gas. But in general, China’s usage of natural gas has been hobbled by geography.

Figure 7: China natural gas fields



Source: PetroChina, MainFirst estimates

Massive pipeline construction underway

China is building pipelines to connect natural gas resources from western sources to coastal cities (while connecting municipalities in between). PetroChina completed its first 4,000 km, US\$5.7B, West-East pipeline with a capacity to bring 600 Bcf/yr of gas from the Tarim basin in Xinjiang to Shanghai in 2004. A second 9,102 km, US\$20B, West-East pipeline with a capacity of 1 Tcf/yr is scheduled for completion in 2011. Talks are afoot for a third West-East pipeline connecting the Tarim Basin to Fujian province.

Sinopec is building a 1,700 km, US\$8.7B pipeline with a capacity of 425 Bcf/yr from its Puguang gas field in Sichuan province to Shanghai. The pipeline is scheduled to begin operations in 2009. In the Southwest, PetroChina is building the Sino-Burma pipeline which will bring Burmese gas from the Bay of Bengal to the city of Kunming in Yunnan province. The pipeline will cost US\$1B and begin operation in 2013 importing 146 Bcf/yr of natural gas.

Besides the high profile trunk lines, China is concurrently building a network of branch lines linking hundreds of cities to natural gas sources. By 2015, over 300 Chinese cities are expected to be supplied with natural gas compared to just over 100 today. PetroChina is taking the lead spending over US\$5B on pipeline in 2008 and 2009.

Figure 8: Pipeline construction 2008-2009

Pipeline construction 08-09	Diameter (mm)	Length (km)	Capacity (Bcf/yr)	Ownership	Investment	Operational
2nd West-East	1,219	9,102	1,059	PetroChina	20,609	2011
Lanzhou-Zhengzhou-Changsha	508-660	2,148	560-700	PetroChina	1,739	Jun-09
Sichuan-to-East	1,016	1,674	424	Sinopec	8,696	Jun-09
Yulin-Ji'nan	610-711	1,012	106	Sinopec	1,159	2009-2010
Fujian LNG	-	369	-	CNOOC	797	2009
Fujian Refinery	-	345	-	Sinopec	232	2009
Kunming-Dali	324-273	323	135	Sinopec	76	May-09
Yongqing-Tangshan-Qinhuangdao	1,016	320	318	PetroChina	464	May-09
Yingxian-Zhangjiakou	508	283	42	PetroChina	246	YE09
Changling-Zhuzhou	406 and 356	270	280	Sinopec	145	Jun-08
Jiujiang-Zhangshu	-	240	154	Sinopec	87	Jan-08
Changling-Changchun-Jilin petrochemicæ	610-711	221	99	PetroChina	174	Oct-09
Zhengzhou-Anyang	355	215	98	Sinopec	-	-
Yanchang refinery-Xi'an refinery	-	200	234	Yanchang	210	Jul-09
Liaoyang-Bayu Rim	406.4	200	-	Sinopec	-	Jul-09
Caofeidian-Tianjin	813	190	934	Sinopec	-	Jul-09
Liuzhou-Guilin	273	190	70	Sinopec	39	Jan-09
Round-Beijing	-	183	133	Sinopec	-	Jul-08
Daqing-Qiqihar	406.4	155.7	29	PetroChina	-	Sep-08
Jiyuan-Baibao Pipeline	-	104	61	PetroChina	-	Nov-09
Nanpu-Tangshan	660	51.6	88	PetroChina	26	Nov-08
Aoshan-Cezi Island	-	45	701	Sinopec	-	Feb-09
Caiyu-Tongzhou	1,016	41.4	424	PetroChina	-	Dec-08
Henqin Island-Macao	406	12.8	7	Sinopec	29	Feb-09
Total		17,896	5,395		34,728	
PetroChina 08 Pipeline segment capex					5,301	
PetroChina 09E Pipeline segment capex					5,514	

