

The Long View: Bernstein Asia-Pac Energy - Lift Off For China's Unconventional Gas Revolution

| Ticker | Rating | CUR | 12/1/2010 Closing Price | Target Price | TTM Rel. Perf. | EPS | | | P/E | | | Yield |
|--------|--------|-----|-------------------------------|-----------------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | | 2009A | 2010E | 2011E | 2009A | 2010E | 2011E | |
| 857.HK | O | HKD | 9.74 | 11.00 | -10.1% | 0.64 | 0.85 | 1.02 | 15.2 | 11.5 | 9.5 | 3.0% |
| PTR | O | USD | 122.84 | 141.90 | -14.0% | 8.25 | 10.96 | 13.16 | 14.9 | 11.2 | 9.3 | 3.0% |
| MXAPJ | | | 448.74 | | | 24.22 | 31.07 | 35.90 | 18.5 | 14.4 | 12.5 | 2.8% |
| SPX | | | 1180.55 | | | 61.70 | 84.58 | 95.57 | 19.1 | 14.0 | 12.4 | 2.0% |

O – Outperform, M – Market-Perform, U – Underperform, N – Not Rated

Highlights

- China is at the start of a gas revolution which will see unconventional gas production; tight gas, CBM and shale gas grow to 6bcf/d by 2020 to account for 30% of domestic supply mix.** With double digit demand growth, a policy shift towards gas in the next 5 year plan and significant reserves of unconventional gas, we expect China to follow in the footsteps of the US to become a major producer of unconventional gas.
- The technology to unlock unconventional gas plays has increasingly been transferred to Chinese companies.** CNOOC and Petrochina have been actively acquiring coal bed methane and shale gas assets in Australia and North America where they have partnered up with leading industry players. Moreover, E&P's within China have made considerable progress in well design to maximise production from coal bed methane plays in china.
- Unconventional gas will be more competitive than gas imports.** Our analysis indicates the CBM production can be break even at \$3-4/mscf and that at a wellhead price of \$7/mscf projects are capable of delivering returns of 30% IRR. This compares with imports where the price of imported gas through either LNG or long distance pipelines is closer to \$12/mscf.
- A surge in activity from Petrochina and independent CBM E&P companies will take place over the next 3 years.** After a series of pilot production programs to optimize development drilling, independent E&Ps are about to embark on a series of development projects across China which will see approximately \$1bn invested in five key development blocks across China.
- Major above ground risks remain which continue to pose challenges to the sector.** Financing, partnership alignment, access to pipeline capacity and restrictions on land access remain some of the key issues which are holding back the development of unconventional gas in China. Given the importance of this sector to meeting China's gas needs we expect NDRC to speed up policy reforms which will open up competition in this sector to private companies.

Investment Conclusion

It is time for China's unconventional gas revolution. With double digit gas demand growth, a shift in the energy mix towards cleaner fuels and potentially significant reserves of tight gas, coal bed methane and shale gas we expect China to follow in the footsteps of the US as a major producer of unconventional gas. Not only does this make sense from a supply-demand perspective, but also from an economic perspective.

Producers should be able to make an attractive return at gas prices of USD7/mscf at the well head, which is more competitive than LNG or long distance pipeline gas.

Before getting overly excited however, it is clear that China's unconventional gas revolution will take time. Total unconventional gas will likely account for 30% of China's gas supply by 2020 compared with 50% in the US today. Not only are there below ground challenges, but there are also significant above ground challenges. China remains a highly regulated market with limited competition and lacks the entrepreneurial dynamism of the US or Australia which has hundreds of E&P's competing in this sector.

There are two ways to play unconventional gas in China. The first is through Petrochina which remains a long term value play on China's growing gas industry and remains undervalued on an NAV basis. The alternative way is through some of the small cap CBM companies which operate in China (Green Dragon, Sino Oil and Gas, Enviro Energy, Far East Energy, Fortune). If these companies deliver on their plans, we expect to see a surge in investment and drilling activity over the next 3 years which will have a material impact on these companies. These are significant risks however. Financing requirements, management quality, partner alignment and regulatory policy remain key uncertainties. Although there will be failures, it is in China's interests to see some of these companies succeed and we remain cautiously optimistic that one or two winners could emerge.

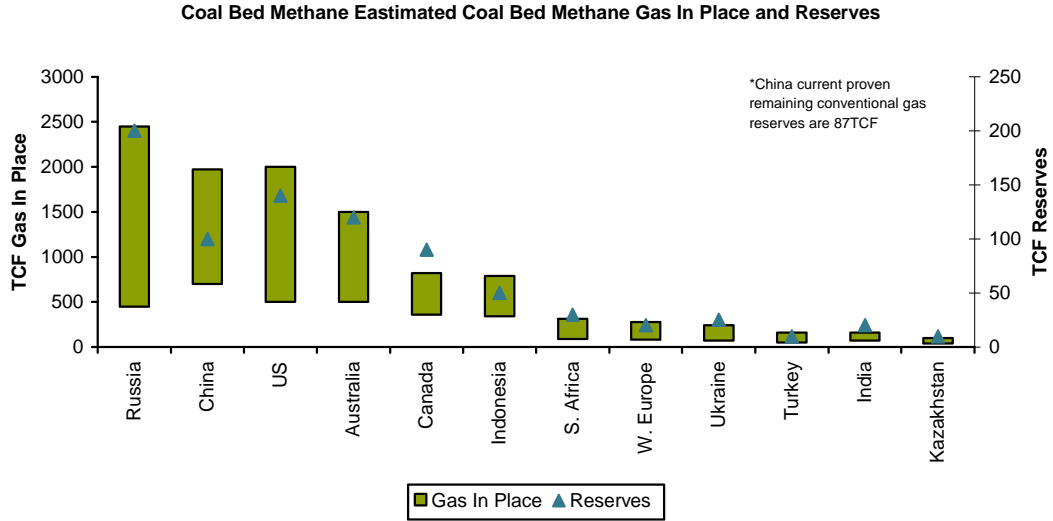
Details

As gas demand surges and the policy shift to gas continue to take place, China's gas market potential over the coming decade is enormous. While demand growth is understood, the controversy is where gas supply will come from to meet this demand growth. In recent years the focus has been on going overseas to secure LNG from Qatar and Australia, and pipeline gas from Central Asia. These gas imports are not cheap however with delivered prices at \$11-12/mscf compared with domestic gas at \$6-7/mscf. Before more imports are added to the growing list, what about the natural gas resources in China's own back yard? If there is one less from the US it is that the cost of unconventional gas can be more competitive than natural gas imports. China's policy makers are starting to understand the importance of this question given the unconventional gas revolution which has taken place in the US. While shale gas is at a very early stage, the time for coal bed methane has come of age. In this research note we ask could China be the same and how best to play the theme.

China's Unconventional Gas Resources

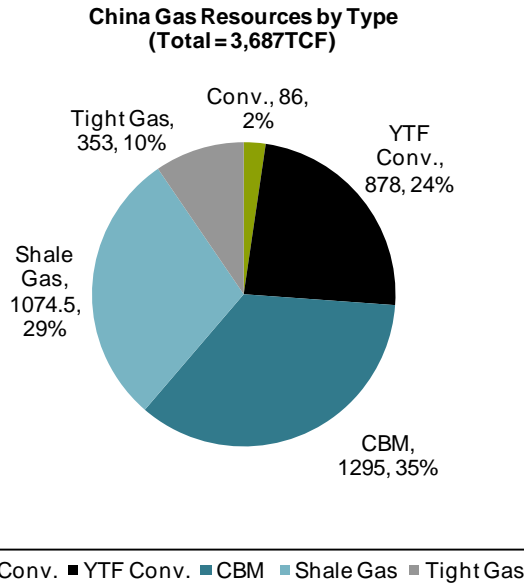
China has an enormous coal reserve base which should underpin a large resource base in coal bed methane. China's estimated coal bed methane reserves are similar to that of the US and Australia, which (other than Russia) have similarly large coal reserves (**Exhibit 1**). According to China's geologists current proven conventional gas reserves represent 2% of China's total gas resource base. While there is more conventional gas yet to find, three quarters of China's gas reserves base is thought to consist of unconventional gas. Of the unconventional resource base, coal bed methane is the most significant, with total estimated reserves of 1300TCF (**Exhibit 2**). So far 6.5TCF is proved with PetroChina being the largest holder of China's proved CBM reserves, accounting for almost 50% (**Exhibit 3**).

Exhibit 1
China has similar coal bed methane reserves to the US and Australia



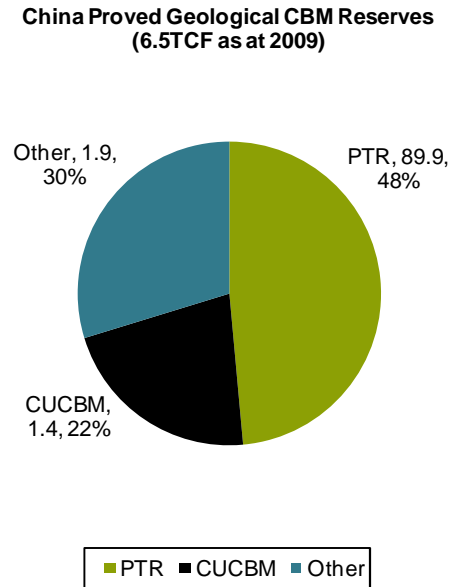
Source: Advanced Resources International

Exhibit 2
Coal Bed Methane Accounts for a third of China's undeveloped resource base



Source: BP Stat. Review, Shale Gas in China; Liu 2008; Coal Bed Methane Exploration in China, Qiu 2009

Exhibit 3
Ordos and Qinshui account for a third of China's CBM



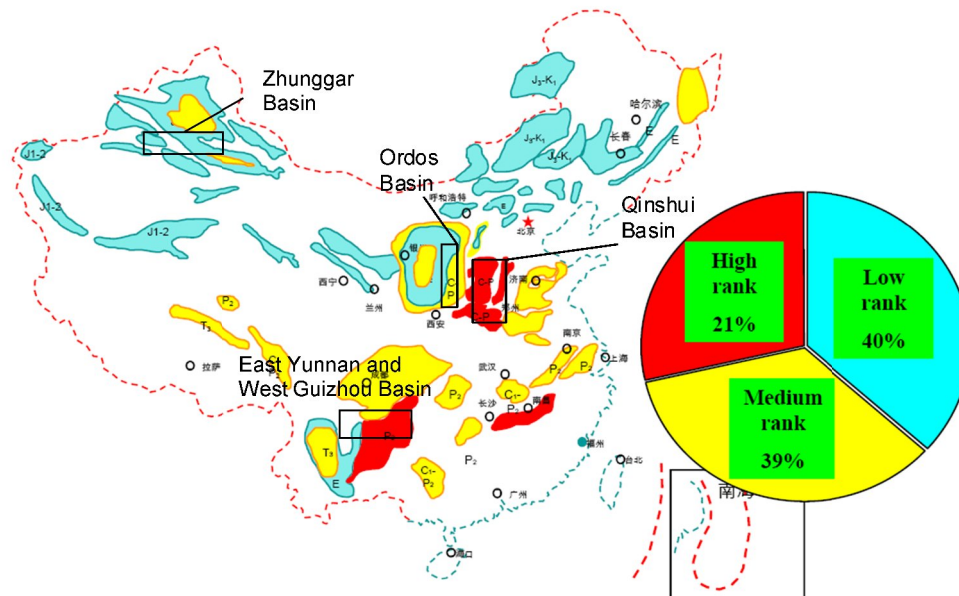
Source: Coal Bed Methane Exploration in China, Qiu 2009

China's Coal and CBM Basins

With over 100 billion tons of proven coal reserves, China clearly has a lot of coal. The key coal producing basins are the Ordos and Qinshui basins in central China (**Exhibit 4**). While the Ordos Basin is a low to medium rank coal the Qinshui basin is a high maturity anthracite coal. Other major coal basins are in the west in the Zhunggar and Tarim basins of Xinjiang, east of Yunnan and west Guizhou and Inner Mongolia. With the exception of Yunnan most of the other coals are medium to low grade in thermal maturity.

