BERNSTEIN RESEARCH

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741
Liang Zhang • liang.zhang@bernstein.com • +852-2918-5746

China Unconventional Gas: Key Take Away From Our China Unconventional Gas Investor Day

Ticker	Rating	CUR	2/23/2011 Closing Price	Target Price	TTM Rel. Perf.	EPS 2009A	EPS 2010E	EPS 2011E	P/E 2009A	P/E 2010E	P/E 2011E	Yield
857.HK	O	HKD	10.38	11.50	1.4%	0.64	0.85	1.02	16.2	12.2	10.2	2.8%
PTR	O	USD	133.62	148.35	0.0%	8.25	10.96	13.16	16.2	12.2	10.2	NA
MXAPJ			463.37			24.64	32.14	37.08	18.8	14.4	12.5	2.7%
SPX			1315.44			61.70	85.34	97.17	21.3	15.4	13.5	1.8%

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

Highlights

On February 16th we hosted the SCB China unconventional gas investor day, which was attended by Petrochina, Green Dragon Gas, Dart Energy, Far East Energy, Sino Oil and Gas, Enviro Energy and Fortune Oil. This report is based on key conclusions and insights from the investor day.

- **Coal bed methane will become an important source of natural gas in China in the coming years.** Over the next decade coal bed methane production will increase from negligible production today to 2bcf/d or 10% of China total gas production. By 2020 total unconventional gas will account for 30% of China's gas production.
- **Coal bed methane in China will be more difficult to develop than the US or Australia**. Although China has enormous coal reserves, coals in China have lower permeability, are more brittle and are more faulted than the prolific basins in Eastern Australia or US. Consequently development will take longer and development costs will be higher.
- **Investments in technology are starting to pay off – but there is no silver bullet**. After a decade of experimenting with different technologies, companies are starting to achieve commercial flow rates. Horizontal wells, multilateral cluster wells, vertical fracced wells are all being deployed. Depending on the geology, what is successful in one basin will not necessarily work in another.
- **Domestic Coal bed methane will be more competitive than gas imports**. All in costs (development and operating costs) for the development of coal bed methane in China are between USD1.50 to USD2.00/mscf. CBM can be economic at the well head at $6-7/mscf which is lower than LNG or pipeline gas imports. Given the enhancement to energy security, CBM is actively being encouraged by the NDRC.
- **Over the next 3 years there will be a significant increase in investment**. In addition to Petrochina, a number of small cap companies in the sector will experience a surge in drilling and gas output. Over the past 12 months $500MM has been raised for development drilling and we expect over 500 wells to be drilled by independents over the next 3 years which will significantly boost production.
- **The entrance of CNOOC into the sector and listing of CBM companies on the Hang Seng will be a positive for CBM in China.** The impending 50/50 joint venture between CNOOC and CUCBM will spur development and provide additional capital with the sector. Moreover, the listing of the largest

Asia-Pacific Oil & Gas

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

independent CBM Company Green Dragon on the Hang Seng will provide further interest in this sector for investors.

- **Despite the progress, there remains a number of above ground challenges facing the industry.** Approval of field development plans, access to pipeline capacity and scale of investment remains challenges to growth. While none of these are show stoppers, more can be done to encourage investment within the sector.

Investment Conclusion

Unconventional gas has been transformational in the US – but will it be transformational in China? Over time we think so, but it will take time. China is not the US. While the resource base could be enormous, technology, access and investment need to be increased significantly if unconventional gas is going to make the impact that it has done state side. While China will grow unconventional gas to 30% of gas supply by 2020 we think with the right incentives, there is more upside to this target.

Investors seeking to take advantage of unconventional gas in China have two options. Petrochina, or one of the smaller independent companies which are operating in the sector. Petrochina will dominate bed methane in China but it is unlikely to move the needle in the short term. Investors should stay focused on the first shale gas well which is being drilled with Petrochina and Shell in Sichuan which will provide the first glimpse into the shale gas potential of China.

Alternatively, investors can invest in CBM through some of the small cap companies which are operating within this sector. Green Dragon, Far East Energy and Sino-Oil and Gas are further along in their development plans and will grow production significantly over the coming 3 years. Enviro and Dart are still at an early stage with largely unexplored blocks in west China which look promising but have yet to be appraised. Companies which will be successful are those which can deliver on production and drilling targets. Overall, the sector is up 60% in the past 12 months. While it may be too early to pick the winners, investors could try picking a basket of stocks as a way to invest in this fast growing sector.

Details

Every energy company should have a China gas strategy. After all, China will be the largest growth market in the world over the next two decades. Don't just take our word for it – take a look at the XOM 2030 energy outlook. China's gas demand is set to grow more strongly than any other market in the world. While this seems likely – a bigger question is will China be more like the US or more like Europe? Will it be a large gas importer (as seems likely under the current business as usual scenario) or will unconventional gas transform the outlook in a way that few can predict at present (as happened in the US over the past 10 years).

Unconventional gas (tight gas, shale gas, coal bed methane) has been transformational in the US. We think this will be big business in China also – but it will take time. While it looks promising below the ground, there are a number of above ground challenges which may mean that development in China takes longer than it would do in other countries.

Last week we hosted our China unconventional gas investor day. In addition to Petrochina, we had a number of companies which presented including Green Dragon Gas, Dart Energy, Far East Energy, Sino Oil and Gas, Enviro Energy and Fortune Oil. This report is based on key conclusions and insights from the investor day.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

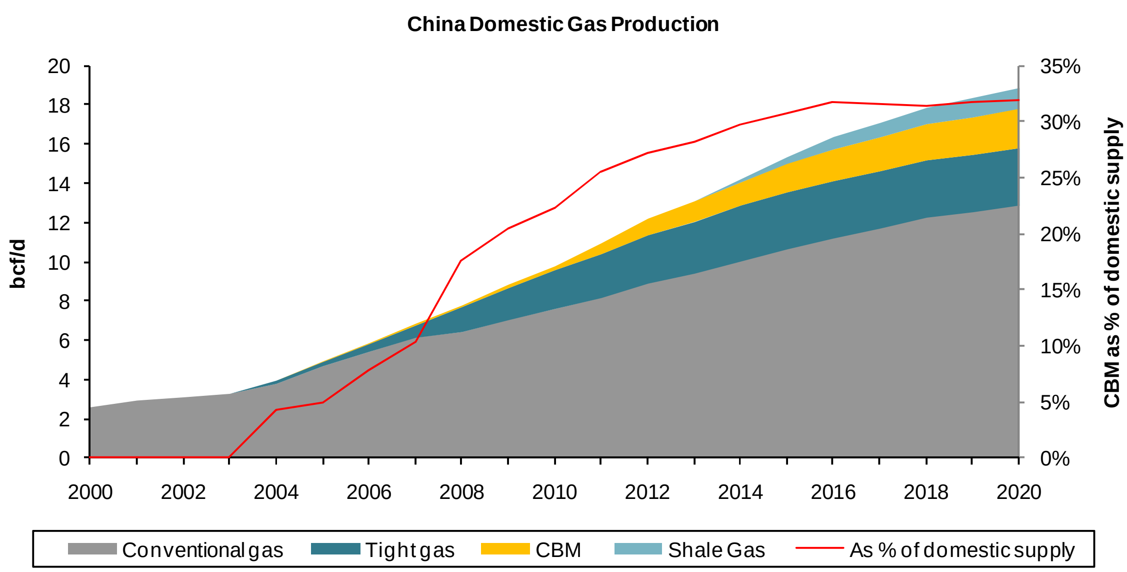
Outlook for Gas and CBM in China

What Petrochina chose to say about the gas market is important. After all they have the best vantage point with which to assess supply and demand given their virtual control over all aspects of the value chain of gas in China. Overall Petrochina expect gas demand to grow from over 100bcm in 2010 to 220bcm by 2015. Domestic supply is estimated to 16bcf/d with 6bcf/d of imports or close to 30% of total supply. By 2020 Petrochina expect gas demand to exceed 30bcf/d.