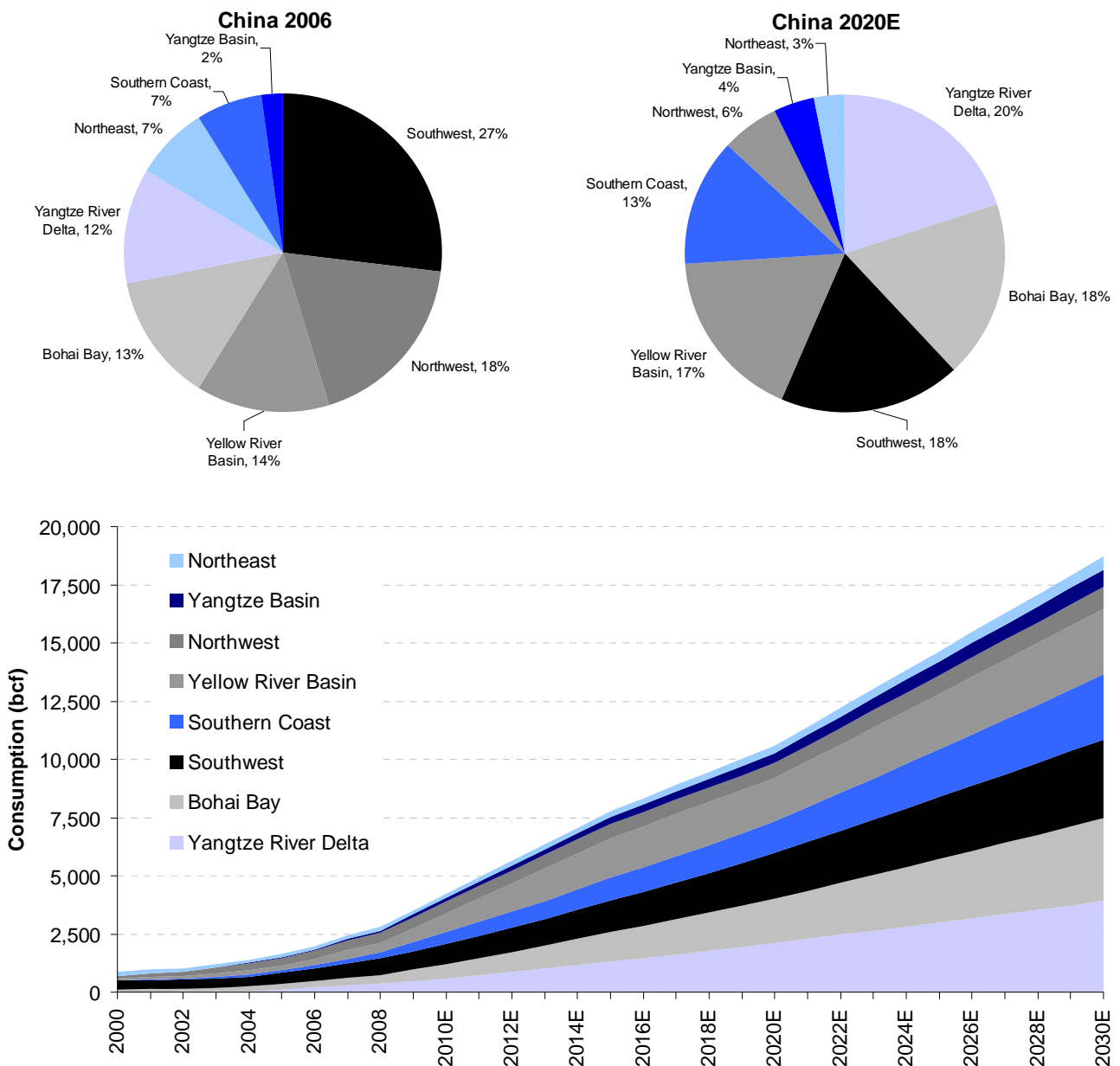
Source: China OGP

Pipelines rationalizing natural gas consumption

In 2006, 18% of China’s natural gas was consumed by sparsely populated northwest China – where the Tarim and Qadam natural gas fields are located. As pipeline infrastructure is built, those basins will supply China’s eastern cities, river valleys, and southern coasts. By 2020, we believe The Yangtze River Delta (Shanghai region), Bohai Bay (Beijing and Tianjin region), and the Southern Coast (Hong Kong, Shenzhen, Guangzhou) will account for just over 50% of consumption vs 32% today.

With the pipelines in place, price rationalization can also occur with gas supplied to cities and industrial regions capable of paying higher prices. Infrastructure and upstream development will drive each other with a chicken/egg knock on effect.