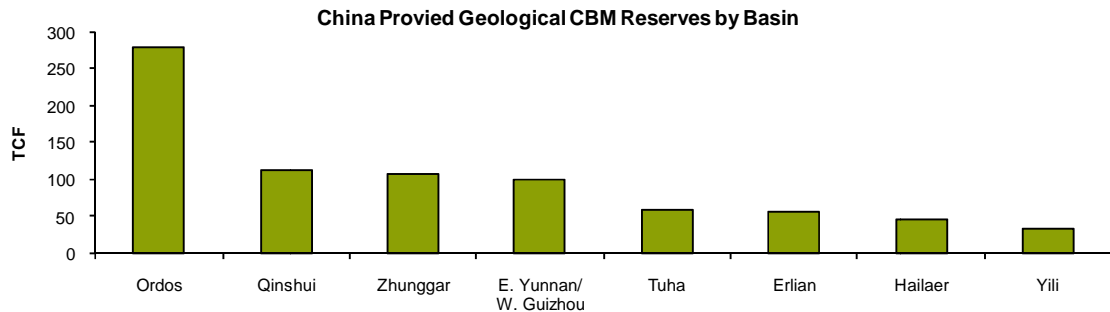
Given the geological distribution of China's coal resource, it is no surprise that China's proved CBM reserves are concentrated in 4 key regions of Ordos, Qinshui being the two largest basins which account for 50% of the total resource. (**Exhibit 5**). Ordos is by far the largest basin containing 280 TCF of proved CBM reserves, with the other three basins containing 50 - 100 TCF each.

Exhibit 4
The main coal bed methane basins of China



Source: CUCBM

Exhibit 5
China's proved CBM reserves are concentrated in Ordos, Qinshui, Zhunggar and E. Yunnan/W. Guizhou

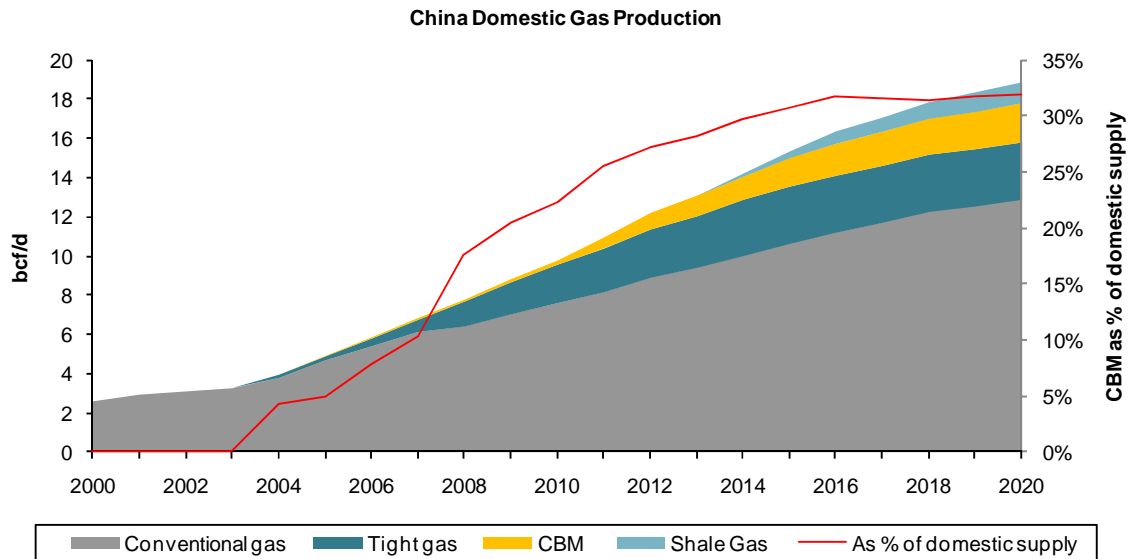


Source: Company reports, Bernstein analysis

China is at the start of an unconventional gas revolution which will see unconventional gas production (tight gas, CBM and shale gas) grow to 6bcf/d by 2020 or 30% of domestic supply mix (**Exhibit 6**). By analogy with the US, it is clear that China has a way to go. The US currently has 20TCF of proven coal bed methane reserves which have increased significantly over the past 20 years as new basins have been drilled up (**Exhibit 7**). Coal bed methane production is around 5bcf/d (**Exhibit 8**), which is less than 10% of total US production but equivalent to over 50% of China's total current natural gas demand.

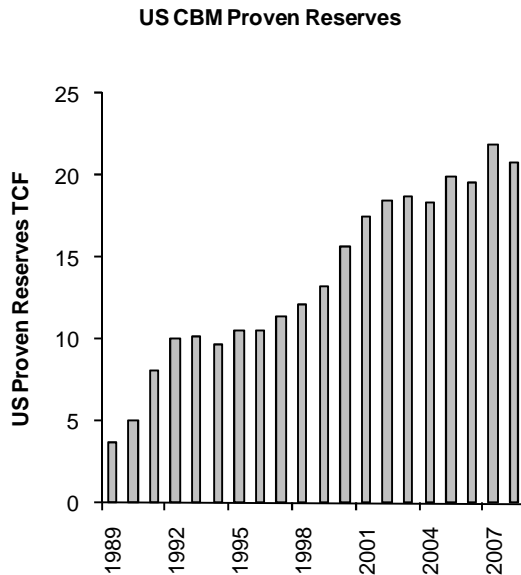
While the potential looks promising in China the reality is that coal bed methane production over the past 10 years has been a long and painful experience for most companies as they have struggled to achieve commercial gas production rates. This may be about to change however with renewed government focus on unconventional gas and the ambitious production plans ahead for coal bed methane, which is expected to account for 10% of domestic supply by 2020. With double digit demand growth, a policy shift towards gas in the next 5 year plan and significant reserves of unconventional gas, we expect China to follow in the US and become a major producer of unconventional gas.

Exhibit 6
Unconventional gas production (tight gas, CBM and shale gas) grow to 6bcf/d by 2020 or 30% of domestic supply mix



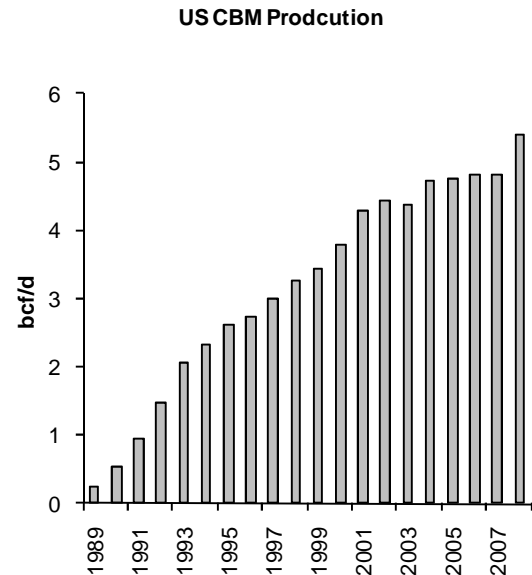
Source: Company reports, Bernstein analysis

Exhibit 7
The US currently has 20TCF of proven reserves



Source: EIA

Exhibit 8
CBM production is around 5bcf/d. Equal to over 50% of China's demand



Source: EIA

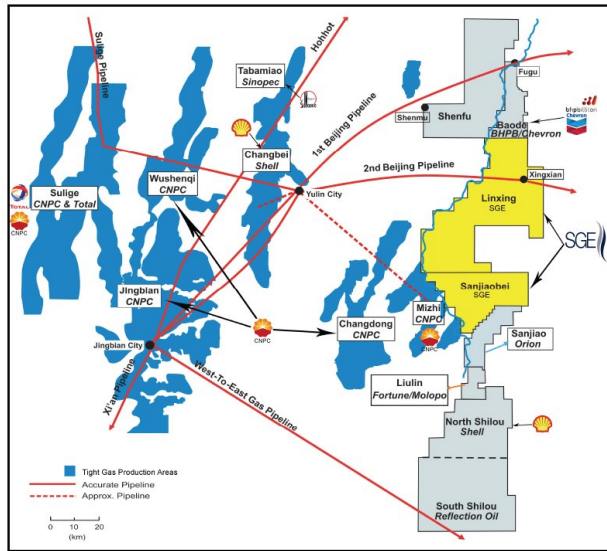
The Ordos Basin – Where is the Sweet Spot?

The Ordos basin is one of the largest sedimentary basins in China and home to China's largest tight gas fields such as Jingbian and Sulige. Coals within the Qinshui are Permo-Carboniferous in age and are medium rank in terms of their thermal maturity.

The Carboniferous Taiyuan formation is the main coal bearing formation which contains over 7 major coal seams. The main coal seams are #8 and #9 (Exhibit 10). Coal seam #8 is the most important and about 3 to 10 meters thick. While the base of the #8 unit is shale, the top of the coal seam is overlain by limestone which can also act as an aquifer in places. This is not ideal given the importance of hydraulic isolation of the coal seam and de-pressurization which is key for gas production given the under-saturated nature of these coals. The overlying Shanxi formation contains 4 to 6 major coal seams of which #3, #4 and #5 are relatively thick and continuous. Within the #8 coal seam there are areas of overpressure which is supportive of gas production. Cleats and fractures are present which can enhance permeability in some areas, although the overall permeability in the coal averages between 1 to 10md.

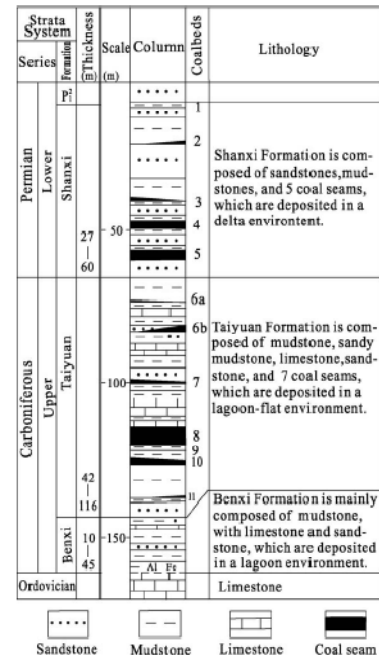
The acreage which has been licensed out is located to the east of the basin where the coals sit at a depth of between 300 and 1000m which is the ideal depth window for coal bed methane development and production (Exhibit 9). Further to the west the coal dips steeply away and is outside the limit of coal bed methane production (Exhibit 11). The blocks under license trend in a north south orientation along the margin of the basin. Given the distribution key parameters (coal thickness, overpressure, permeability) within the basin, our understanding is that sweet spot is somewhere close to the Sanjiao and Liulin bocks operated by Orion and Fortune respectively.

Exhibit 9
Ordos basin licensee blocks



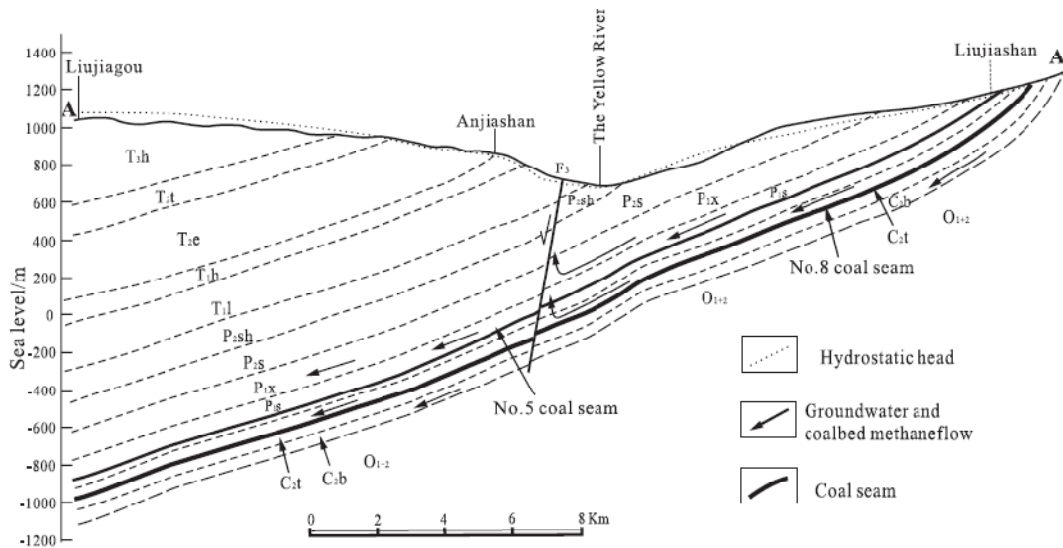
Source: SGE Corporate Report

Exhibit 10
Geological log of the Ordos basin



Source: Su, Zhang and Zhang, Coal Geology

Exhibit 11
Geological Cross Section Across the Ordos Basin



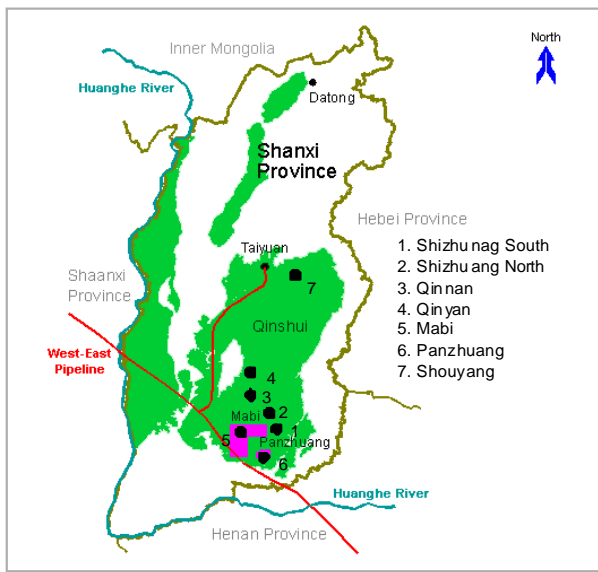
Source: Su, Zhang and Zhang, Coal Geology

Qinshui Basin – China's Anthracite CBM Play

The Qinshui basin the best known coal bed methane basin in China on account of the exceptionally high gas contents which can literally cause coal mines to "explode". Most of the blocks are located in the southern part of the basin where the gas content of the coals is generally higher. The permeability of the coals is generally similar to the Ordos basin at between 1md to 10md, although the Shouyang block in the north of the basin is known to contain coals which offer fracture permeability of greater than 100md. Many of the cleats or fractures within the coal are filled with a secondary cement (calcite) which does not help overall permeability. Coals in the Qinshui basin are anthracite grade which is the highest grade of thermal maturity. While this creates the high gas content the coal absorption capacity is high and most of the coals remain under-saturated with saturation levels of 80% meaning that they need to be de-pressurized before they can be produced. This can lead to significant time being required for de-watering of coals.