By 2020 gas production is likely to reach 20bcf/d with unconventional gas (shale gas, tight gas and coal bed methane) accounting for 6.2bcf/d or 30% of total supply – compared with current levels of less than 10% (**Exhibit 1**). To put this in perspective, unconventional gas reached 30% of the supply mix in the late 90's and now accounts for 50% of the overall supply mix. Within the unconventional gas production output, CBM production is estimated to be 20bcm or 10% of total supply. This implies growth of 50 times the current output. Petrochina's own plan is to increase CBM production from 40mmscf/d in 2010 to 400mmscf/d by 2015 and 1bcf/d by 2020 (or 50% of China's total CBM output).

Estimated resources of CBM in China are just under 1000TCF (**Exhibit 2**). Total CBM acreage in China is 212,000km2 and gas in place is estimated at 835TCF according to Petrochina's estimates, implying a resource concentration of 4bcf per km2. At present only a fraction of the resource base has been proven and total output is 140mmsc/d – which is equivalent to where the US was in the late 1980's before increasing production to current levels of 5bcf/d.

Exhibit 1
Unconventional gas production (tight gas, CBM and shale gas) grow to 6bcf/d by 2020 or 30% of domestic supply mix

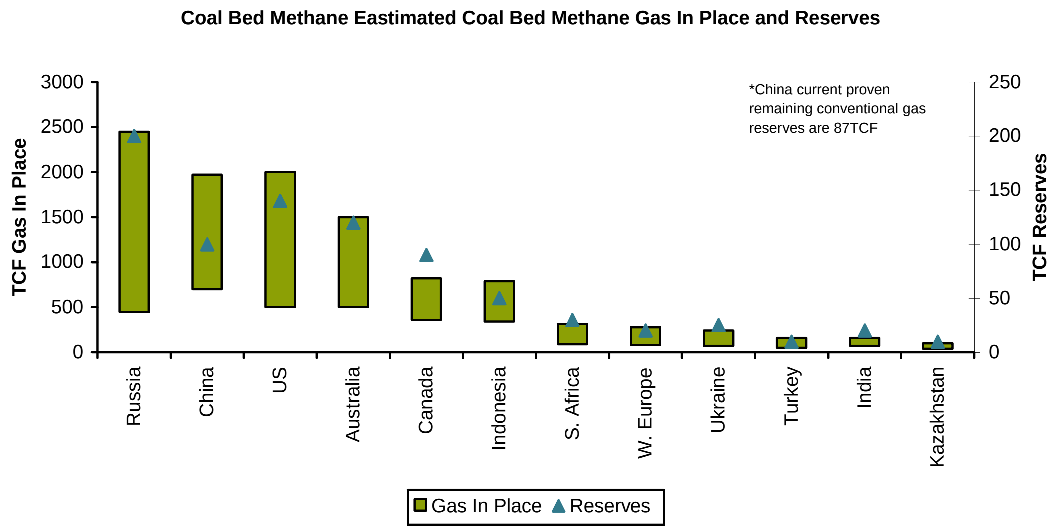


Source: Company reports, Bernstein analysis

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 2

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



Source: Advanced Resources International

What has changed in the Industry?

While companies have talked about coal bed methane in China for many years, things are finally starting to progress and over the next few years we believe there will be a significant increase in coal bed methane production in China. There are four factors which are starting to positively impact the sector.

- Technology – Coals in China can be challenging to develop due to low permeability and flow rates. The use of horizontal drilling technology has increased production from low permeability coal seams increasing production to commercial rates where development can be contemplated.
- Access to Capital – Over the past 12 months, independent companies have raised USD500MM in capital which will be used to expand drilling activities and increase production levels over the next 3 years.
- Entrance of CNOOC into the sector – It seems likely that CNOOC will take a 50% share in upstream CUCBM's acreage. CUCBM has not been successful in developing CBM in China and the introduction of CNOOC will provide capital and focus for development.
- Competitiveness. CBM prices are unregulated in China. The increase in oil prices has pulled up unregulated gas prices resulting in significantly higher margins. Moreover, given the cost of imports, CBM in China will be more competitive than pipeline gas or LNG.
- Policy. CBM will enhance energy security in China and reduce dependence on oil imports. Within the next 5 year plan there will be special attention paid to this sector and continued encouragement for CBM producers to increase production.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

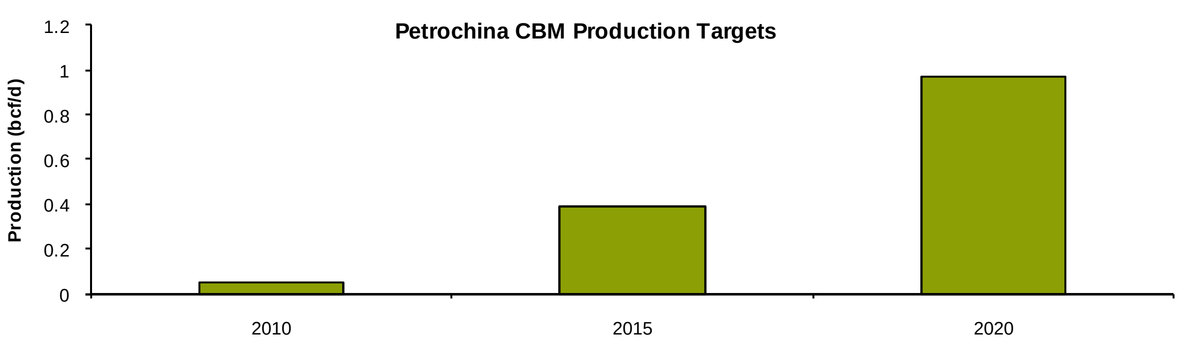
Petrochina – Technology Key to Unlocking Significant Resource Base

Petrochina is and will be the largest player in the CBM industry in China. Not only does Petrochina control midstream access through vast pipeline network, but it also controls 75% of the total acreage and 70% of the gas in place (estimated at over 800TCF). Petrochina's total net acreage for CBM in China is 161,000km2 (75% of total acreage) with gas in place resource estimates of 580TCF (70% of total resource). Only a small fraction of this has been booked as proven reserves. Petrochina's total current proven reserves total 7TCF which represents about 15 of the overall resource. At the end of last year, Petrochina had built 110mmscf/d of capacity and had an output of 40mmscf/d which is a tiny fraction of Petrochina's daily production. In terms of development, the eastern edge of the Ordos and Qinshui basins remain key regions for Petrochina, and by 2020 the company plans on producing 1bcf/d (**Exhibit 3**).

Petrochina highlighted a number of challenges with CBM development in China. Firstly, the highly faulted nature of the coal seams in certain basins meant that seismic was critical to developing CBM blocks where horizontal wells were required. Secondly, the importance of varying well designs to meet different geological conditions. Petrochina have employed vertical wells, multi-lateral horizontal wells and cluster well s depending on the geological conditions. It seems clear that no technology fits all. Thirdly, frac stimulation where appropriate can give a significant improvement to production. Finally, low cost gas gathering systems at surface remains important to keep costs of development at reasonable levels.

Major challenges according to Petrochina are (1) the lack of proved reserves (currently 9TCF vs. resource estimate of over 800TCF) (2) The quality of the resource; 1.3 of CBM resources are in low rank coals where no development technology exists to exploit and (3) low per well production rates of 0.05mmscf/d which is sub-economic to develop. Solution to these problems is to focus on eastern Ordos and Qinshui where coals are more mature and technology can increase per well flow rates. The possibility of a CBM spin-off company was mentioned as a possibility. Overall, while the outlook remains positive for CBM, more work will be required to further optimize development of CBM in China, particularly in improving per well flow rates and recovery factors.