Figure 10: Natural gas consumption by region



Source: China National Bureau of Statistics, MainFirst estimates

Figure 11: China natural gas demand by region and LNG terminals

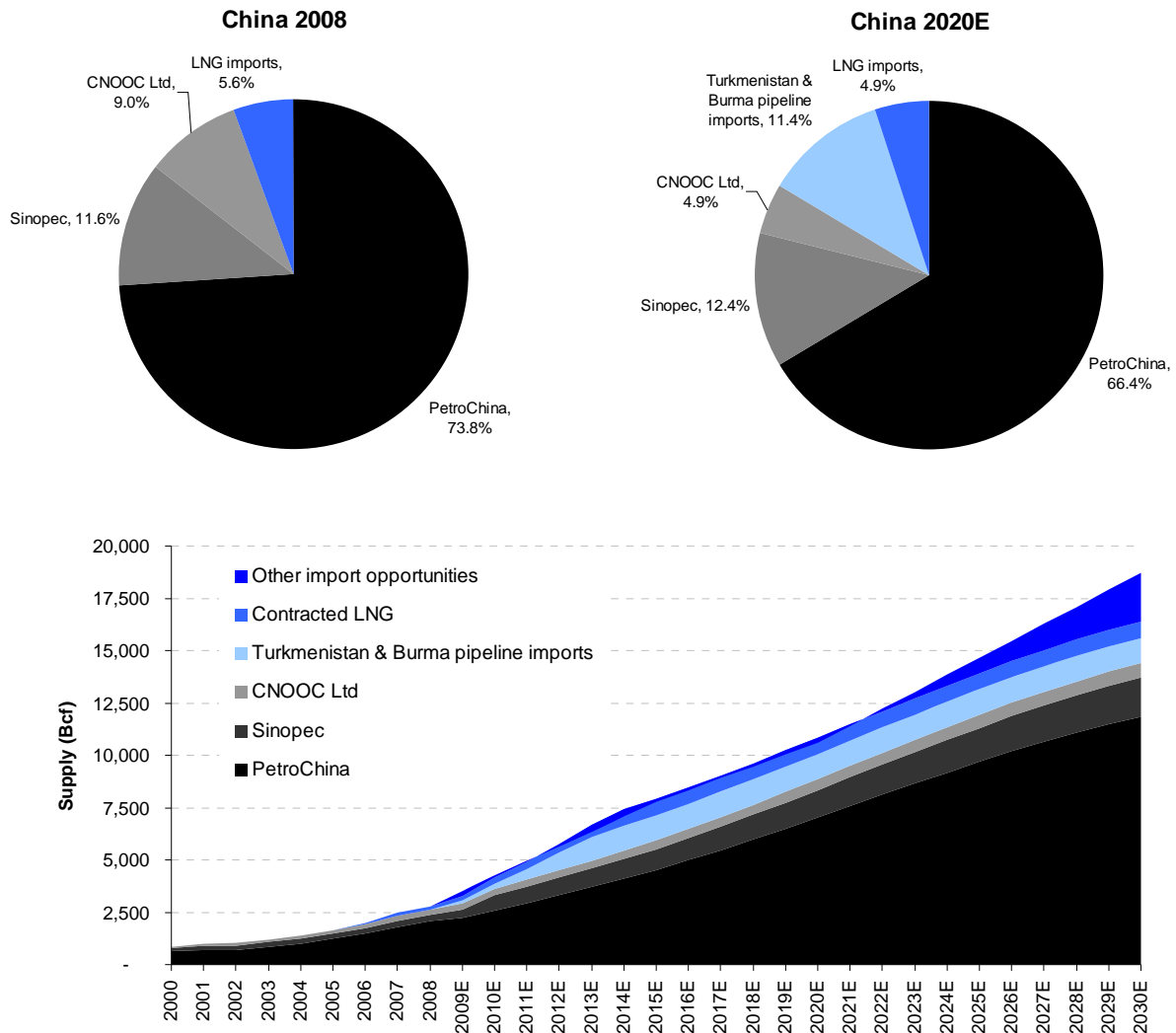


Source: China National Bureau of Statistics, MainFirst estimates

PetroChina to be China’s dominant natural gas supplier

In 2008, PetroChina supplied 74% of China’s natural gas. We expect PetroChina to increase natural gas production at double digit rates for the next 8-10 years, doubling production by 2014 and more than tripling production by 2020. In addition, we expect PetroChina to import ~1.5 Tcf of natural gas from central Asian and from Qatari and Australian LNG. By 2020, we estimate that PetroChina’s upstream production will supply 66% of China’s natural gas consumption while PetroChina imports will account for ~13% of consumption, giving the company 79% of China’s natural gas market. Sinopec will account for 12% and CNOOC Ltd will account for 5%. The remaining 3% will be supplied by CNOOC Group (CNOOC Ltd’s parent) through Australian and Southeast Asian LNG.