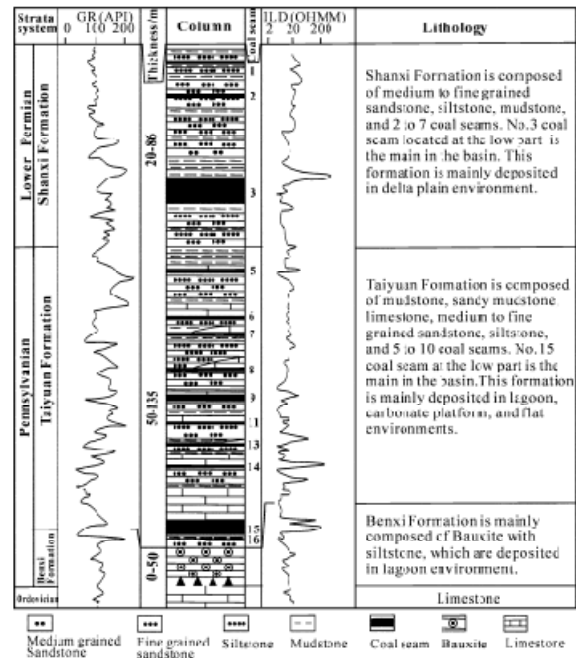
Like the Ordos basin the key formations are the Carboniferous Taiyuan formation and the Shanxi formation of the lower Permian. The key coal seam in the Taiyuan in the Qinshui basin is #15 which has a thickness of 1 – 15m (**Exhibit 13**). As in the Ordos basin, this coal seam is overlain by a limestone formation which can carry an aquifer and does not help to hydraulic isolation of the reservoir. Across the basin the #15 coal seam lies at about 700m depth which close to is optimal for CBM production. Within the Shanxi formation, the #3 coal is the key formation and 20m to 50m shallower than #15 seam. The Panzhuang block (AAGI) and South Shizhuang block (GDG) are generally the most favorable within the basin as these areas are slightly over-pressured, have the highest gas contents and are separated from the main aquifer within the basin which reduces water influx from the overlying limestone formation (**Exhibit 12**).

Exhibit 12
Map of the Qinshui Basin. Most blocks to the south



Source: AAGI Corporate Report (modified)

Exhibit 13
Geological log of the Qinshui Basin



Source: Su et. al. Coal Geology

How do the Chinese Coals Compare with US and Australia

Although China has large coal bed methane reserves how do the quality of the coals compare with other regions? The US is the world's largest producer of coal bed methane. Of the US basins, the San Juan basin

is the most prolific with the Powder River and Black Warrior basins among some of the other well known producing regions. In Australia, the key basins are in Queensland in the Bowen and Surat basins which will provide natural gas for the CBM to LNG projects which are currently being planned. A comparison between the coals from these key basins with the Qinshui Basin in China is shown in (Exhibit 14).

The gas content, coal thickness and the coal storage capacity are key drivers of coal bed methane resources and reserves. Thick coals with high gas contents provide the richest concentrations of gas per km². In contrast, the principal drivers of production from coals are the permeability and the presence of fractures or cleats which enhance permeability. The degree of gas saturation is also important. Until saturation point is reached, no matter what the gas content, coals will produce water over gas.

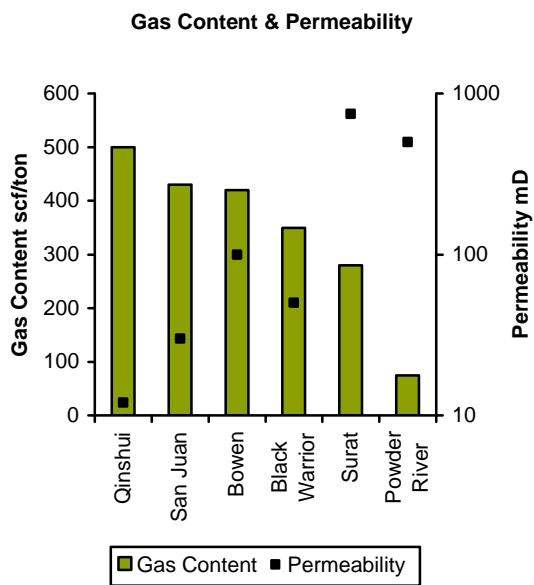
Exhibit 14
Comparison with the US and Australian Coal Basins

| Country | US | US | US | Australia | Australia | China |
|-------------------------|---------------|---------------|---------------|---------------|---------------|--------------|
| Basin | San Juan | Powder River | Black Warrior | Bowen | Surat | Qinshui |
| Net Coal thickness (ft) | 70 | 75 | 15 | 25 | 70 | 20 |
| Gas Contents scf/ton | 430 | 75 | 350 | 420 | 280 | 500 |
| Permeability mD | 30 | 500 | 50 | 100 | 750 | 10 |
| Plateau Rate mmscf/d | 2.0 | 0.25 | 0.1 | 1.2 | 2.2 | 0.1 |
| Reserves Per Well (bcf) | 8.0 | 1.0 | 0.5 | 5.0 | 2.8 | 0.3 |
| Formation | Cretaceous | Paleocene | Carboniferous | Permian | Jurassic | Carb/Permian |
| Coal Type | Subbituminous | Subbituminous | Subbituminous | Subbituminous | Subbituminous | Anthracite |

Source: Bernstein Est.

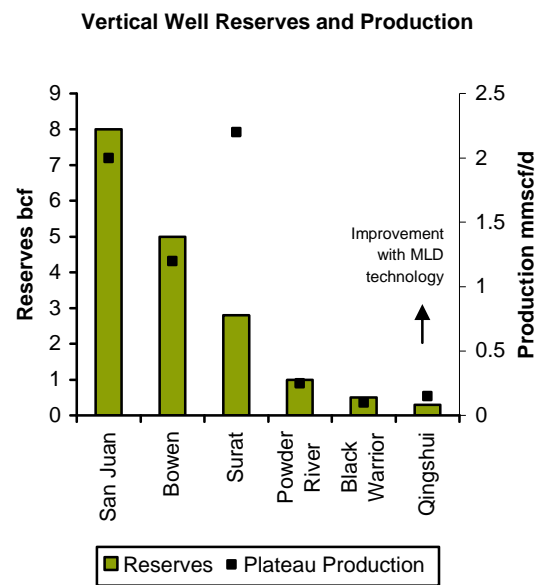
The Qinshui coals stand out as having among the highest gas content of any coals in our global screen, even higher than the prolific San Juan basin. Unfortunately however they are under saturated and low in permeability relative to almost all other prolific coal bed methane basins (Exhibit 15 and Exhibit 16).

Exhibit 15
Gas Content and Permeability of International CBM Basins



Source: Bernstein Est.

Exhibit 16
Flow rates and reserves of CBM basins



Source: Bernstein Est.

Although the Far east Energy Company (FEEC) have reported permeability in 100md range in the Shouyang block, most coals in the Qinshui basin are around 10md or less. By comparison, most other prolific basins have coals with permeability in the 10-100md range or over 500mD such as in the Powder River or Surat basins in Australia. As result the deliverability and reserves recovery per well for vertical coal bed methane wells in the Qinshui basin are low compared to other regions. San Juan which has the highest per well rates and recoveries has exceptional flow rates because the coals are over-pressured, thick and have high gas content with high gas saturations.

CBM Licensing in China

China started licensing out coal bed methane blocks in the late 1990's. This was done to attract international technology and capital to an area where there was clearly an opportunity but little experience within Chinese companies to exploit. In the first wave of CBM development, US majors were the major acquirers of licenses. Conoco, Philips, Arco and Texaco were all key holders of acreage within the Ordos and Qinshui basins. Initial tests proved disappointing however as wells de-watered slowly and gas production was relatively small. Given the low demand for gas within the region and low gas prices, economic development of the coal seams was not deemed possible.

As a result, many companies sold their rights to production sharing contracts to smaller companies, many of which had experience or management with coal bed methane in North America. As a result, most of the foreign companies participating in China CBM today tend to be small foreign independents some of which acquired directly or picked up acreage relinquished by the majors. Shell and Conoco are the notable majors who remain in coal bed methane in China and still have an active interest. A summary of the key acreage holders in China is shown in **Exhibit 17**

Exhibit 17

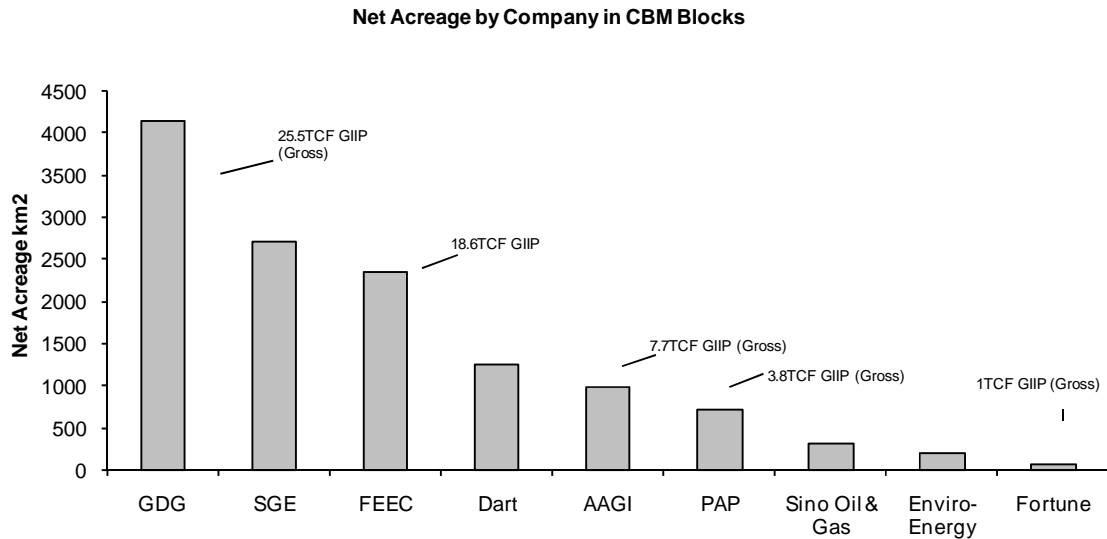
License Blocks Issued In China with Foreign Partners