Exhibit 3
Petrochina plans to grow CBM production by a CAGR of 35% over the next 10 years



Source: Company reports

Green Dragon Gas – The Largest Independent CBM Company in China

Green Dragon Gas is the leading independent CBM Company in China in terms of acreage, reserves and market capitalization. Currently listed on the London AIM market, Green Dragon have announced plans to move over to the Hang Seng market this year, which should improve liquidity in the stock. The focus for

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

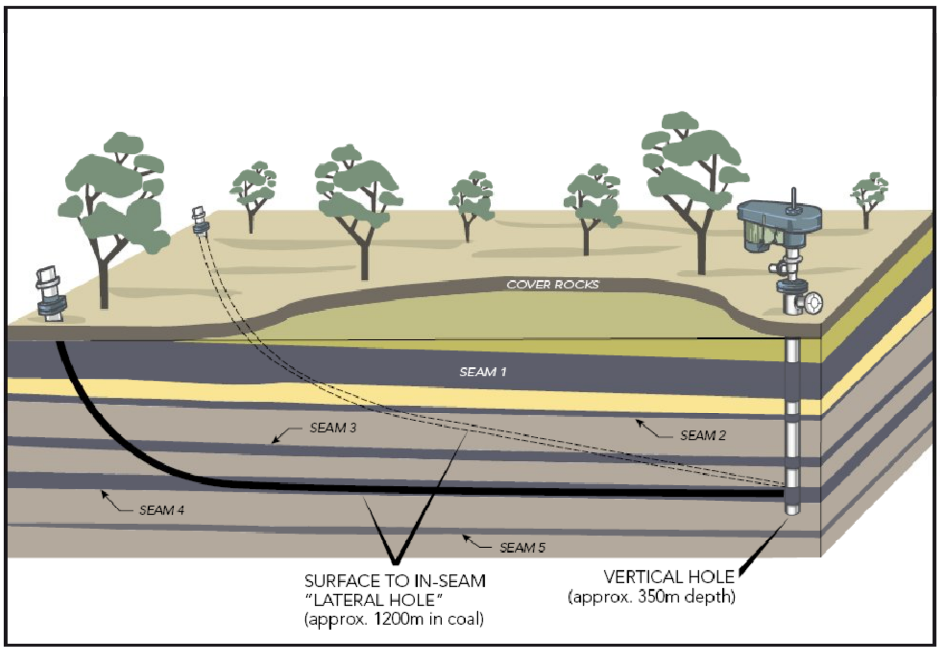
Green Dragon is the GSS block in Shanxi which has 3.3TCF of gas in place and net 3P reserves of 1083bcf the Green Dragon 60% equity share.

After years of optimizing the drilling technique, Green Dragon have opted for extended horizontal wells which are twinned with a vertical well and a slotted PVC liner to ensure the coal seam does not cave into the well bore. The challenge remains faulting within the block which requires careful well planning to ensure continuous drilling within coal seams though the use of vertical control wells (**Exhibit 4**).

Over the next 2 years 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) or 18bcf/year by the end of 2012/early 2013. The key for Green Dragon in our view is to deliver on these targets.

Unlike other CBM companies, Green Dragon Gas is pursuing a downstream strategy through CNG and will seek gas swaps with Petrochina and Sinopec to monetize gas through their own downstream assets. This should maximize netbacks for Green Dragon. We expect further updates on transportation or swap agreement over the coming months. In addition to the HK listing, further updates on reserves, drilling progress and production growth towards the 18bcf target will be key catalysts for the stock.

Exhibit 4
Surface to Seam Drilling Technique



Source: CH4

Far East Energy – Permeability and Pipelines

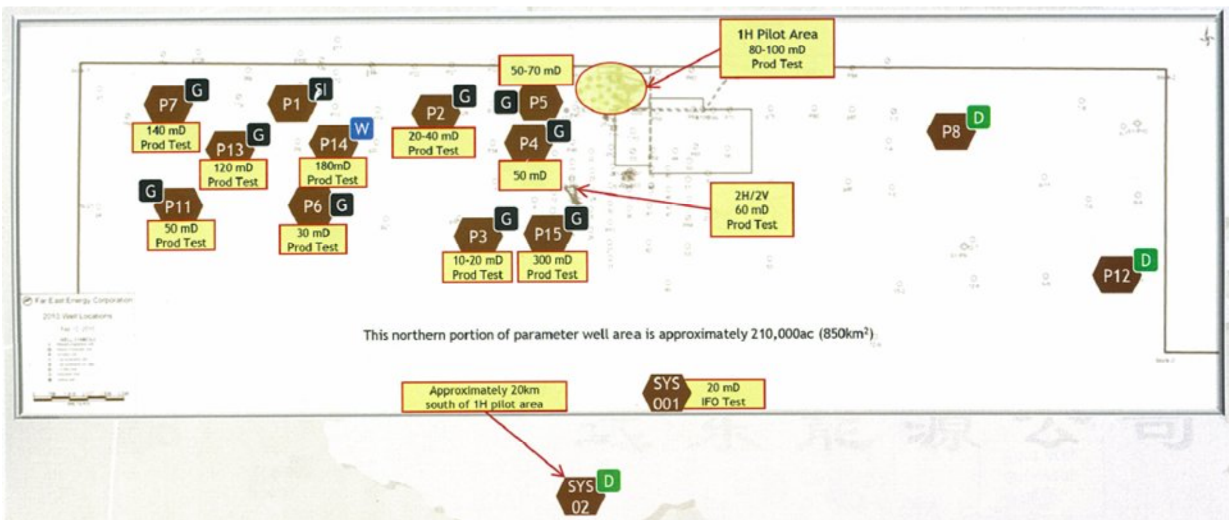
Far East Energy and 3 PSC's with two blocks in Qinshui basin and one in Yunnan. The most important of these blocks is the Shouyang block which has an area of 1963km2 and a gas in place of 6.9TCF. This block is distinctive among the CBM blocks in China in that permeability is considerably higher than any of the other blocks. Far East Energy has wells in the 10-100md permeability range compared with the average permeability of coal in China which has permeability of 1-10md.

As a result of better permeability, Far East Energy plan to drill vertical fracced wells which will be lower cost than horizontal wells. Far East estimate that production per well could reach 0.3mmscf/d. FEEC plan to initiate a small scale commercial development of a small part of the bock which will involve the drilling of 60 vertical fracced wells for a cost of $20MM USD. This is a less ambitious target than some of the other companies in the region. FEEC company believes 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 take or pay contract at $6.50/mscf for gas volumes up to 10mmsc/d. The first pipeline has connected to FEEC Shouyang block with a capacity of 40mmscf/d. A second pipeline is being constructed which will add a further 60mmscf/d of pipeline capacity which could significantly enhance the options for gas sales.

Exhibit 5

Shouyang Block Parameter Well Development



Source: Company reports

Sino Oil and Gas – The Chinese Pure Play

Sino oil and gas have a 70% share in the key Sanjiao block in eastern Ordos which is one of the most promising blocks in the basin and highlighted by Petrochina as promising. Gas in place is estimated for this block at 2.1TCF with net 3P reserves to Sino oil and gas of 577bcf. In addition Sino Oil and Gas have a 90% share in the Jinzhuang field which is thought to have 704bcf of proven reserves.

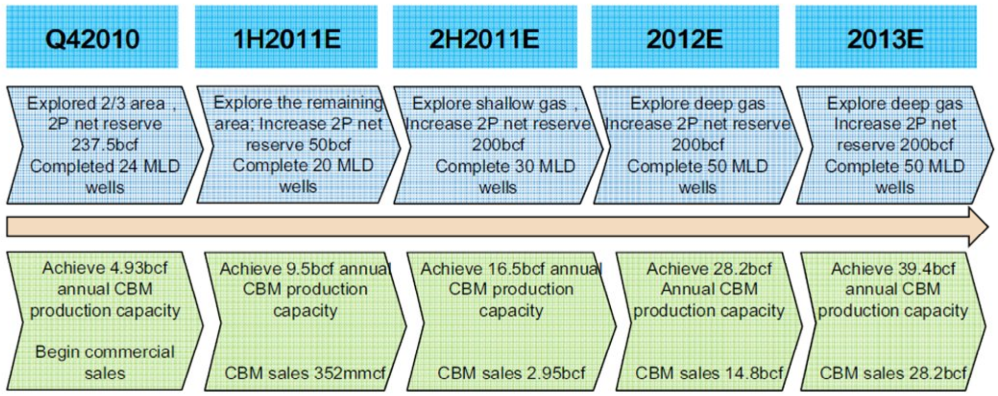
Like Green Dragon, Sino Oil and Gas are developing the block with horizontal wells but with multi-laterals rather than a single lateral. Sino Oil and Gas have an aggressive campaign to develop the block and plan to spend $370MM (gross) over the next 3 years to develop the block which is the greatest expenditure planned by any of the CBM companies (**Exhibit 6**). The plan envisages the drilling of 370 horizontal wells. Sino Oil and Gas are targeting sales of 8mmscf/d by the end of 2011 and 76mmscf/d of CBM sales by 2013 and total sales of over 100mscf/d (39.4bcf) if tight gas assets are included.