Figure 12: Natural gas supply



Source: China National Bureau of Statistics, MainFirst estimates

Import will be limited until 2020

China has signed approximately 775 Bcf/yr of LNG contracts with one train from Australia already delivering and others starting by 2014 (page 21). In addition, approximately 1.2 Tcf/yr of natural gas has been signed with Turkmenistan and Burma with deliveries starting 2009 and peaking in 2014. With China’s projected natural gas production growing at double digit rates through 2014 and high single digit rates through 2020, we do not foresee a need for substantially more import contracts in the medium term.

We believe China’s natural gas production is a long way from peaking

After 2020, the picture becomes murkier. The high case for natural gas imports will be if China’s natural gas production peaks in 2025 as some experts have predicted (conservatively we believe). If such a scenario played out, China will likely need to import 50% of its natural gas by 2030, ~9.3 Tcf/yr. This will result in a need for another ~7.3 Tcf/yr of additional imported gas.

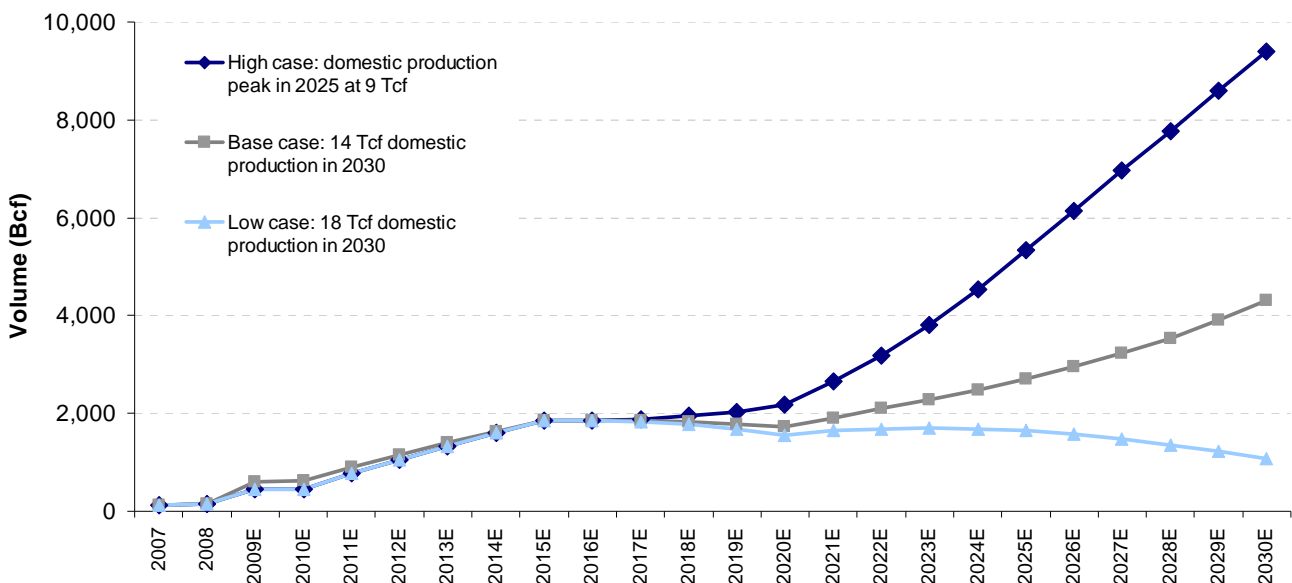
We do not believe this is likely. Exploration and development of domestic natural gas resources has just begun in earnest. Drilling is still conventional through high permeability sandstone. China is still 20 years away from unconventional natural gas exploration and development. The country’s abundant coal resources could significantly add to natural gas production through coalbed-methane (CBM), a technique being tested in pilot programs. China is a long way off from frac-drilling, an unconventional extraction technique for shale-gas. These methods of natural gas production have seen technological breakthroughs in recent years allowing the US to significantly increase its natural gas supply despite over 50 years of intense exploration and development.