| Block | Location | km2 | | Reserve | | Signing | Foreign Partner | CUCBM/ | | Basin |
|---------------------|----------------|----------|--|---------|--|---------|---------------------|-------------|------|----------|
| | | PSC Area | | bn m3 | | | | Equity | PTR | |
| 1 Haibei | Anhui | 2663 | | 60 | | Jun-98 | CVX | | | Anhui |
| 2 Sanjiao | Shanxi | 448 | | 63.5 | | Jun-98 | Orion | 70 | 30 | Ordos |
| 3 Sanjiao Bei | Shanxi | 1126 | | 55 | | Jun-98 | SGE | 49 | 50 | Ordos |
| 4 Shilou | Shanxi | 3602 | | 175 | | Jun-98 | RDS/Reflection | | | Ordos |
| 5 Linxing | Shanxi | 3325 | | 300 | | Jun-98 | SGE | 64.75 | 35.3 | Ordos |
| 6 Fengcheng | Jiangxi | 1541 | | 37 | | Aug-99 | GDG | 49 | 51 | Ordos |
| 7 Liulin | Shanxi | 198 | | 30 | | Nov-99 | Fortune Oil/Arrow | 32.5/17.5 | 50 | Ordos |
| 8 Zhungeer | Inner Mongolia | 2817 | | 400 | | Nov-00 | CVX? | | | N. Ordos |
| 9 Baode | Shanxi | 1079 | | 120 | | Nov-00 | CVX? | | | Ordos |
| 10 Shenfu | Shaanxi | 3001 | | 600 | | Nov-00 | CVX? | 50 | | Ordos |
| 11 Hengshanbao | Ningxia | 1807 | | 230 | | Jan-01 | Virgin | | | W. Ordos |
| 12 Qingshui | Shanxi | 2317 | | 450 | | Apr-02 | COP | | | Qinshui |
| 13 Shouyang | Shanxi | 1963 | | 230 | | Jul-02 | FEEC/COP | 66.5/3.5 | 30 | Qinshui |
| 14 Louchang, Enhong | Yunnan | 1072 | | 140 | | Dec-02 | FEEC | 60 | 40 | Yunnan |
| 15 Qinyuan | Shanxi | 3665 | | 550 | | Mar-03 | GDG | 60 | 40 | Qinshui |
| 16 Panxie East | Anhui | 584 | | 20 | | Jan-03 | GDG | 60 | 40 | Anhui |
| 17 Shizhuang South | Shanxi | 455 | | 90 | | Jan-03 | GDG | 60 | 40 | Qinshui |
| 18 Shizhuang North | Shanxi | 375 | | 75 | | Jan-03 | GDG | 60 | 40 | Qinshui |
| 19 Jincheng | Shanxi | 151 | | 28 | | Mar-03 | AAGI | 50 | 50 | Qinshui |
| 20 Huangshi | Hubei | 305 | | 5 | | Oct-03 | Gladstone | | | Hubei |
| 21 Mabi | Shanxi | 1381 | | 240 | | Jul-04 | AAGI | 60 | 40 | Qinshui |
| 22 Baotianqingshan | Guizhou | 947 | | 160 | | Sep-05 | GDG | 60 | 40 | Guizhou |
| 23 Liuhuanggou | Xinjiang | 654 | | 35 | | Dec-05 | Enviro Energy (TWE) | 47 | 53 | Xinjiang |
| 24 Shilounan | Shanxi | 1011 | | 189 | | Feb-06 | Reflection | 60 | 40 | Ordos |
| 25 Suzhou | Xinjiang | 856 | | 120 | | Mar-06 | Ivana Venture | 65 | 35 | Xinjiang |
| 26 Qinnan | Shanxi | 2317 | | 320 | | Jul-02 | FEEC, Arrow, COP | 17.7/52.3/5 | 25 | Qinshui |
| 27 Panzhuang | Shanxi | 157 | | 20 | | Mar-03 | AAGI | 51 | 49 | Qinshui |
| 28 Shiloubei | Shanxi | 2591 | | n/d | | Nov-05 | RDS, Verona | 55/5 | 40 | Ordos |
| 29 Zijinshan | Shanxi | 708 | | 109 | | Apr-08 | PAP | 100 | 0 | Ordos |
| 30 Hengcheng | Shaanxi | n/d | | n/d | | Mar-07 | Longmen Huifeng | 60 | 40 | Ordos |

Source: CUCBM, Bernstein Est.

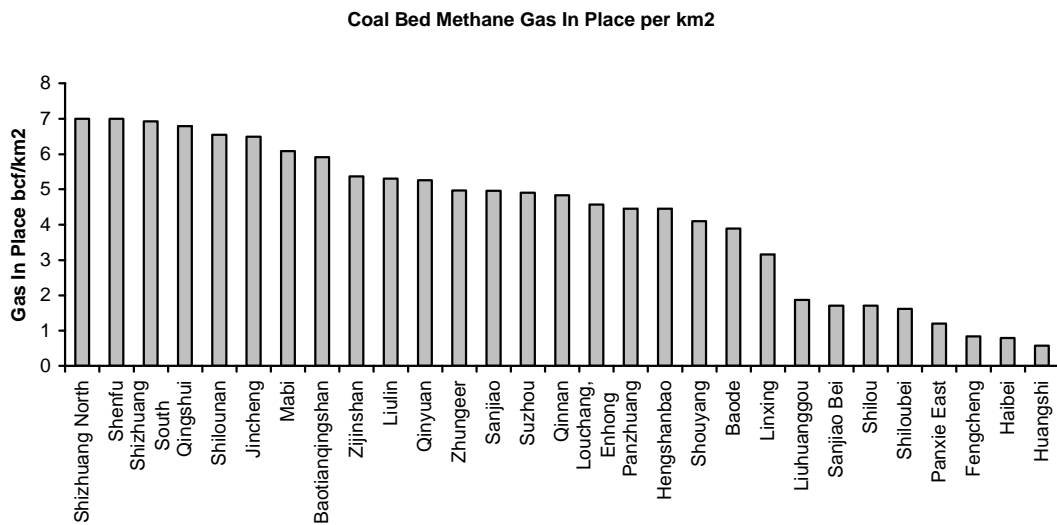
Among the independents, Green Dragon Gas, Sino Energy Holding, Far East Energy has the largest acreage positions, mostly in the Qinshui and Ordos basins (**Exhibit 18**). Green Dragon Gas has the largest gross gas in place of any independent E&P with over 25TCF in place in their acreage and with net 3P reserves of 2.3TCF. The average gas in place for each of the blocks varies from 7bcf/km2 to less than 1bcf/km2 (**Exhibit 19**). The average in the Ordos and Qinshui basins is close to 5 to 6bcf/km2. With an average recovery factor of 50% to 60%, 3P reserves per km2 are between 3 to 4bcf/km2.

Exhibit 18
Net Acreage and Reserves of CBM Companies



Source: Bernstein Est.

Exhibit 19
Gas In Place Per km2



Source: Bernstein Est.

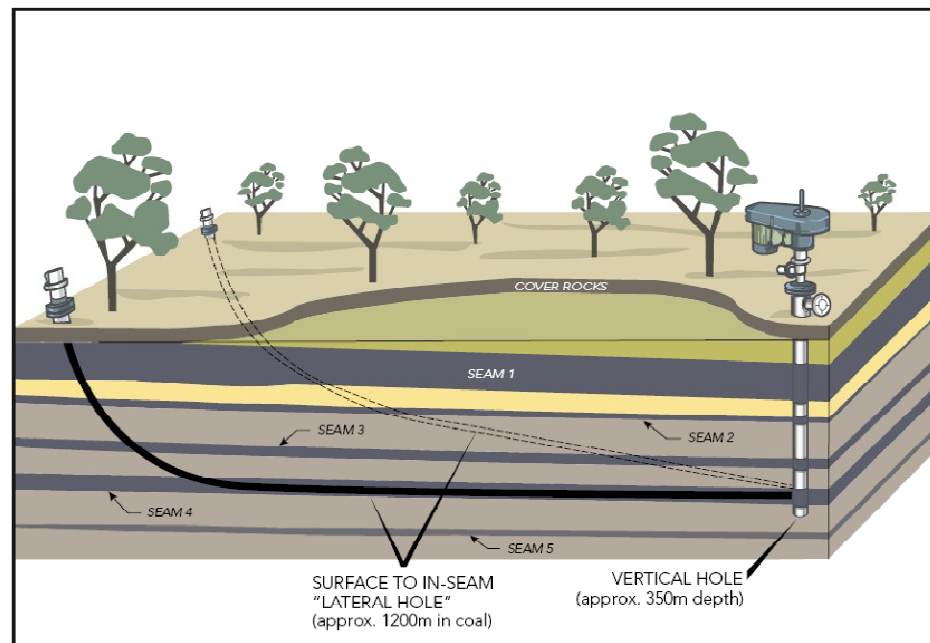
The Economics of CBM

While China has CBM resources, how much can be developed economically? The development of coal bed methane in China will be different from other major producing basins in North America and Australia. Coal seams in China are generally thinner and lower in permeability than the prolific basins of Australia and the US. Moreover, given the limestone cap-rock to the key producing coal seams, hydraulic separation can be a problem and means that producing wells need to produce from as far from the aquifer carrying beds as possible.

As a result the most effective way to develop Chinese coal bed methane is through horizontal wells (with multiple well bores) which are fraced to enhance the permeability of the coal and maximize contact with the coal formation. Independent E&P companies have realized this and have pioneered the development of horizontal wells which run for 1200m in the reservoir with multilateral wells off the main well bore. These wells are twinned with a vertical well which is used to lift water from the well bore to accelerate de-watering and de-pressurization of the reservoir to enable free gas to flow within the reservoir (**Exhibit 20**).

Exhibit 20

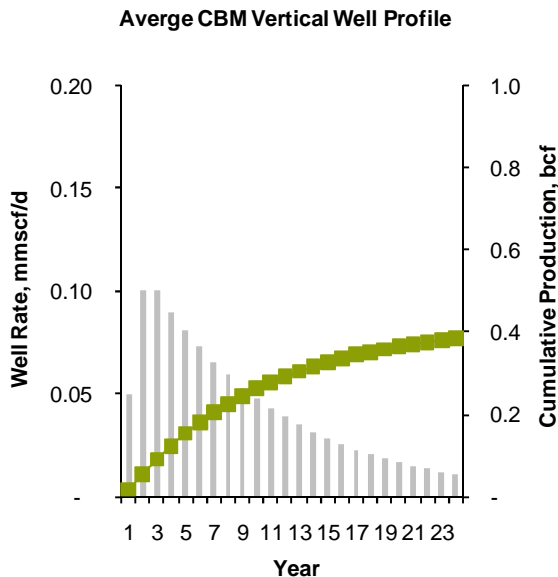
Surface to Seam Drilling Technique



Source: CH4

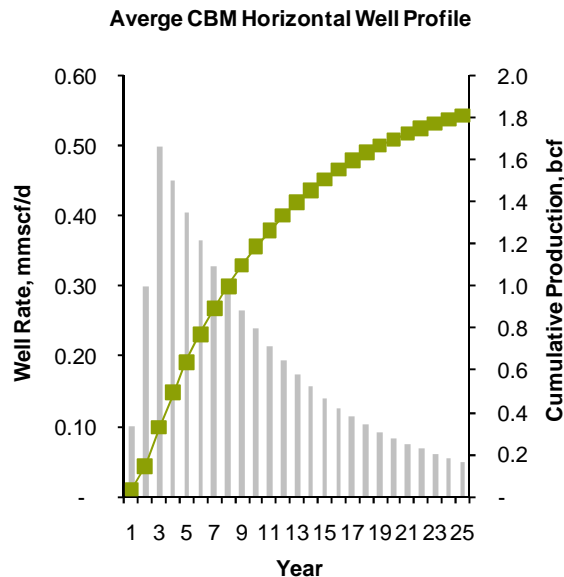
This technique has led to a significant improvement in well productivity and reserves recovery. Analysis of published data indicates that the average vertical CBM well produces 50 to 100mscf/d and can recover 0.4bcf of gas. Horizontal wells drilled as described above can produce over 5 to 10 times more gas with productivity up to 2mmscf/d in some cases and recoveries of 4bcf (**Exhibit 21** and **Exhibit 22**).

Exhibit 21
A single vertical well profile



Source: Bernstein Est

Exhibit 22
A single horizontal well profile



Source: Bernstein Est.

While horizontal wells are significantly higher in cost, the higher flow rates and reserves recovery makes these wells better investments. Given that we have yet to see a large scale CBM development in China, overall cost estimates remain uncertain. We have assumed the following development scenario which we believe is realistic (**Exhibit 23**). Our assumptions are based on a block developed using vertical wells spaced at 100 acres and horizontal wells spaced at 200 acres. The cost of a horizontal and vertical well is assumed to be \$2.0MM and \$0.5MM respectively (including associated surface facilities, flow lines and handling).