To reach this target Sino Oil and Gas will have to raise additional funds given their current cash position and we anticipate a number of fund raising issues in 2011/12. Sino Oil and Gas have signed an LOI for

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

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.

Exhibit 6
Sanjiao CBM Project Timeline



Source: Company reports

Dart Energy – Elephant Hunting

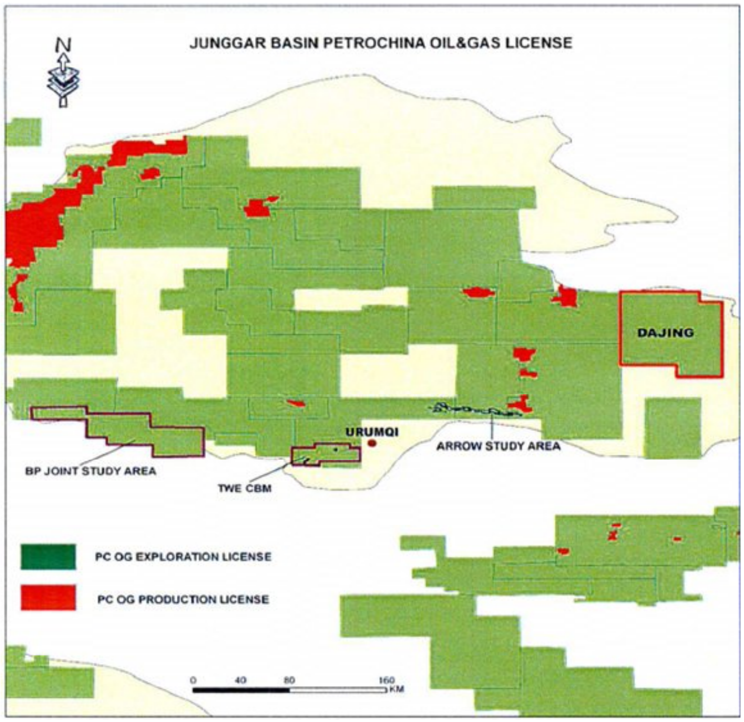
Dart energy is unique amongst the CBM independent companies in that they operate across a number of countries (Australia, China, India, Indonesia, Vietnam and Europe).

In China Dart's CBM interests are the Liulin block in eastern Ordos which has 85bcf of proven reserves and 1 TCF of gas in place and the Dajing block. The pilot program for Liulin consists of a number of horizontal wells with multi-laterals drilled in a cluster style – similar to Sino Oil and Gas. Dart Energy has been progressively deepening their equity interest and have options to grow to 75% equity. The 2011 work programme includes 5 in-seam wells, 3 vertical frac wells and pipeline design and installation.

The bigger prize for Dart in China however is the Dajing block in Xinjiang province which is largely unexplored but is thought to contain 6.5TCF (**Exhibit 7**). Dart plan to drill 14 core wells in 2011 and the key will be to test coal parameters within the block, in particular permeability.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 7
Dart Energy's Dajing Block is located in the Junggar Basin



Source: Company reports

Fortune Oil – Diversified China Interests

Fortune Oil together with Dart Energy are partners in Fortune Limited Gas (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 fracced wells have been drilled in the block with a further 20 fracced wells underway. Flow rates of 0.35mmscf/d have been observed. 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.

Enviro Energy – Not Just Coal Bed Methane, but Shale Gas Also

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.

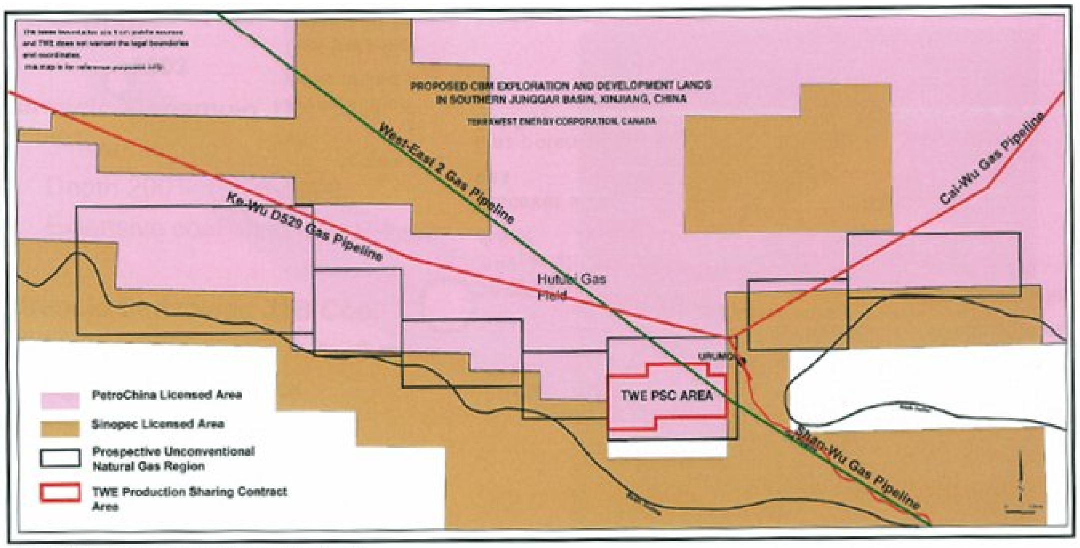
Assuming the pilot production programme is successful, Enviro will commence Phase 1 development of the block. This will involve the drilling of 180 wells over the next 3 years from 2012-4 at a cost of $160MM. Target production by 2014 is 22mmscf/d (gross). It is likely that most of the gas will be monetized in nearby Urumqi or through the West to East Pipeline which runs close to the block (**Exhibit 8**). The wellhead price is likely to be greater than $5.50/mscf.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

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 8

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



Pipeline locations are from public sources and are approximate

Source: Company presentation

Key Issues with CBM Development in China

While Coal Bed methane will have impressive growth ahead, it will only account for 10% of total gas production in China by 2020. In our view there still remain a number of barriers to commercial development of CBM resources in China.

- 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 bocks 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

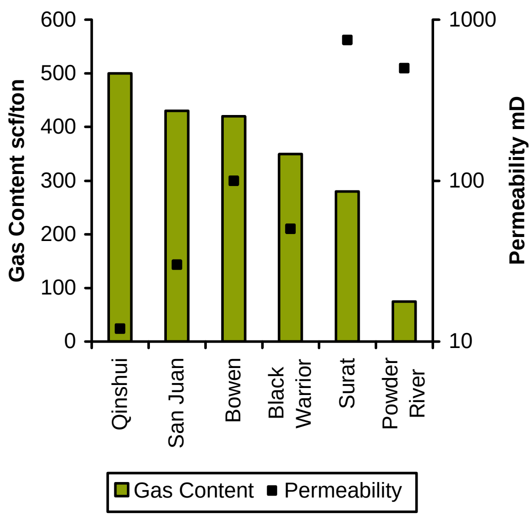
Development major blocks can require US$500MM to US$1bn. Even if capex is phased over several years the costs will be significant for some of the smaller E&P's who are not rich in cash. As a result it seems likely that the independents will have to dilute their equity, raise capital through rights issues or develop at a much slower pace that currently envisioned.