Our base case assumes production growth tapering from high single digit growth in 2020 to low single digit growth in 2030. This will result in the need to import 22% of China’s natural gas by 2030, or another ~2.2 Tcf of additional imported gas.

A chance for 100% self sufficiency

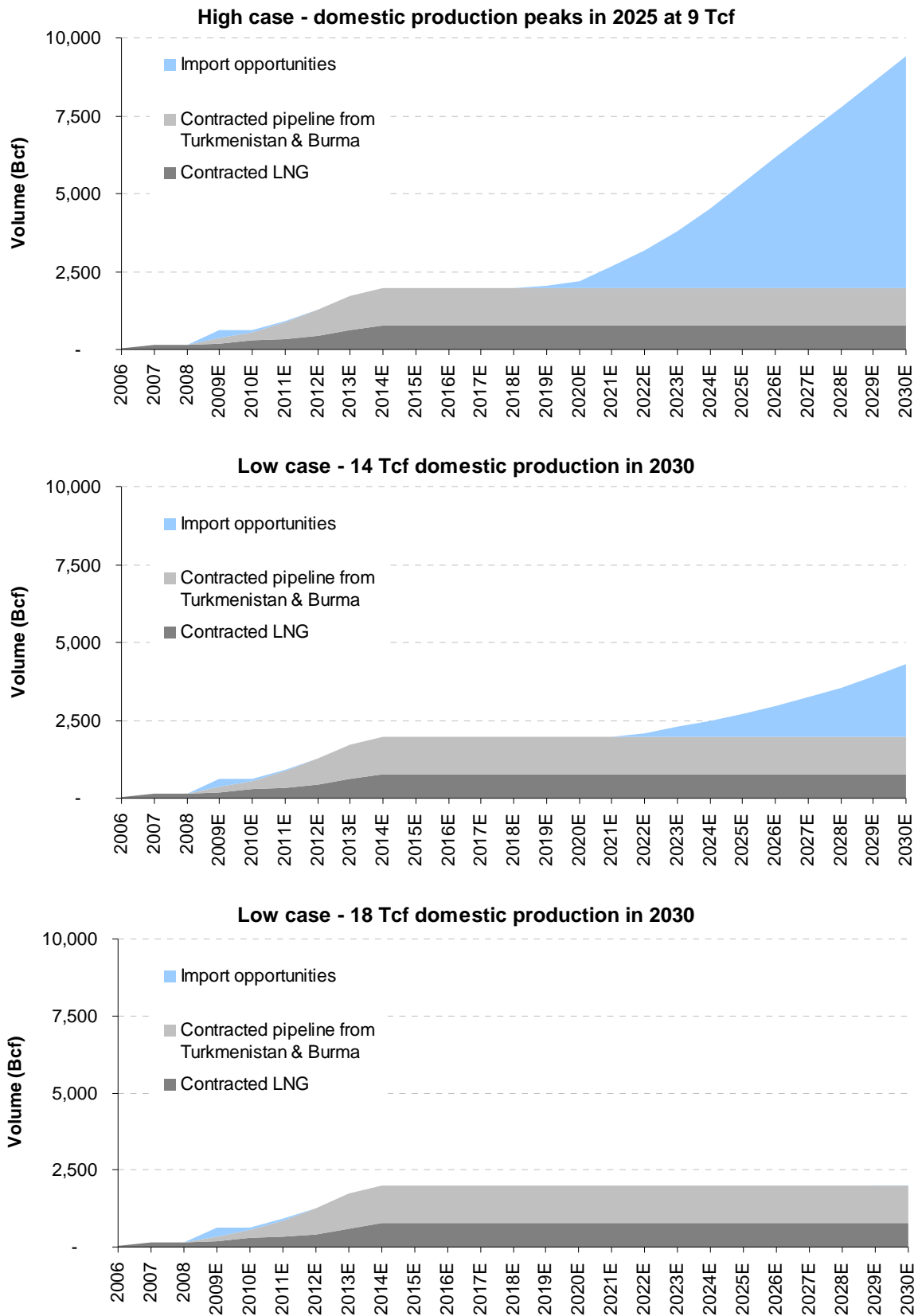
We believe the risk is tilted towards near self sufficiency for natural gas. If mid single digit production growth can be sustained through 2008, not an unrealistic scenario if CBM and shale gas (not to mention coal gasification) are able to offset declines in conventional fields, China’s needs for imported gas will be significantly diminished. The technology has already been developed in North America, 2030 is still a long way off, and the market has a tendency to underestimate technology in the long term.