Exhibit 23

Key assumptions used in our CBM model

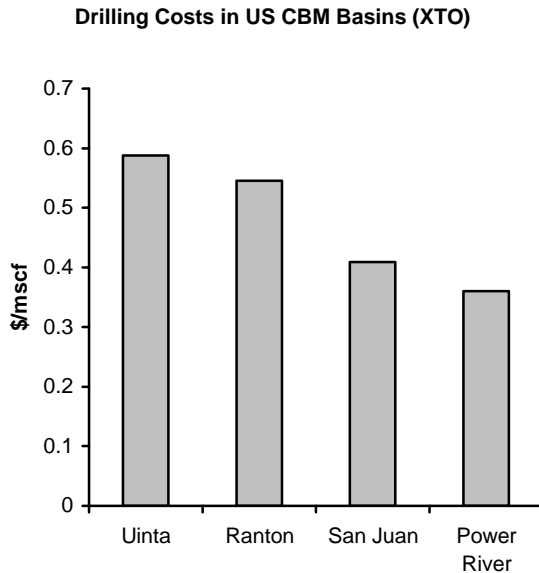
| Key Assumptions | | | | | | | | |
|-------------------------|---------|-------|----------------------------|------------|---------------------|---------------|---------|-------|
| Block Parameters | | | Economic parameters | | | | | |
| Block area | km2 | 462 | | | Wellhead gas price | \$/mscf | 6.5 | |
| GIIP | bcf/km2 | 4.55 | | | Gas price inflation | % | 4% p.a. | |
| GIIP | bcf | 2,102 | | | Opex | \$/mscf | 0.8 | |
| Recoverable reserves | bcf | 1,426 | | | Opex inflation | % | 3% p.a. | |
| Recovery factor | % | 68% | | | F&D costs | \$/mscf | 1.2 | |
| | | | Total | Horizontal | Vertical | Tax rate | % | 25% |
| Well spacing | acres | 67 | 67 | 200 | 100 | Discount rate | % | 10% |
| No. of wells | # | 1650 | 1650 | 550 | 1100 | NPV | \$MM | 1,621 |
| Costs per well* | \$MM | 1.0 | 1.0 | 2.0 | 0.5 | NPV | \$/mscf | 1.1 |
| Reserves per well | bcf | 0.9 | 0.9 | 1.8 | 0.4 | IRR | % | 28.1% |
| Peak rate per well | mmscf/d | | | 0.50 | 0.10 | | | |
| Ramp up period | years | | | 2 | 2 | | | |
| Decline rate | % | 10% | 10% | 10% | 10% | | | |

*Costs include drilling, de-watering, completion and surface facility costs

Source: Bernstein Est.

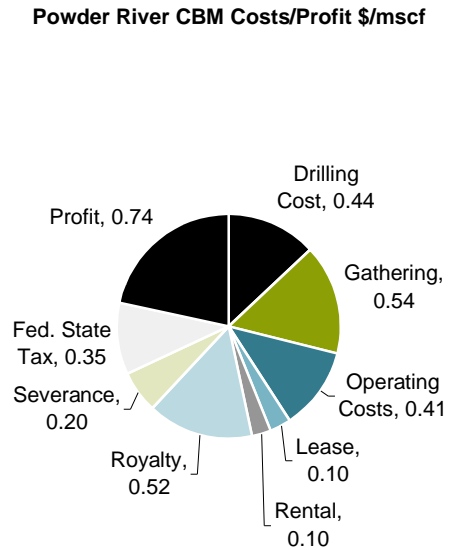
As a check on the capital estimates, we have compared these to North American CBM projects. Using data from XTO (now XOM) average drilling development costs in CBM basins is around \$0.50/mscf (**Exhibit 24**). This is only part of the cost however, including gas gathering costs (flow lines, water separation and compression) which adds a further \$0.50/mscf the minimum development costs are around \$1/mscf which is in line with our estimates (**Exhibit 25**). Operating costs are close to \$0.50/mscf which assumes surface evaporation ponds for water disposal without the need for secondary re-injection.

Exhibit 24
Drilling Costs of US CBM Wells



Source: XTO Corporate Presentation, XTO

Exhibit 25
All in Costs for Powder River development

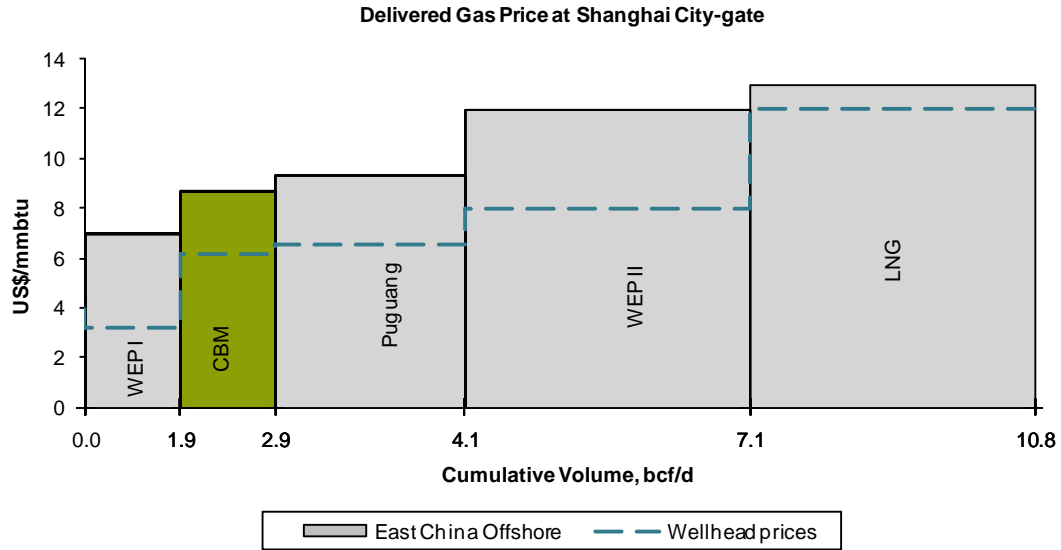


Source: Powder River Coal Bed Economics

Pricing of CBM in china is not regulated unlike conventional gas. No VAT is applied to coal bed methane sales. In addition the government provides a 0.2RMB/m² subsidy (\$0.8/mmbtu) which is supplemented by a local subsidy in Shanxi of 0.05RMB/m³ (\$0.2/mmbtu) to encourage development. This allows CBM suppliers to charge a c.50% premium at the wellhead relative to domestic conventional gas c.30% at the citygate. At the same time, CBM prices remain competitive to imported pipeline gas and LNG (**Exhibit 26**).

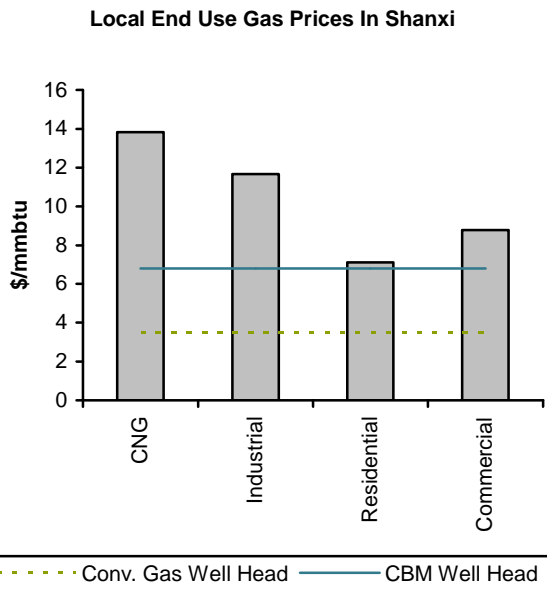
Over recent years the local gas price in Shanxi and neighbouring provinces has been increasing (**Exhibit 27**). City gate prices are around \$8/mmbtu while industrial pricing can be as high as \$12/mmbtu (close to fuel oil parity). Sales to CNG users have been a popular way to monetize CBM gas given the lack of infrastructure connections (**Exhibit 28**). CNG retail prices are high at \$13/mmbtu which gives a net back of \$7 to \$8/mmbtu at the wellhead. For the purpose of this analysis we have assumed an average wellhead price of \$6.5/mmbtu real (escalating at 4%). This price is double the regulated conventional gas price in Ordos.

Exhibit 26
CBM pricing in China is competitive to gas imports



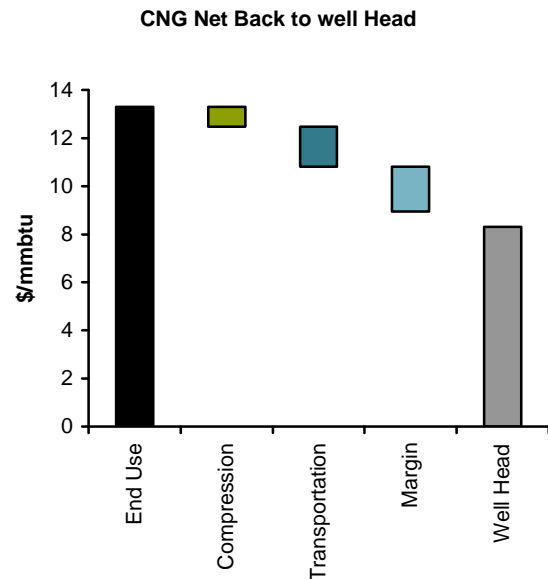
Source: Company reports, Bernstein estimates

Exhibit 27
End Use Gas Prices in China



Source: Green Dragon Gas Corporate Report, Bernstein Est

Exhibit 28
CNG Netbacks to Wellhead



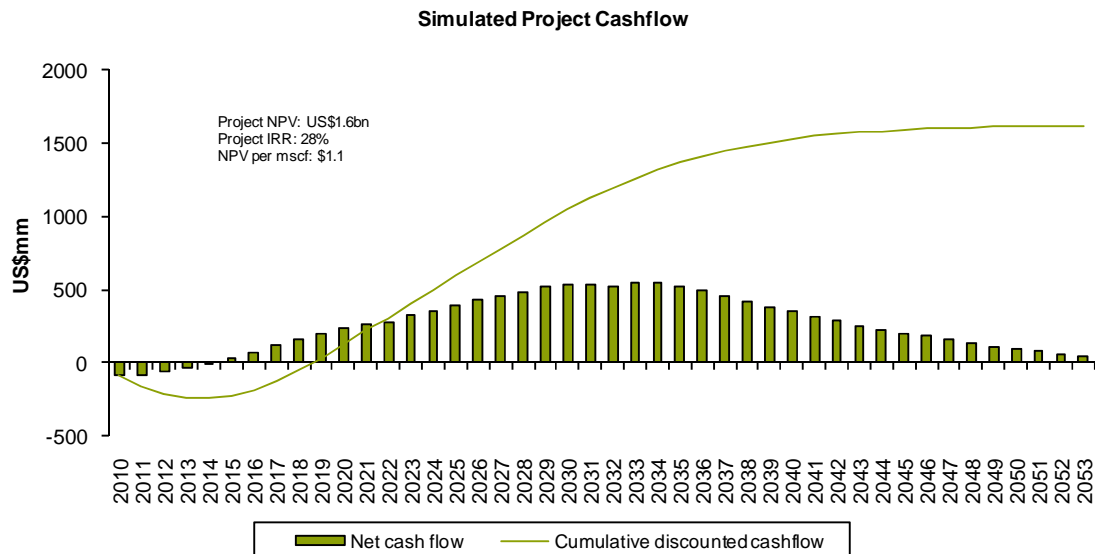
Source: Bernstein Est

Using the cost estimates and our gas price assumptions above, we have developed an economic model to arrive at our estimate of the value of gas from a CBM development. Using our base case assumptions, we calculate a project NPV of US\$1.6bn with an IRR at 28% which allows us to conclude that CBM

developments should be economic (**Exhibit 29**). We estimate the present value of a CBM development to be around \$1 to 1.5/mscf but could vary depending on final costs and gas price assumptions. The overall IRR should be 30% and a \$3 to \$4/mmbtu gas price (real) is required for a minimum IRR of 15% (**Exhibit 30** and **Exhibit 31**).

Exhibit 29

Using our base case assumptions, we calculate a project NPV of US\$1.15bn with an IRR at 29%



Source: Bernstein Est.