- Resource Quality

Asia-Pacific Oil & Gas

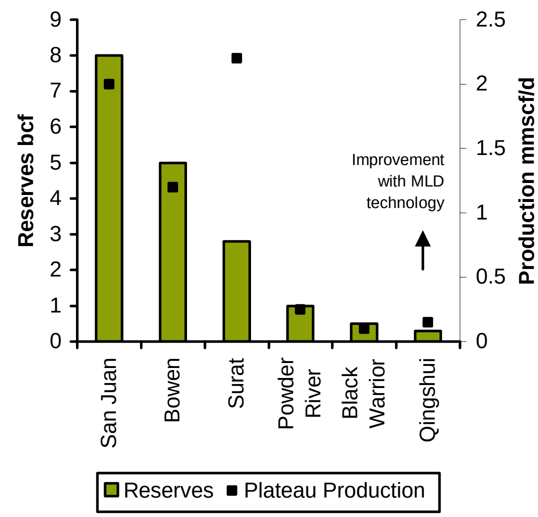
While coals in China have a high gas content they have low permeability, which means that flow rates are lower than in other basins such as the US or Australia (**Exhibit 9** and **Exhibit 10**). Moreover, Chinese coals tend to be brittle and are significantly faulted which complicates development drilling. While these issues can be overcome, CBM production in China does require specific technology solutions to the geological conditions in China. Over the past few years there has been significant progress, including the use of seismic data to guide well location selection (**Exhibit 11**), but further refinement is needed to develop low permeability coal seams in China.

Exhibit 9
Gas Content and Permeability of International CBM Basins



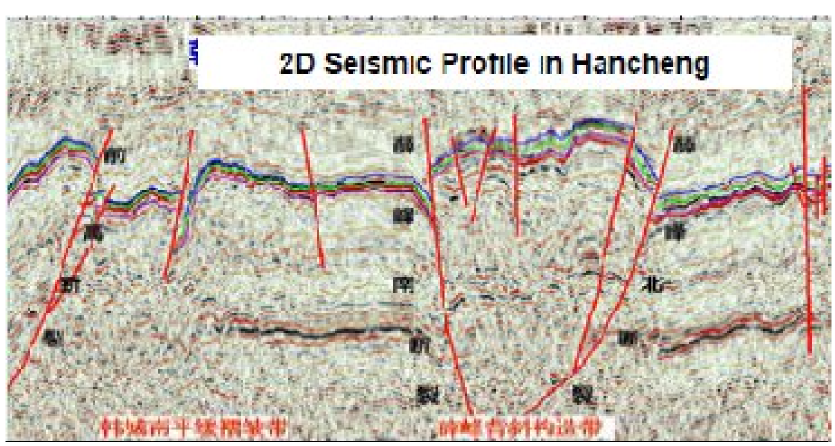
Source: Bernstein Est.

Exhibit 10
Flow rates and reserves of CBM basins



Source: Bernstein Est.

Exhibit 11
Seismic data will help identify fault lines and guide well location selection



Source: Company reports

- Regulatory

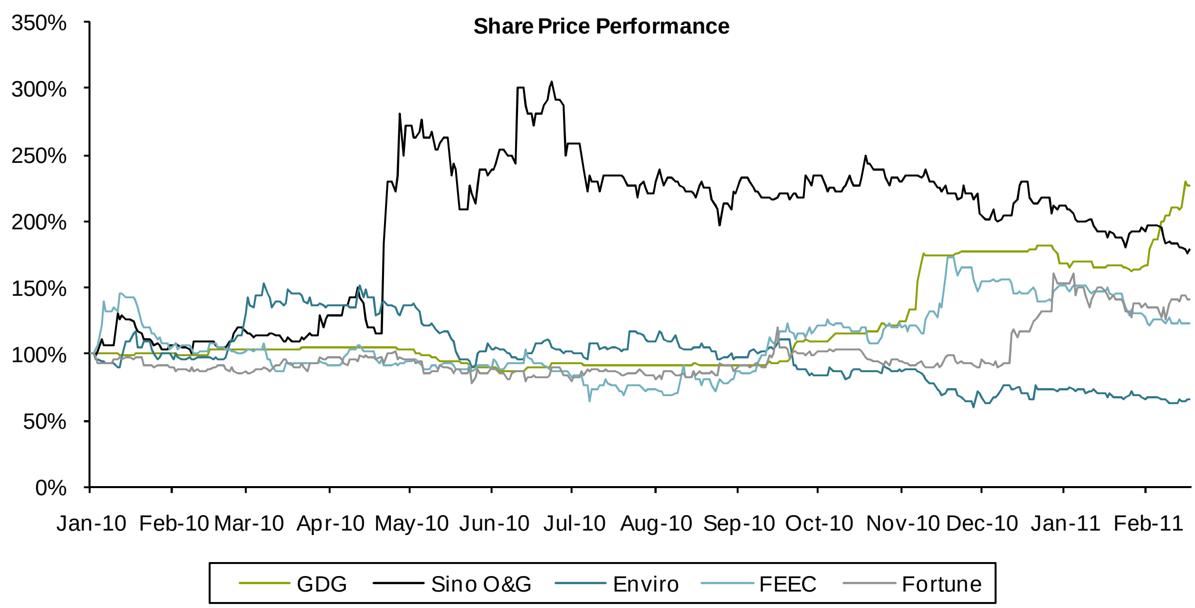
At present no CBM project with a foreign partner has (to our knowledge) been awarded approval of its ODP (development plan). While this may be matter of time, there remain uncertainties over what regulations or restrictions the government may put in place prior to the first developments being awarded. 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.

Ways to Play China's Unconventional Gas Space

For investors looking for a way to play the unconventional gas sector in China, there are a number of independent 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. Over the past two years, these companies have exhibited high volatility and traded separately from each other. For instance, Green Dragon's stock has more than doubled over that period, with the majority of that coming in 2010, while Sino Oil & Gas's stock has staggered since more than doubling in May 2010. Consequently, careful selection is required for investing in any specific stock in the group (**Exhibit 12**).

Another way to play to the CBM space would be to invest in a basket of these stocks. Investing in an index of these stocks rather than any specific company over the past 12 months would have delivered strong returns, 40% on a market cap-weighted basis and 60% on an un-weighted basis, with significantly lower volatility when compared to the share price movements of individual stocks (**Exhibit 13**). 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 12
Independent CBM Companies in China have traded differently

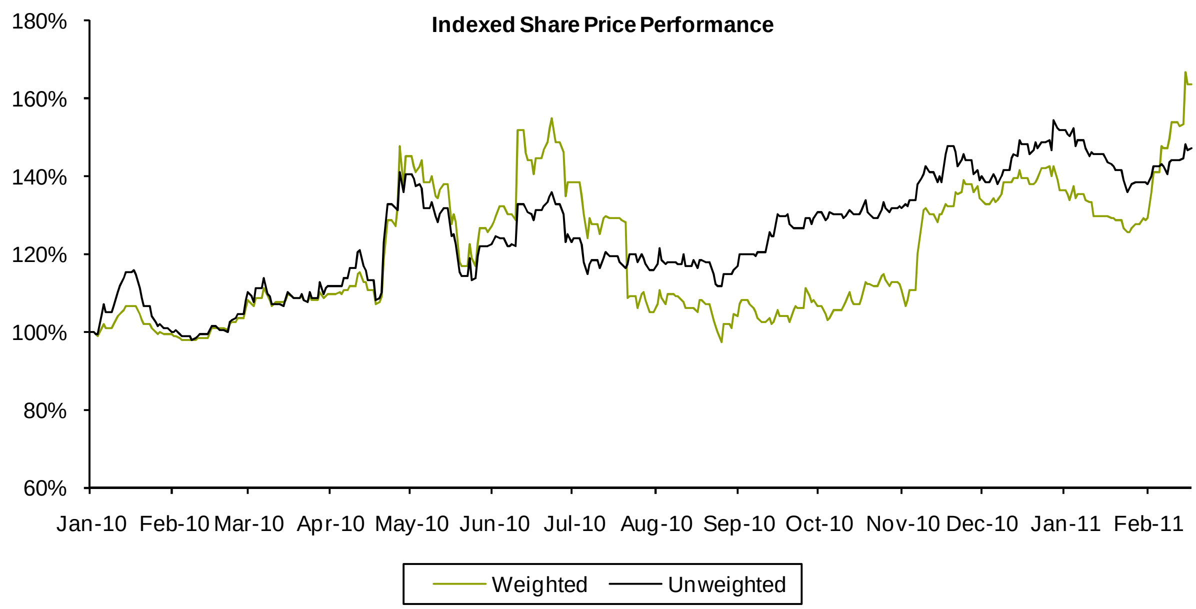


Source: Bloomberg

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 13

These companies collectively have performed well over the past 12 months



Source: Bloomberg

Among the publicly traded CBM companies in China, Green Dragon Gas, Sino Oil & Gas, Enviro Energy and Far East Energy Company are the purest ways to play the coal bed methane theme (**Exhibit 14**). Green Dragon is currently by far the biggest by both net acreage and market cap and the only vertically integrated player in the group. On a per acres valuation basis, the company is currently close to US$1,800/acre, similar to Enviro Energy. Enviro-Energy, the smallest player by market cap, is still in early stages of appraisal, starting a pilot appraisal programme that will involve the drilling of 10 wells and pilot production tests in its CBM block in Xinjiang.