Figure 13: Required natural gas imports



Source: China National Bureau of Statistics, MainFirst estimates

Figure 14: Natural gas imports: high, base, and low case



Source: China National Bureau of Statistics, MainFirst estimates

Figure 15: Base case supply-demand forecast

SUPPLY (Bcf)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Woodside/CNOOC							32	116	127	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Petronas/CNOOC										51	51	51	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Qatargas/PetroChina											93	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Woodside/PetroChina													93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
Shell/PetroChina													93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
BG/CNOOC															168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168
Spot					0			20	29																						
LNG imports							32	136	156	191	285	332	420	607	775	775	775	775	775	775	775	775	775	775	775	775	775	775	775	775	775
Turkmenistan pipeline imports										107	107	107	533	799	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065
Burman pipeline imports														110	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146
Other imports (exports/surplus)										314	231	468	204	(111)	(357)	(141)	(127)	(134)	(161)	(204)	(260)	(73)	112	302	503	723	968	1,244	1,559	1,920	2,332
Imports					0		32	136	156	612	622	906	1,157	1,405	1,629	1,845	1,860	1,852	1,825	1,782	1,727	1,913	2,098	2,288	2,490	2,709	2,954	3,231	3,546	3,906	4,318
PetroChina	665	684	705	840	987	1,245	1,480	1,784	2,064	2,228	2,563	2,921	3,310	3,697	4,104	4,514	4,979	5,466	5,972	6,494	7,028	7,568	8,111	8,651	9,181	9,696	10,189	10,654	11,085	11,475	11,819
Sinopec	105	198	209	228	245	247	277	310	325	392	750	795	843	894	947	1,004	1,064	1,125	1,187	1,250	1,312	1,375	1,436	1,497	1,557	1,616	1,672	1,727	1,778	1,827	1,873
CNOOC Ltd	95	86	116	129	168	158	193	224	252	284	301	319	338	359	380	403	427	451	475	499	523	546	568	589	610	629	646	662	676	688	699
Est production inc-royalties	865	969	1,030	1,197	1,400	1,651	1,950	2,318	2,640	2,905	3,614	4,036	4,349	4,949	5,431	6,021	6,477	7,043	7,635	8,243	8,863	9,489	10,116	10,738	11,348	11,949	12,507	13,043	13,539	13,981	14,391
TOTAL SUPPLY	865	969	1,030	1,197	1,400	1,651	1,982	2,454	2,796	3,516	4,236	4,942	5,648	6,354	7,060	7,766	8,331	8,896	9,460	10,025	10,590	11,402	12,214	13,026	13,838	14,650	15,461	16,273	17,085	17,897	18,709
DEMAND (Bcf)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Chemicals	322	340	364	469	467	554	694	800	881	1,080	1,268	1,440	1,602	1,752	1,891	2,019	1,966	1,886	1,779	1,644	1,483	1,568	1,649	1,726	1,799	1,868	1,933	1,993	2,050	2,103	2,152
Industrial fuel	356	389	401	435	511	614	648	734	853	1,065	1,274	1,476	1,674	1,870	2,063	2,252	2,499	2,758	3,027	3,308	3,601	3,922	4,250	4,585	4,926	5,274	5,628	5,989	6,356	6,729	7,109
Town gas	152	199	227	252	364	402	520	655	783	1,005	1,235	1,469	1,711	1,961	2,219	2,485	2,599	2,704	2,800	2,887	2,965	3,215	3,469	3,725	3,985	4,248	4,515	4,784	5,057	5,333	5,613