Exhibit 30

Present Value of CBM per mscf

| | | NPV per mscf, \$ | | | | | | | | |
|--------------------|-----|-----------------------------|-----|-----|-----|-----|-----|-----|-----|--|
| | | Wellhead gas price, \$/mscf | | | | | | | | |
| F&D costs, \$/mscf | 1.4 | 0.1 | 0.4 | 0.6 | 0.9 | 1.2 | 1.4 | 1.7 | 2.0 | |
| | 1.3 | 0.1 | 0.4 | 0.7 | 0.9 | 1.2 | 1.5 | 1.8 | 2.0 | |
| | 1.2 | 0.2 | 0.4 | 0.7 | 1.0 | 1.3 | 1.5 | 1.8 | 2.1 | |
| | 1.1 | 0.2 | 0.5 | 0.8 | 1.0 | 1.3 | 1.6 | 1.8 | 2.1 | |
| | 1.0 | 0.3 | 0.5 | 0.8 | 1.1 | 1.3 | 1.6 | 1.9 | 2.2 | |
| | 0.9 | 0.3 | 0.6 | 0.8 | 1.1 | 1.4 | 1.7 | 1.9 | 2.2 | |
| 0.8 | 0.3 | 0.6 | 0.9 | 1.2 | 1.4 | 1.7 | 2.0 | 2.3 | | |

Source: Bernstein Est

Exhibit 31

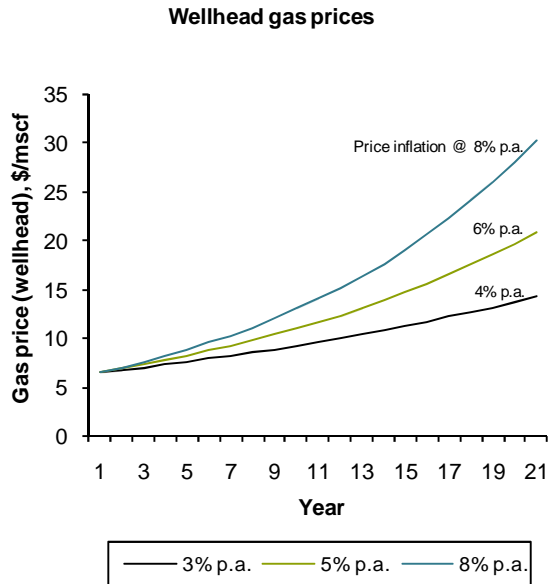
Project IRR of CBM developments

| | | Project IRR | | | | | | | |
|--------------------|-----|-----------------------------|-----|-----|-----|-----|-----|-----|-----|
| | | Wellhead gas price, \$/mscf | | | | | | | |
| F&D costs, \$/mscf | 1.4 | 11% | 15% | 19% | 22% | 25% | 28% | 31% | 33% |
| | 1.3 | 12% | 17% | 20% | 24% | 27% | 30% | 33% | 35% |
| | 1.2 | 13% | 18% | 22% | 26% | 29% | 32% | 35% | 37% |
| | 1.1 | 14% | 20% | 24% | 28% | 31% | 34% | 37% | 40% |
| | 1.0 | 16% | 22% | 26% | 30% | 34% | 38% | 41% | 44% |
| | 0.9 | 18% | 24% | 29% | 33% | 37% | 41% | 45% | 48% |
| 0.8 | 21% | 27% | 33% | 38% | 42% | 46% | 50% | 53% | |

Source: Bernstein Est

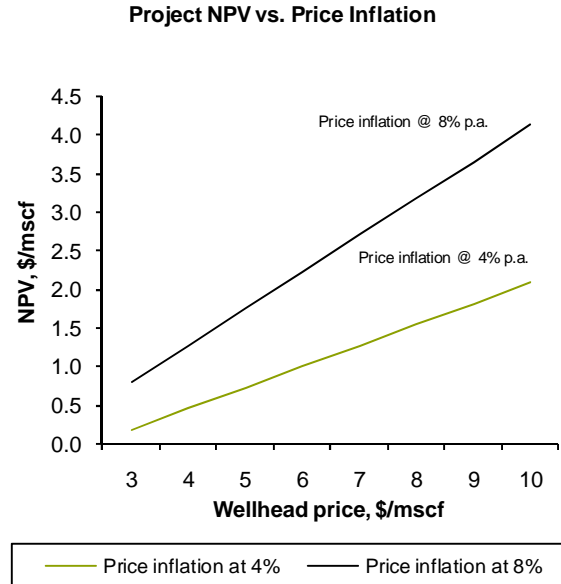
One of the greatest sensitivities to economic value is gas price inflation (**Exhibit 32** and **Exhibit 33**). Although we expect regulated gas prices to increase significantly over the coming years, we do not expect unregulated gas prices to increase at a rate much beyond the rate of inflation. As such we believe that an escalator of 4% is more appropriate and is consistent with a long term oil/gas price ratio of around 10:1 which we believe is reasonable.

Exhibit 32
Gas price inflation assumption has a huge impact on long term gas prices...



Source: Bernstein Est

Exhibit 33
... and therefore project NPV



Source: Bernstein Est

Risks to CBM Development

While we are optimistic on the future of coal bed methane in China, we believe that at most CBM will account for 10% of the domestic supply mix by 2020. This would imply c. 2bcf/d and is still a significant increase from where we are today. Although there are a number of projects (AAGI, Green Dragon, Fortune Oil, Far East Energy) well advanced through pilot production and at the early stages of commercial production there remain some key above ground risks that investors should be aware of:-

Infrastructure/Market Access

To develop large scale coal bed methane projects requires market access at scale. While compressed natural gas or small scale liquefaction units may help to support small scale or early development schemes, we do not believe these are suitable for large scale development of CBM blocks in China. Ultimately CBM producers need to connect with pipelines to major markets. The good news is that most of the CBM blocks are proximal to major pipelines (Ordos to Beijing, WEP). The more difficult part is that Petrochina control access to most pipelines and has strong bargaining power in any gas off-take agreements.

Financing

Development of a 400km² block which contains 3P reserves of 3-4bcf/km² will require USD \$1.2bn to \$1.5bn assuming F&D costs of \$1/mscf. Even if capex is phased over several years the costs will be significant for some of the smaller E&P's who are not rich in cash. As a result it seems likely that the independents will have to dilute their equity, raise capital through rights issues or develop at a much slower pace that currently envisioned.

Government Approvals

At present no CBM project with a foreign partner has (to our knowledge) been awarded approval of its ODP (development plan). While this may be matter of time, there remain uncertainties over what regulations or restrictions the government may put in place prior to the first developments being awarded. Moreover, some of the PSC's have requirements to complete the exploration and appraisal phase within 3-5 years of signing. If companies have been unable to deliver on this, there is a residual risk that extensions may not be approved.

Partnership Alignment

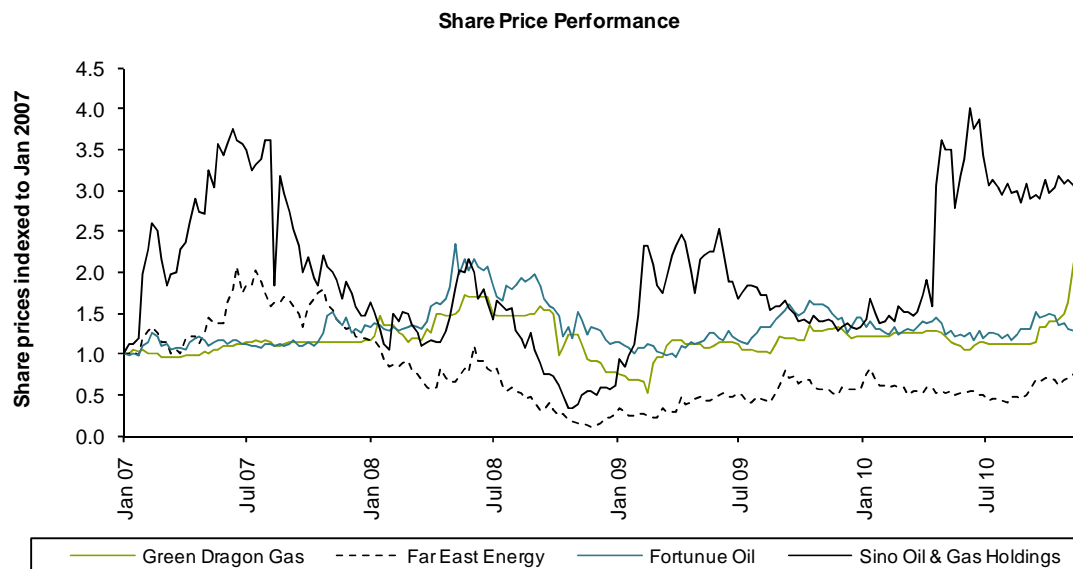
Since the decision by Petrochina to pull out of their joint venture with CUCBM, CBM blocks have been split between both companies. While this could be a positive, there remains a funding issue with CUCBM and whether it will be able to pay for its share of any development work program which could lead to project delays. There are also uncertainties around Petrochina's strategy and what blocks they want to develop first. Any development will need clear alignment with the designated Chinese partner to move forward.

Ways to Play the Sector

Other than Petrochina who has the largest exposure to CBM in China, there are a number of E&P's which are involved in the CBM industry, including Green Dragon, Far East Energy and Sino Oil & Gas, Fortune Oil and Enviro Energy Holdings. Most of these companies have traded sideways over the last 3 years, but have gained momentum in recent months (**Exhibit 34**). While we do not cover these companies, they will be interesting to follow over the next 12 months as they ramp up drilling activity and seek government approval for the first large scale coal bed methane projects in China. If any of these companies are successful, it could lead to a re-rating in values across this sector.

Exhibit 34

Share Price Trends for CBM Companies in China



Source: Bloomberg

Within China, Green Dragon Gas and Far East Energy Company are the purest ways to play the coal bed methane theme. Green Dragon is developing a pilot product in its flagship GSS block in Shizhuang which is one of the most attractive CBM blocks in China (**Exhibit 35** and **Exhibit 36**). Green Dragon Gas is

considerably larger than Far East Energy in terms of net acreage and also has a growing downstream gas segment. Although Petrochina will dominate this area in the long term, CBM will have little direct impact on their earnings over the next few years. Longer term however, the growth in CBM could be an important driver for gas growth within the company. Enviro-Energy are also involved in coal bed methane as to are Fortune Oil although this still represents only a small part of their business. Sino Oil & Gas have also entered the space through their acquisition of Orion which held a 70% share in the Sanjiao block which is one of the most promising CBM blocks in Eastern Ordos. While there are other companies involved some of these are privately held such as PAP and AAGI.

Exhibit 35

Independent Coal Bed Methane Companies

| | Green Dragon Gas | Sino Oil & Gas | Enviro Energy | Far East Energy | Fortune Oil |
|-----------------------------------|------------------|----------------|---------------|-----------------|-------------|
| Bloomberg ticker | GDG LN | 702 HK | 8182 HK | FEEC US | FTO LN |
| Exchange | London | Hong Kong | Hong Kong | US | London |
| Market Cap, US\$mm | 1,428 | 516 | 136 | 221 | 226 |
| Total debt, US\$mm | 110 | 5 | 31 | 10 | 87 |
| Cash, US\$mm | 128 | 73 | 26 | 45 | 94 |
| EV, US\$mm | 1,411 | 448 | 142 | 186 | 218 |
| NPV of pilot project, US\$mm | 293 | 644 | 128 | 247 | 92 |
| Value of undeveloped area, US\$mm | 2,123 | 60 | 307 | 1,080 | 35 |
| Total Value, US\$MM | 2,416 | 704 | 435 | 1,327 | 128 |

Source: Bloomberg

Exhibit 36

Green Dragon appears to have to most attractive CBM block

| Company | Block | Thickness | Gas Content | Gas Saturation | Perm | Acquirer | Faulting | Score |
|------------------|--------------|-----------|-------------|----------------|------|----------|----------|-------|
| Green Dragon | Shizhuang S. | 2 | 3 | 2 | 2 | 3 | 2 | 14 |
| Sino Oil and Gas | Sanjiao | 2 | 2 | 2 | 2 | 2 | 3 | 13 |
| Fortune | Liulin | 2 | 2 | 2 | 2 | 2 | 3 | 13 |
| Enviro-Energy | Xinjiang | 3 | 1 | 2 | 2 | 2 | 3 | 13 |
| FEEC | Shouyang | 2 | 2 | 1 | 3 | 1 | 2 | 11 |

3 = good, 2 = average, 1 = Low

Source: Bernstein estimates

China will see a wave of CBM activities over the next 3-5 years as companies plan to bring their CBM assets into commercial developments (**Exhibit 40** and **Exhibit 41**). Of these companies, Green Dragon and Sino Oil and Gas have the most material development plans.