Sino Oil & Gas and Far East Energy and sit at the high and low ends of the of the valuation spectrum within the group. Sino Oil & Gas has the most aggressive development plan in the group and raised several rounds of capital in 2010, but is likely to have further funding needs as it has failed to raise the approximately US$300m sought through a failed placement the second half of 2010. Far East Energy, on the other hand, has the most modest development plan. The company is currently trading well below its peers, likely due its listing on the OTC Bulletin Board, but it has the second largest resource base among peers and one that includes the Shouyang block. This block has unusually high permeability compared to other blocks in the Qinshui and Ordos and may compare well with those in San Juan and Black Warrior in the US.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 14

Independent CBM Companies in China

US$m, unless otherwise noted	Green Dragon Gas	Sino Oil & Gas	Enviro Energy	Far East Energy	Dart Energy (China business)	Fortune Oil (CBM business)
Bloomberg ticker	GDG LN	702 HK	121 HK	FEEC US	DTE AU	FTO LN
Exchange	London	Hong Kong	Hong Kong	US.OTCBB	Australia	London
Resource						
Net Acreage (000 acres)	1,034	86	54	590	496	14
Net GIIP (TCF)	14.7	2.4	1.1	9.5	3.4	0.1
Net 3P Reserves (BCF)	2,333	1,384	na	na	na	na
Valuation (US$m)						
Market Cap	1,965	440	121	166	639	353
Debt	110	5	31	0	0	87
Cash	230	98	26	33	154	94
EV	**1,845**	**347**	**127**	**133**	**484**	**346**
EV / acre ($/acre)	1,784	4,045	2,360	226	nm	nm
EV / GIIP ($/bcf)	126	147	120	14	nm	nm

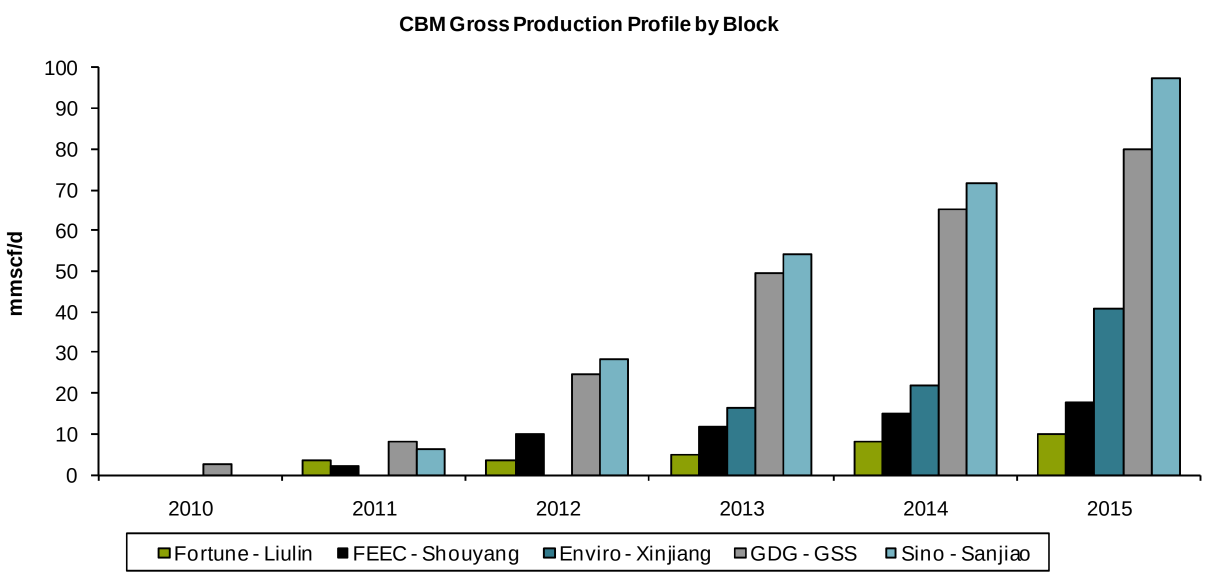
Source: Company reports, Bloomberg, Bernstein analysis

Risks and Rewards of Playing China's CBM Space

The potential these companies have is vast. Assuming that development plans go according to plan, each of these companies will experience dramatic surges in production over the next 3-5 years as they bring their CBM assets into commercial operations during a time when China's gas demand will continue to strong growth (**Exhibit 15** and **Exhibit 16**). Of these companies, Green Dragon and Sino Oil and Gas have the most material development plans.

Exhibit 15

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



Source: Company reports, Bernstein analysis and estimates

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 16

Summary of phase 1 development plan by company

Green Dragon - GSS	2010	2011	2012	2013	2014	2015	Total
Capex $MM		125	125				250
Wells	12	50	50				112
Production mmscf/d				49			
Production bcf				18			

Phase 1 Capex

End 2012/early 2013 target

Enviro Energy - Xinjiang	2010	2011	2012	2013	2014	2015	Total
Capex $MM		15	27	54	70		166
Wells		10	30	54	100		194
Production mmscf/d				16	22		
Production bcf				6	8		

Phase 1 Capex

Pilot

2014 target

Sino Oil and Gas - Sanjiao	2010	2011	2012	2013	2014	2015	Total
Capex $MM	34	168	84	84			370
Wells	20	100	50	50			220
Production mmscf/d	0	6	28	54			
Production bcf	0	4	9	13			

Total Capex

Total Well Count

2013 target

Far East Energy - Shouyang	2010	2011	2012	2013	2014	2015	Total
Capex $MM		20					20
Wells		60					60
Production mmscf/d			10				
Production bcf							

2011 capex

2011 drilling plan

7-10mmscf/d by end 2011

Fortune Oil - Liulin	2010	2011	2012	2013	2014	2015	Total
Capex $MM							
Wells							
Production mmscf/d		3.5					
Production bcf		1.3					

Early production scheme

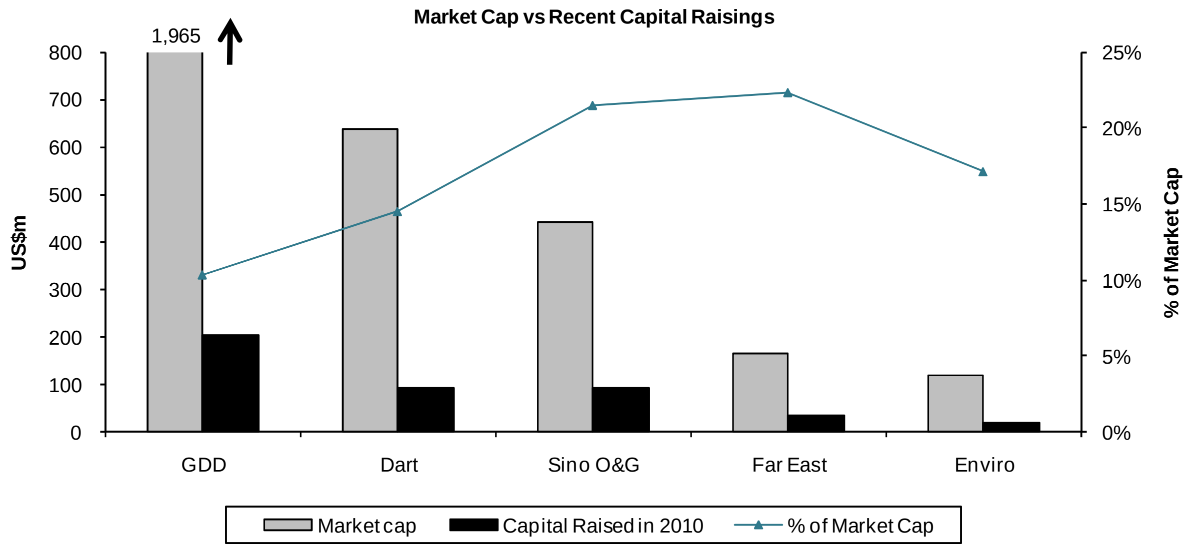
Source: Company reports, Bernstein analysis and estimates