Power	36	40	38	41	59	81	119	266	280	367	460	558	662	772	888	1,010	1,266	1,548	1,854	2,185	2,542	2,697	2,846	2,989	3,127	3,260	3,386	3,507	3,622	3,732	3,835
TOTAL DEMAND	865	969	1,030	1,197	1,400	1,651	1,982	2,454	2,796	3,516	4,236	4,942	5,648	6,354	7,060	7,766	8,331	8,896	9,460	10,025	10,590	11,402	12,214	13,026	13,838	14,650	15,461	16,273	17,085	17,897	18,709
Southwest	378	376	381	394	418	489	533	613	699	790	876	964	1,051	1,145	1,249	1,361	1,470	1,587	1,699	1,817	1,945	2,090	2,234	2,378	2,521	2,663	2,806	2,947	3,088	3,228	3,368
Northwest	104	156	172	252	299	337	364	400	436	471	504	534	561	583	601	613	619	625	632	638	644	681	717	750	782	812	840	867	891	914	936
Yellow River Basin	70	96	109	136	207	185	268	393	407	618	797	1,008	1,208	1,389	1,551	1,692	1,758	1,802	1,839	1,855	1,850	1,964	2,073	2,179	2,281	2,378	2,472	2,562	2,647	2,729	2,805
Bohai Bay	105	136	141	159	196	242	261	332	388	500	617	736	861	990	1,125	1,264	1,385	1,509	1,638	1,770	1,906	2,064	2,223	2,384	2,546	2,710	2,876	3,043	3,212	3,383	3,555
Yangtze River Delta	10	13	19	19	49	123	231	301	359	473	595	723	860	1,006	1,160	1,322	1,468	1,620	1,779	1,945	2,118	2,292	2,467	2,644	2,823	3,003	3,185	3,369	3,554	3,740	3,929
Northeast	170	164	149	147	138	161	147	155	162	172	182	193	205	217	230	244	259	274	291	303	327	351	375	399	422	446	469	492	515	538	561
Southern Coast	25	25	56	87	90	85	132	196	261	375	508	598	689	782	875	971	1,050	1,130	1,211	1,293	1,377	1,505	1,637	1,771	1,910	2,051	2,196	2,343	2,494	2,649	2,806
Yangtze Basin	3	3	3	3	4	29	46	65	84	118	157	184	212	241	270	299	323	348	373	398	424	456	489	521	554	586	618	651	683	716	748
TOTAL DEMAND	865	969	1,030	1,197	1,400	1,651	1,982	2,454	2,796	3,516	4,236	4,942	5,648	6,354	7,060	7,766	8,331	8,896	9,460	10,025	10,590	11,402	12,214	13,026	13,838	14,650	15,461	16,273	17,085	17,897	18,709
SUPPLY YoY change (%)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
LNG imports								324%	15%	23%	49%	16%	27%	44%	28%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turkmenistan pipeline imports										0%	0%	400%	50%		33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Burman pipeline imports															33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other imports (exports/surplus)											-26%	103%	-56%	-154%	223%	-60%	-11%	6%	20%	27%	27%	-72%	-253%	170%	67%	44%	34%	29%	25%	23%	21%
Imports					0			324%	15%	292%	2%	46%	28%	21%	16%	13%	1%	0%	-1%	-2%	-3%	11%	10%	9%	9%	9%	9%	10%	10%	11%	
PetroChina		3%	3%	19%	18%	26%	19%	21%	16%	8%	15%	14%	13%	12%	11%	10%	10%	10%	9%	9%	8%	8%	7%	7%	6%	6%	5%	5%	4%	4%	3%
Sinopec	88%	5%	9%	7%	1%	12%	12%	5%	21%	91%	6%	6%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%	5%	4%	4%	4%	3%	3%	3%	3%	3%
CNOOC Ltd	-9%	34%	11%	30%	-6%	22%	16%	12%	13%	6%	6%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%	4%	4%	4%	3%	3%	2%	2%	2%	1%	
Est production inc-royalties	12%	6%	16%	17%	18%	18%	19%	14%	10%	24%	12%	11%	10%	10%	9%	9%	9%	8%	8%	8%	7%	7%	6%	6%							