Green Dragon Gas

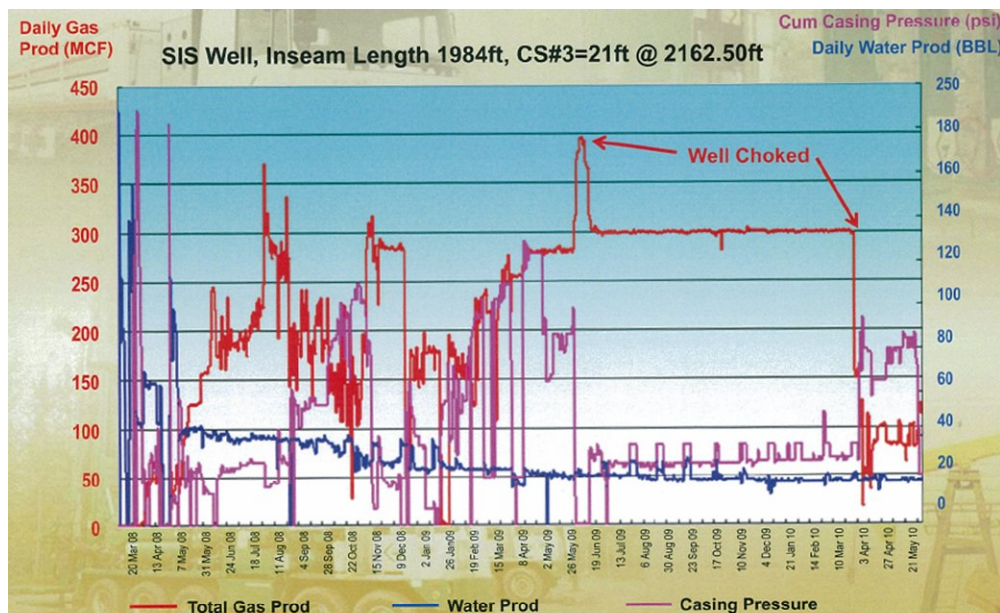
Green Dragon Gas is China's leading independent CBM producer in terms of acreage, reserves and market capitalization. Listed on the London market, GDG aims to move its listing to the HK main board next year which would be a shrewd move based on the performance of other companies which have done the same thing. The flagship project is development of the GSS block which has 3.3TCF of gas in place with GDG net 3P reserves of 1082bcf. GDG has 60% equity in this project.

GDG have been actively drilling in the GSS block for several years and are producing more than 1mmscf/d with well flow rates reached 0.3 to 0.4mmscf/d (**Exhibit 37**). Over the next 18 months GDG plan to spend \$250MM to develop the block of which around \$200MM will be upstream expenditure. We anticipate 120 horizontal wells will be drilled in an effort to bring production up to 50mmscf/d (gross) by the end of

2012/early 2013 (18bcf). GDG is pursuing a differentiated marketing strategy relative to other CBM companies in China with emphasis on local CNG sales and gas swaps leveraging the downstream gas infrastructure they have acquired. We believe that well head net back prices will be close to \$7.00/mscf.

After years of developing the surface-in-seam drilling technology, the key challenge for GDG is to deliver the Phase 1 development plan and the production target by end 2012 which will enable the company to become cash flow positive. Given the acreage position, GDG certainly appear to have options to expand with the GSN block being the next likely development.

Exhibit 37
Green Dragon's well statistics



Source: Company presentation

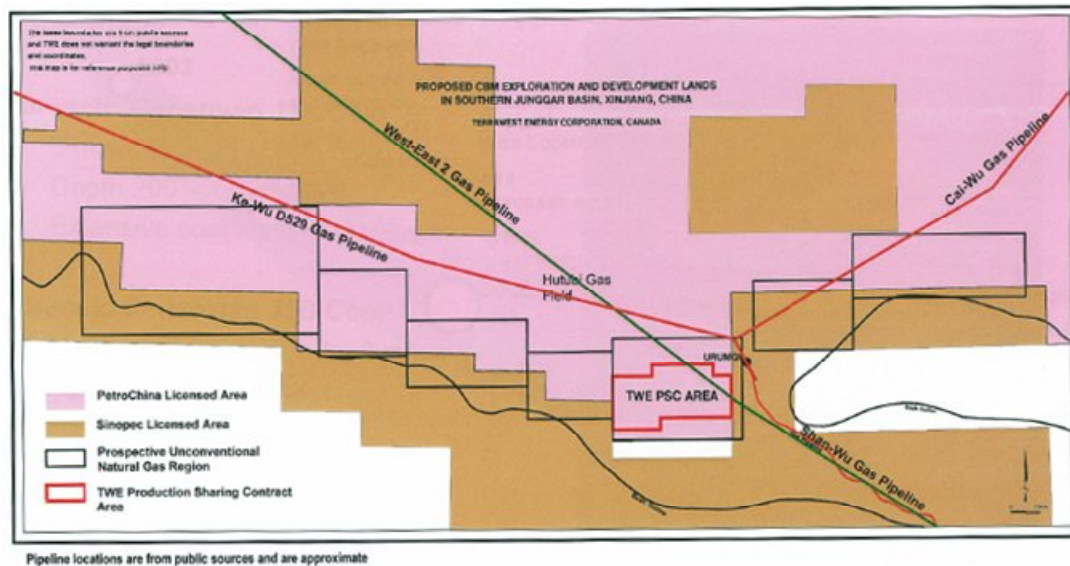
Enviro Energy Holdings

Enviro Energy holds a net 30% share in a CBM PSC in Xinjiang through Terrawest. The block is estimated to have a gas in place of 3.2TCF with gross recoverable reserves of close to 2.2TCF. The Xinjiang block is still at a very early stage of appraisal. Over the next 6 months Enviro Energy will conduct a pilot appraisal programme which will involve the drilling of 10 wells (mostly vertical) and pilot production tests.

Assuming the pilot production programme is successful, Enviro will commence Phase 1 development of the block. This will involve the drilling of 180 wells over the next 3 years from 2011-14 at a cost of \$160MM. Target production by 2014 is 22mmscf/d (gross). It is likely that most of the gas will be monetized in nearby Urumqi or through the West to East Pipeline which runs close to the block (**Exhibit 38**). The wellhead price is likely to be greater than \$5.50/mscf.

The upside for Enviro shareholders could be the shale gas play which sits below the CBM acreage. This Jurassic shale which has high organic carbon content and a gas content of 30-50scf/t. Reserves could be as much as 2TCF, although this remains highly speculative. Appraisal of the shale gas play is likely to take place in 2011 or 2012.

Exhibit 38
Enviro's block in Xinjiang is close to the West to East Pipeline



Source: Company presentation

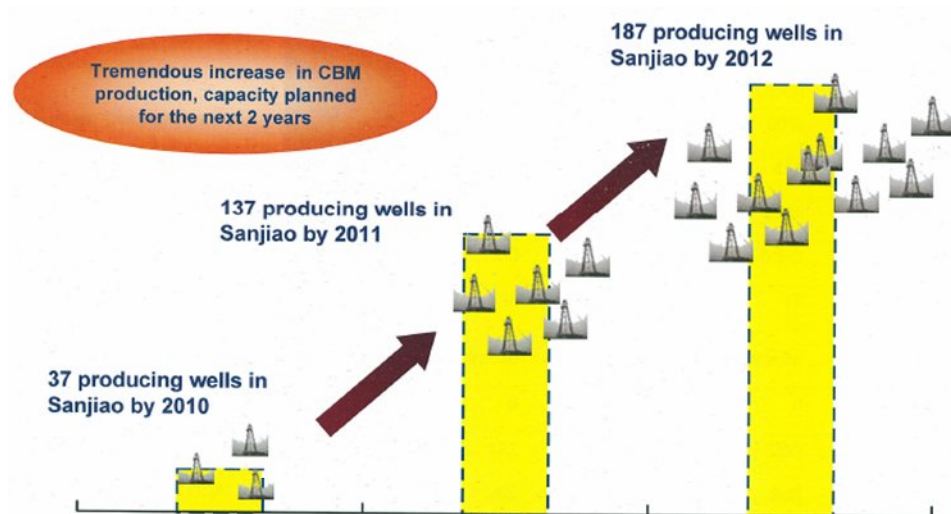
Sino Oil and Gas

Through their acquisition of Orion, Sino Oil and Gas have a 70% share in the Sanjiao block which is one of the most promising CBM blocks in Eastern Ordos. Gas in place is estimated for this block at 2.1TCF with net 3P reserves to Sino oil and gas of 577bcf.

Sino Oil and Gas have an aggressive campaign to develop the block and plan to spend \$370MM (gross) over the next 3 years to develop the block which is the greatest expenditure planned by any of the CBM companies. The plan envisages the drilling of 220 horizontal wells to deliver production of 35mmscf/d by 2013 (**Exhibit 39**).

Sino Oil and Gas have signed an LOI for sales gas at \$6.20/mscf. In addition, Sino are exploring options of selling gas through local CNG sales and LNG which could boost netbacks over and above these estimates. Given their cash position, Sino Oil and Gas will require additional financing to move forward with this development.

Exhibit 39

Sino Oil & Gas plans to bring on 187 wells in Sanjiao by 2012

Source: Company presentation

Far East Energy Company

The focus for the Far East Energy Company is the Shouyang block in the northern part of the Qinshui basin. This is a large block with an area of 1963km² and a recently revised gas in place of 6.9TCF. This block is distinctive among the CBM blocks in China in that the permeability is unusually high and in the 10 – 100md range compared with the 1-10md range for other blocks within the Qinshui and Ordos.

FEEC plan to initiate a small scale commercial development of a small part of the block which will involve the drilling of 60 vertical fraced wells for a cost of \$20MM USD. This is a less ambitious target than some of the other companies in the region. FEEC company believe that all in costs are lower for this block given the higher permeability's which results in an all in cost of \$1/mscf compared to other blocks which have an all in cost of \$2/mscf. By the end of 2011 FEEC aim to produce around 7-10mmscf/d and have a target to increase in the longer term to 40mmscf/d. FEEC have signed a sales agreement with their partners CUCBM which should enable them to sell at the wellhead for \$6.45/mscf.

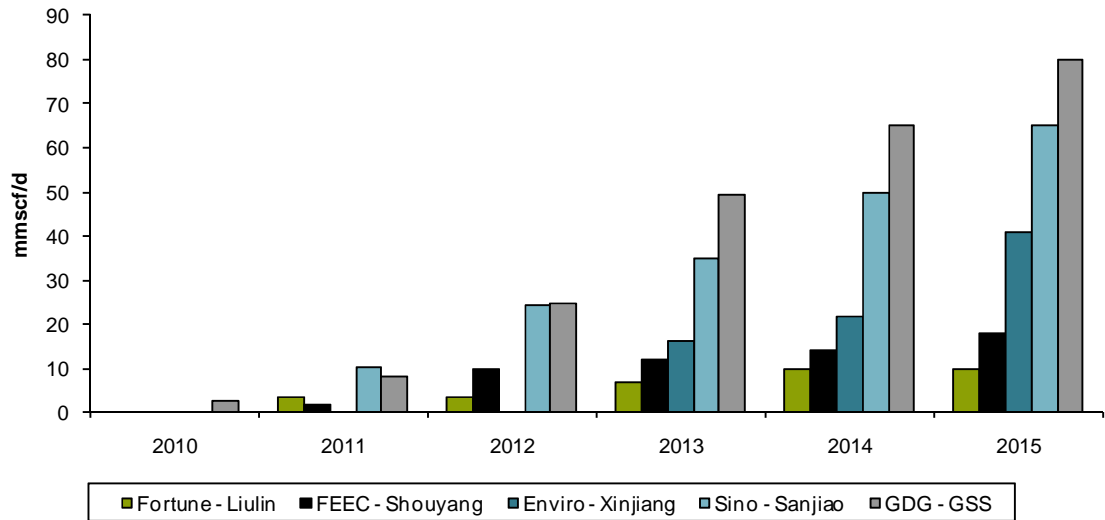
Fortune Oil

Fortune Oil together with Dart Energy are partners in FLG which has a 50% share in the Liulin block in Eastern Ordos. The block is smaller than others in the region with an area of 198km² and a Gas in Place estimated at 1TCF (gross). Already 50 fraced wells have been drilled in the block with a further 20 fraced wells underway. A gas sales agreement has been signed with Shanxi CUCBM which will take 3.5mmscf/d at a price of \$6.45/mscf. FLG will drill a number of horizontal wells over the next 12 months in which we expect they will increase the gas output significantly from this block.