However, as these companies seek to bring their businesses to scale, the risk for shareholders will not only be execution failure to dig out the gas during the development phase but also capital dilution before the gas is even dug out. Last year, each of the independent CBM companies in China aggressively raised capital to fund their development plans, with the level of capital raised amounting to 10-23% of current market capitalization (**Exhibit 17**). Going forward, companies may need to raise further capital, particularly. Sino Oil & Gas and Enviro Energy (**Exhibit 18**), if they are to fully fund their capex requirements. Debt would certainly be preferable to further equity raises, but these independent CBM companies have not yet been able to access bank credit and may not continue to have difficulty doing so before production comes on-line. Green Dragon did complete two convertible bond offerings of US$50m in 2010, yet that still does not eliminate the risk of dilution and those bonds carry a coupon rate of 7%.

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 17

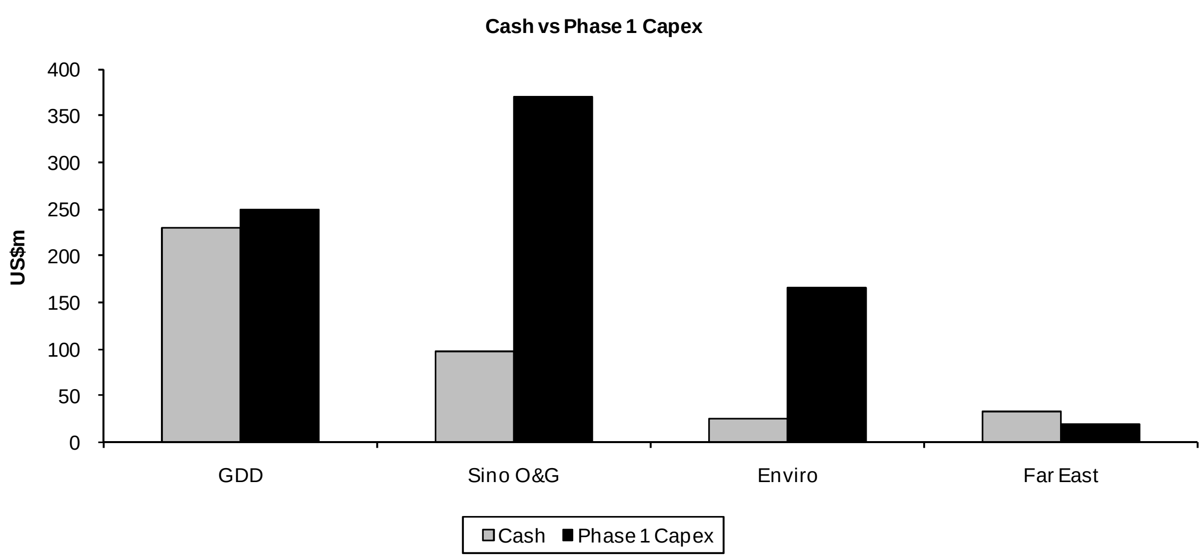
CBM Companies aggressively raised capital in 2010



Source: Company reports, Bloomberg, Bernstein analysis

Exhibit 18

More capital raisings may follow for companies with aggressive development plans



Source: Company reports, Bernstein analysis

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Valuing CBM Acreage in China

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 19**). Our analysis indicates that the pilot CBM projects yield an NPV of between US$1.0-1.5/mscf ($6 to $10/boe). 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 20**).

Exhibit 19
Value of CBM acreage by company

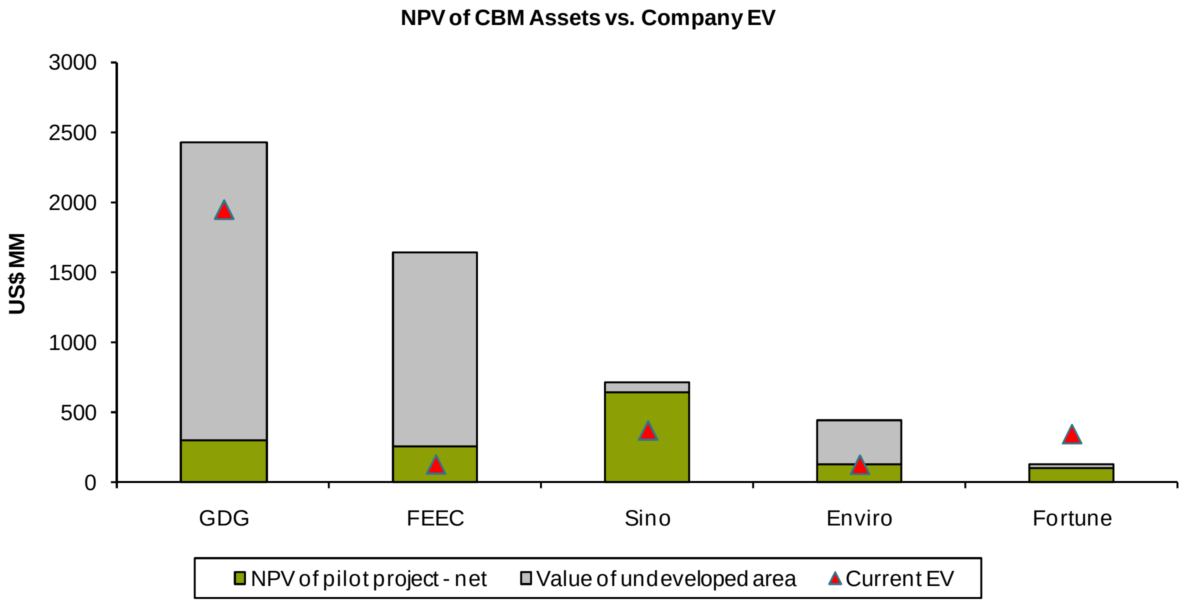
Summary of Economics Company		GDG	Sino O&G	Enviro	FEEC	Fortune
Block info		GSS	Sanjiao	Xinjiang	Shaoyang	Liulin
Gross block area	km2	455	461	653	1,963	198
Gross block GIIP	BCF	3,341	2,100	4,870	6,974	1,050
Recovery factor	%	50%	50%	50%	50%	50%
Gross recoverable reserves	BCF	1,671	1,050	2,435	3,487	525
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 reocoverable reserves - Gross	$MM	611	85	1,024	1,624	113
Value of remaining reocoverable reserves - Net	**$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

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

Exhibit 20

NPV of CBM assets indicates more upsides to come



Source: Bloomberg, Bernstein estimates

Neil Beveridge, Ph.D. (Senior Analyst) • neil.beveridge@bernstein.com • +852-2918-5741

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 x PO) / (Ke – g), where is our estimates of ROE for 2012, 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 21**).

Exhibit 21
Summary of price targets

Summary of price targets						
Company	Cur	2012E BVPS	x	P/B	=	Price Target
PTR	HKD	7.2		1.6		11.50

Source: Bernstein analysis and estimates

Risks

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. The introduction of resource tax is a further downside risk. Better than expected refining margins and domestic gas prices as a result of policy changes represent an upside risk to our price target.