Figure 16: Natural gas price and EPS estimate changes

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E	2016E
WTI (US\$/boe)	30.40	26.03	26.23	31.27	41.69	56.55	66.58	72.90	99.50	55.00	70.00	75.00	85.00	85.00	85.00	85.00	85.00
OLD																	
Natural gas price (US\$/mcf)																	
PetroChina Wellhead	1.52	1.72	1.70	1.82	1.76	1.79	1.90	2.10	2.80	3.06	3.36	3.65	3.99	4.36	4.76	5.19	5.65
PetroChina Citygate	1.83	1.82	1.87	1.70	2.03	2.12	2.44	2.64	3.38	3.65	3.94	4.26	4.60	4.97	5.36	5.79	6.25
Sinopec Citygate	2.12	1.92	1.96	2.04	2.11	2.32	2.84	3.08	3.84	4.30	4.85	5.34	5.87	6.46	7.11	7.82	8.60
CNOOC Ltd	3.09	3.08	2.98	2.87	2.75	2.82	3.05	3.30	3.83	4.14	4.47	4.82	5.21	5.63	6.08	6.56	7.09
boe % WTI																	
PetroChina Wellhead	30%	40%	39%	35%	25%	19%	17%	17%	17%	33%	29%	29%	28%	31%	34%	37%	40%
PetroChina Citygate	36%	42%	43%	33%	29%	22%	22%	22%	20%	40%	34%	34%	32%	35%	38%	41%	44%
Sinopec Citygate	42%	44%	45%	39%	30%	25%	26%	25%	23%	47%	42%	43%	41%	46%	50%	55%	61%
CNOOC Ltd	61%	71%	68%	55%	40%	30%	27%	27%	23%	45%	38%	39%	37%	40%	43%	46%	50%
EPS																	
PetroChina	0.32	0.26	0.27	0.40	0.61	0.74	0.79	0.81	0.63	0.53	0.72	0.78	0.93	0.98	1.05	1.13	1.23
Sinopec	0.26	0.19	0.19	0.25	0.42	0.47	0.62	0.65	0.31	0.77	0.99	1.05	1.05	1.07	1.09	1.12	1.15
CNOOC Ltd	0.33	0.20	0.22	0.28	0.39	0.61	0.73	0.72	0.99	0.57	0.66	0.72	0.82	0.81	0.80	0.79	0.79
NEW																	
Natural gas price (US\$/mcf)																	
PetroChina Wellhead	1.52	1.72	1.70	1.82	1.76	1.79	1.90	2.10	2.80	3.17	3.58	4.02	4.53	5.09	5.72	6.41	7.19
PetroChina Citygate	1.83	1.82	1.87	1.70	2.03	2.12	2.44	2.64	3.38	3.75	4.16	4.62	5.13	5.69	6.32	7.02	7.79
Sinopec Citygate	2.12	1.92	1.96	2.04	2.11	2.32	2.84	3.08	3.84	4.30	4.94	5.53	6.20	6.94	7.77	8.71	9.75
CNOOC Ltd	3.09	3.08	2.98	2.87	2.75	2.82	3.05	3.30	3.83	4.21	4.63	5.10	5.61	6.17	6.79	7.46	8.21
boe % WTI																	
PetroChina Wellhead	30%	40%	39%	35%	25%	19%	17%	17%	17%	35%	31%	32%	32%	36%	40%	45%	51%
PetroChina Citygate	36%	42%	43%	33%	29%	22%	22%	22%	20%	41%	36%	37%	36%	40%	45%	50%	55%
Sinopec Citygate	42%	44%	45%	39%	30%	25%	26%	25%	23%	47%	42%	44%	44%	49%	55%	61%	69%
CNOOC Ltd	61%	71%	68%	55%	40%	30%	27%	27%	23%	46%	40%	41%	40%	44%	48%	53%	58%
EPS																	
PetroChina	0.32	0.26	0.27	0.40	0.61	0.74	0.79	0.81	0.63	0.54	0.74	0.80	0.97	1.04	1.14	1.25	1.41
Sinopec	0.26	0.19	0.19	0.25	0.42	0.47	0.62	0.65	0.31	0.77	0.99	1.06	1.06	1.09	1.12	1.16	1.21
CNOOC Ltd	0.33	0.20	0.22	0.28	0.39	0.61	0.73	0.72	0.99	0.57	0.67	0.73	0.84	0.83	0.83	0.83	0.84
% CHANGE																	
Natural gas price																	
PetroChina Wellhead	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.6%	10.0%	13.3%	16.7%	20.1%	23.6%	27.1%
PetroChina Citygate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	5.6%	8.6%	11.6%	14.7%	17.9%	21.1%	24.5%
Sinopec Citygate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	3.6%	5.5%	7.4%	9.4%	11.4%	13.4%
CNOOC Ltd	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	3.7%	5.7%	7.6%	9.6%	11.6%	13.7%	15.8%
EPS																	
PetroChina	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.8%	3.1%	4.2%	6.1%	8.4%	11.3%	14.6%
Sinopec	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	1.4%	2.1%	3.0%	4.1%	5.4%
CNOOC Ltd	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.8%	1.3%	1.8%	2.6%	3.7%	5.0%	6.6%

Source: Company accounts, MainFirst estimates

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