Exhibit 40

The next 5 years will see a wave of CBM activities and production in China

CBM Gross Production Profile by Block



Source: Company reports, Bernstein analysis and estimates

Exhibit 41

Summary of phase 1 development plan by company

| Company | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total | Notes |
|-----------------------------------|------|------|-------|------|------|------|-------|----------------------------|
| Green Dragon - GSS | | | | | | | | |
| Capex \$MM | | 125 | 125 | | | | 250 | Phase 1 Capex |
| Wells | 12 | 50 | 50 | | | | 112 | End 2012/early 2013 target |
| Production mmscf/d | | | | 49 | | | | |
| Production bcf | | | | 18 | | | | |
| Enviro Energy - Xinjiang | | | | | | | | |
| Capex \$MM | | 15 | 27 | 54 | 70 | | 166 | Phase 1 Capex |
| Wells | | 10 | 30 | 54 | 100 | | 194 | 2014 target |
| Production mmscf/d | | | Pilot | 16 | 22 | | | |
| Production bcf | | | | 6 | 8 | | | |
| Sino Oil and Gas - Sanjiao | | | | | | | | |
| Capex \$MM | 34 | 168 | 84 | 84 | | | 370 | Total Capex |
| Wells | 20 | 100 | 50 | 50 | | | 220 | Total Well Count |
| Production mmscf/d | 0 | 11 | 25 | 35 | | | | 2013 target |
| Production bcf | 0 | 4 | 9 | 13 | | | | |
| Far East Energy - Shouyang | | | | | | | | |
| Capex \$MM | | 20 | | | | | 20 | 2011 capex |
| Wells | | 60 | | | | | 60 | 2011 drilling plan |
| Production mmscf/d | | | 10 | | | | | 7-10mmscf/d by end 2011 |
| Production bcf | | | | | | | | |
| Fortune Oil - Liulin | | | | | | | | |
| Capex \$MM | | | | | | | | |
| Wells | | | | | | | | |
| Production mmscf/d | | 3.5 | | | | | | Early production scheme |
| Production bcf | | 1.3 | | | | | | |

Source: Company reports, Bernstein analysis and estimates

Based on key block data, company development plans and guided production metrics, we have estimated the value of the CBM assets for each company (**Exhibit 42**). Our analysis indicates that the pilot CBM projects yield an NPV of between US\$1.0-1.5/mscf (\$6 to \$10/boe) which is in line with our generic model shown in **Exhibit 29**. We note that this is materially lower than the \$4/mscf (\$24/boe) which is implied in some of the NSAI reports which have been prepared.

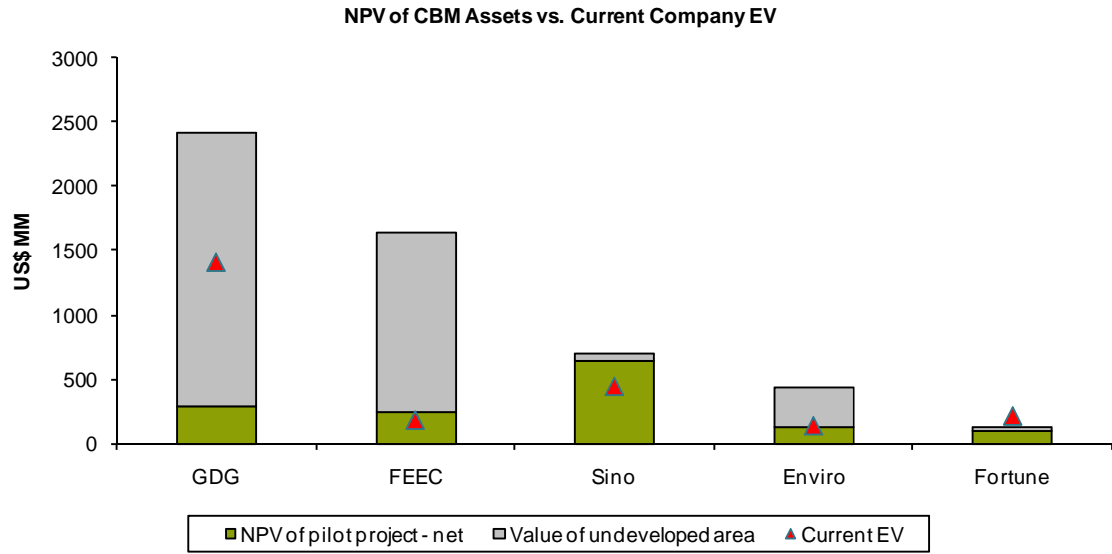
Sino's Sanjiao development appears to be the largest in value terms (c. US\$650MM) while FEEC have the most economic project with an NPV of US\$1.55/mscf. For the remaining acreage of the development blocks, we have assigned a \$0.5/mscf value to the remaining reserves. GDG and FEEC have also positions in CBM blocks elsewhere in China which we valued at US\$2,000/acre which we believe is reasonable given the stage of development. Comparing the total estimated value of CBM assets by company and market EV, there appears to be upside available in most of the names (**Exhibit 43**).

Exhibit 42
Value of CBM acreage by company

| Summary of Economics | | | | | | |
|--|-------------|--------------|------------|------------|--------------|------------|
| Company | | GDG | Sino O&G | Enviro | FEEC | Fortune |
| Block info | | | | | | |
| | | GSS | Sanjiao | Xinjiang | Shaoyang | Liulin |
| Gross block area | km2 | 455 | 461 | 653 | 1,963 | 198 |
| Gross block GIIP | BCF | 3,341 | 2,100 | 4,870 | 6,974 | 1,050 |
| Recovery factor | % | 50% | 50% | 50% | 50% | 50% |
| Gross recoverable reserves | BCF | 1,671 | 1,050 | 2,435 | 3,487 | 525 |
| Equity interest | % | 60% | 70% | 30% | 67% | 31% |
| Net recoverable reserves | BCF | 1,002 | 735 | 731 | 2,319 | 165 |
| Model inputs | | | | | | |
| Gas price | \$/mscf | 6.8 | 6.2 | 5.5 | 6.5 | 6.5 |
| F&D cost | \$/mscf | 1.2 | 1.2 | 1.0 | 0.6 | 1.2 |
| Opex | \$/mscf | 0.8 | 0.8 | 1.0 | 0.4 | 0.8 |
| All-in costs | \$/mscf | 2.0 | 2.0 | 2.0 | 1.0 | 2.0 |
| Peak rate | \$/mscf | 0.5 | 0.7 | 0.5 | 0.4 | 0.4 |
| Reserves/well | BCF | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 |
| Implied decline rate | % | 2% | 5% | 9% | 1% | 2% |
| Model outputs | | | | | | |
| Gross NPV per mscf | \$/mscf | 1.09 | 1.05 | 1.10 | 1.55 | 0.98 |
| Gross NPV per well | \$MM | 4.36 | 4.18 | 2.20 | 6.20 | 2.94 |
| No. wells drilled in phase 1 | # | 112 | 220 | 194 | 60 | 100 |
| Gross reserves developed in phase 1 | BCF | 448 | 880 | 388 | 240 | 300 |
| NPV of pilot project - net | \$MM | 293 | 644 | 128 | 247 | 92 |
| Value of Remaining Acreage | | | | | | |
| Gross recoverable reserves | BCF | 1,671 | 1,050 | 2,435 | 3,487 | 525 |
| Gross reserves developed in phase 1 | BCF | 448 | 880 | 388 | 240 | 300 |
| Remaining gross recoverable reserves | BCF | 1,223 | 170 | 2,047 | 3,247 | 225 |
| Value of remaining recoverable reserves | \$/mscf | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Value of remaining recoverable reserves - Gross | \$MM | 611 | 85 | 1,024 | 1,624 | 113 |
| Value of remaining recoverable reserves - Net | \$MM | 367 | 60 | 307 | 1,080 | 35 |
| Net area of other blocks | km2 | 3,556 | | | 643 | |
| Net area of other blocks | 000 acres | 878 | | | 159 | |
| Value per acre | \$/acre | 2,000 | | | 2,000 | |
| Net value of other blocks | \$MM | 1,756 | | | 318 | |
| Value of undeveloped area | \$MM | 2,123 | 60 | 307 | 1,397 | 35 |
| Total Value | \$MM | 2,416 | 704 | 435 | 1,645 | 128 |

Source: Company reports, Bernstein analysis and estimates

Exhibit 43
NPV of CBM assets indicates more upsides to come



Source: Bloomberg, Bernstein estimates

Disclosure Appendix

Valuation Methodology

We value large cap oil and gas companies by identifying the forward price to book multiples they should trade at based on returns on equity, long term earnings growth expectations, dividend payout ratio and cost of equity. Our starting point is that $Fwd\ P/B = (ROE \times PO) / (Ke - g)$, where ROE is our estimates of ROE for 2011, PO is the dividend payout ratio, Ke is the cost of equity, and g is the long term growth rates. A summary of our price target calculations is shown in **(Exhibit 44)**.

Exhibit 44

Summary of price targets

| Summary of price targets | | | | | | |
|--------------------------|-----|------------|---|-----|---|--------------|
| Company | Cur | 2011E BVPS | x | P/B | = | Price Target |
| PTR | HKD | 6.4 | | 1.7 | | 11.0 |

Source: Bernstein analysis and estimates

Risks

PetroChina: downside risks to our PetroChina price target include a decline in oil prices given the high correlation and beta with oil, accelerated production decline at Daqing oil field and larger than expected losses in their refining division as a result of government fuel price subsidies. Better than expected refining margins and domestic gas prices as a result of policy changes represent an upside risk to our price target.

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Outperform: Stock will outpace the market index by more than 15 pp in the year ahead.

Market-Perform: Stock will perform in line with the market index to within +/-15 pp in the year ahead.

Underperform: Stock will trail the performance of the market index by more than 15 pp in the year ahead.

Not Rated: The stock Rating, Target Price and estimates (if any) have been suspended temporarily.

- As of 11/29/2010, Bernstein's ratings were distributed as follows: Outperform - 44.8% (1.6% banking clients) ; Market-Perform - 46.5% (1.0% banking clients); Underperform - 8.6% (0.0% banking clients); Not Rated - 0.0% (0.0% banking clients). The numbers in parentheses represent the percentage of companies in each category to whom Bernstein provided investment banking services within the last twelve (12) months.
- Neil Beveridge maintains a long position in BP PLC (BP).
- In the next three (3) months, Bernstein or an affiliate expects to receive or intends to seek compensation for investment banking services from 857.HK / PetroChina Co Ltd, PTR / PetroChina Co Ltd.

12-Month Rating History as of 11/30/2010

Ticker Rating Changes

857.HK O (IC) 06/29/09

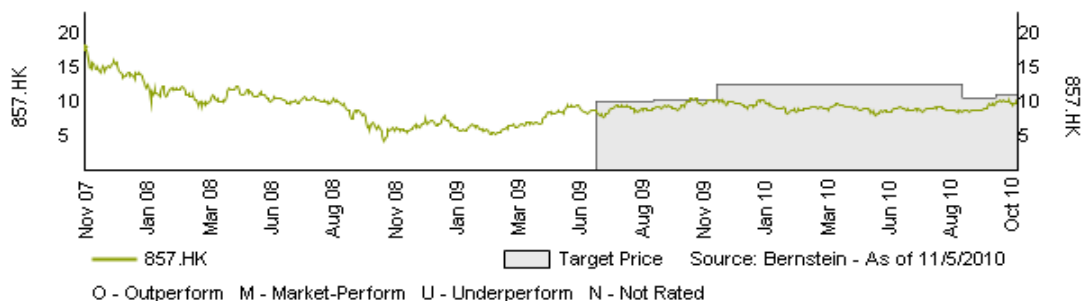
PTR O (IC) 06/29/09

Rating Guide: O - Outperform, M - Market-Perform, U - Underperform, N - Not Rated
 Rating Actions: IC - Initiated Coverage, DC - Dropped Coverage, RC - Rating Change

857.HK / PetroChina Co Ltd

| Date | Rating | Target(HKD) |
|----------|--------|-------------|
| 06/29/09 | O (IC) | 9.80 |
| 09/04/09 | O | 10.10 |
| 11/17/09 | O | 12.50 |
| 09/02/10 | O | 10.50 |
| 10/12/10 | O | 11.00 |

IC - Initiated Coverage



PTR / PetroChina Co Ltd

| Date | Rating | Target(USD) |
|----------|--------|-------------|
| 06/29/09 | O (IC) | 126.00 |
| 11/17/09 | O | 161.00 |
| 09/02/10 | O | 135.50 |
| 10/12/10 | O | 141.90 |

IC - Initiated Coverage



OTHER DISCLOSURES

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