SRO REQUIRED DISCLOSURES

- References to "Bernstein" relate to Sanford C. Bernstein & Co., LLC, Sanford C. Bernstein Limited, and Sanford C. Bernstein, a unit of AllianceBernstein Hong Kong Limited, collectively.
- Bernstein analysts are compensated based on aggregate contributions to the research franchise as measured by account penetration, productivity and proactivity of investment ideas. No analysts are compensated based on performance in, or contributions to, generating investment banking revenues.
- Bernstein rates stocks based on forecasts of relative performance for the next 6-12 months versus the S&P 500 for stocks listed on the U.S. and Canadian exchanges, versus the MSCI Pan Europe Index for stocks listed on the European exchanges (except for Russian companies), versus the MSCI Emerging Markets Index for Russian companies and stocks listed on emerging markets exchanges outside of the Asia Pacific region, and versus the MSCI Asia Pacific ex-Japan Index for stocks listed on the Asian (ex-Japan) exchanges - unless otherwise specified. We have three categories of ratings:

    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 02/03/2011, Bernstein's ratings were distributed as follows: Outperform - 42.9% (1.6% banking clients) ; Market-Perform - 49.4% (1.4% banking clients); Underperform - 7.7% (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 02/22/2011

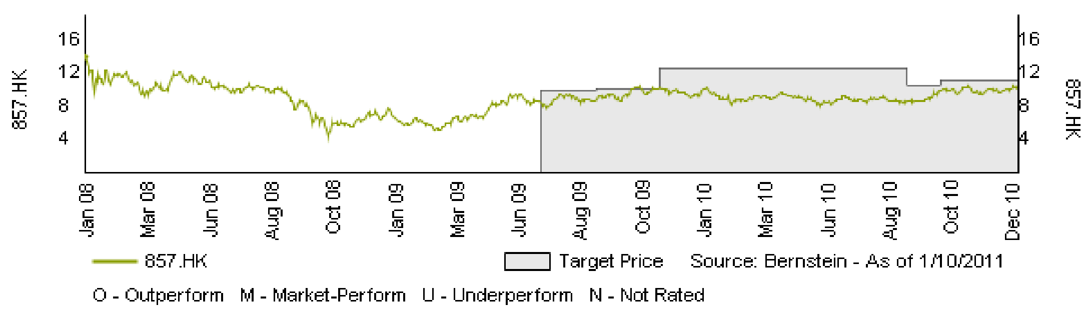
Ticker	Rating Changes
857.HK	O (IC) 06/29/09
PTR	O (IC) 06/29/09

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

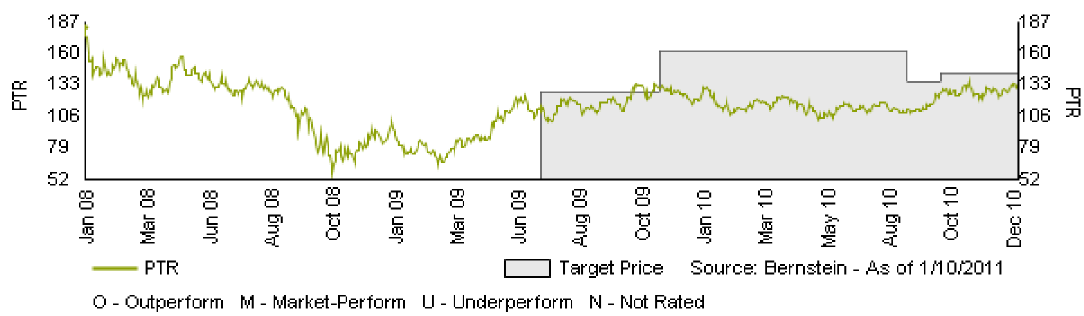
IC - Initiated Coverage



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

A price movement of a security which may be temporary will not necessarily trigger a recommendation change. Bernstein will advise as and when coverage of securities commences and ceases. Bernstein has no policy or standard as to the frequency of any updates or changes to its coverage policies. Although the definition and application of these methods are based on generally accepted industry practices and models, please note that there is a range of reasonable variations within these models. The application of models typically depends on forecasts of a range of economic variables, which may include, but not limited to, interest rates, exchange rates, earnings, cash flows and risk factors that are subject to uncertainty and also may change over time. Any valuation is dependent upon the subjective opinion of the analysts carrying out this valuation.

This document may not be passed on to any person in the United Kingdom (i) who is a retail client (ii) unless that person or entity qualifies as an authorised person or exempt person within the meaning of section 19 of the UK Financial Services and Markets Act 2000 (the "Act"), or qualifies as a person to whom the financial promotion restriction imposed by the Act does not apply by virtue of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, or is a person classified as an "professional client" for the purposes of the Conduct of Business Rules of the Financial Services Authority.

To our readers in the United States: Sanford C. Bernstein & Co., LLC is distributing this publication in the United States and accepts responsibility for its contents. Any U.S. person receiving this publication and wishing to effect securities transactions in any security discussed herein should do so only through Sanford C. Bernstein & Co., LLC.

To our readers in the United Kingdom: This publication has been issued or approved for issue in the United Kingdom by Sanford C. Bernstein Limited, authorised and regulated by the Financial Services Authority and located at Devonshire House, 1 Mayfair Place, London W1J 8SB, +44 (0)20-7170-5000.

To our readers in member states of the EEA: This publication is being distributed in the EEA by Sanford C. Bernstein Limited, which is authorised and regulated in the United Kingdom by the Financial Services Authority and holds a passport under the Investment Services Directive.

To our readers in Hong Kong: This publication is being issued in Hong Kong by Sanford C. Bernstein, a unit of AllianceBernstein Hong Kong Limited. AllianceBernstein Hong Kong Limited is regulated by the Hong Kong Securities and Futures Commission.

To our readers in Australia: Sanford C. Bernstein & Co., LLC and Sanford C. Bernstein Limited are exempt from the requirement to hold an Australian financial services licence under the Corporations Act 2001 in respect of the provision of the following financial services to wholesale clients:

- providing financial product advice;
- dealing in a financial product;
- making a market for a financial product; and
- providing a custodial or depository service.

Sanford C. Bernstein & Co., LLC, Sanford C. Bernstein Limited and AllianceBernstein Hong Kong Limited are regulated by, respectively, the Securities and Exchange Commission under U.S. laws, by the Financial Services Authority under U.K. laws, and by the Hong Kong Securities and Futures Commission under Hong Kong laws, all of which differ from Australian laws.

One or more of the officers, directors, or employees of Sanford C. Bernstein & Co., LLC, Sanford C. Bernstein Limited, Sanford C. Bernstein, a unit of AllianceBernstein Hong Kong Limited, and/or their affiliates may at any time hold, increase or decrease positions in securities of any company mentioned herein.

Bernstein or its affiliates may provide investment management or other services to the pension or profit sharing plans, or employees of any company mentioned herein, and may give advice to others as to investments in such companies. These entities may effect transactions that are similar to or different from those recommended herein.

Bernstein Research Publications are disseminated to our customers through posting on the firm's password protected website, www.bernsteinresearch.com. Additionally, Bernstein Research Publications are available through email, postal mail and commercial research portals. If you wish to alter your current distribution method, please contact your salesperson for details.

Bernstein and/or its affiliates do and seek to do business with companies covered in its research publications. As a result, investors should be aware that Bernstein and/or its affiliates may have a conflict of interest that could affect the objectivity of this publication. Investors should consider this publication as only a single factor in making their investment decisions.

This publication has been published and distributed in accordance with Bernstein's policy for management of conflicts of interest in investment research, a copy of which is available from Sanford C. Bernstein & Co., LLC, Director of Compliance, 1345 Avenue of the Americas, New York, N.Y. 10105, Sanford C. Bernstein Limited, Director of Compliance, Devonshire House, One Mayfair Place, LondonW1J 8SB, United Kingdom, or Sanford C. Bernstein, a unit of AllianceBernstein Hong Kong Limited, Director of Compliance, Suite 3401, 34th Floor, One IFC, One Harbour View Street, Central, Hong Kong.

CERTIFICATIONS

- I/(we), Neil Beveridge, Ph.D., Senior Analyst(s)/Analyst(s), certify that all of the views expressed in this publication accurately reflect my/(our) personal views about any and all of the subject securities or issuers and that no part of my/(our) compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views in this publication.

Approved By: CDK