MONGOLIA COAL BED METHANE – COMPARATIVE ASSESSMENT OF FISCAL REGIMES

Prepared by THREE60 Energy and The University of Queensland, Australia

19 April 2021

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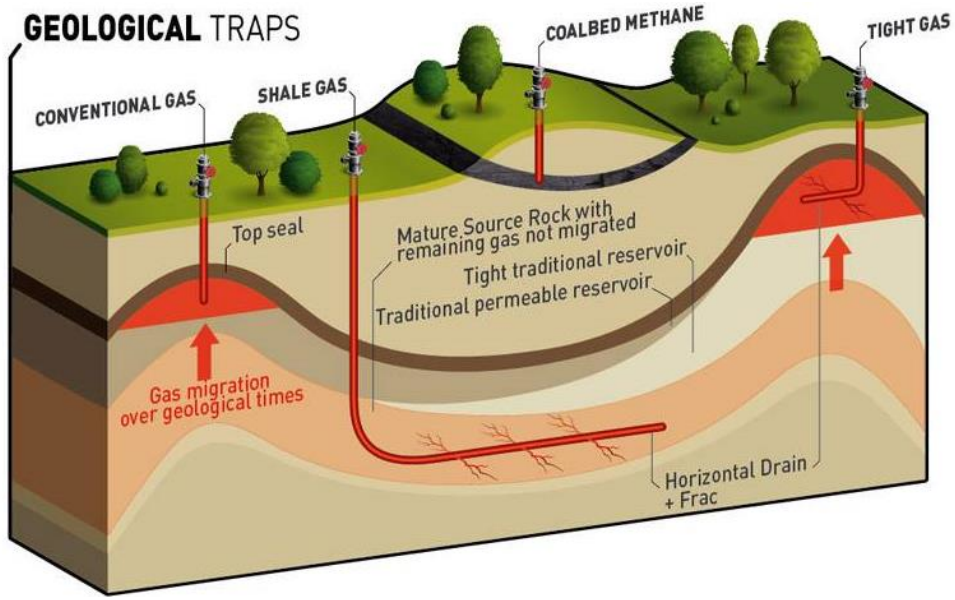

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Elements of PRESENTATION

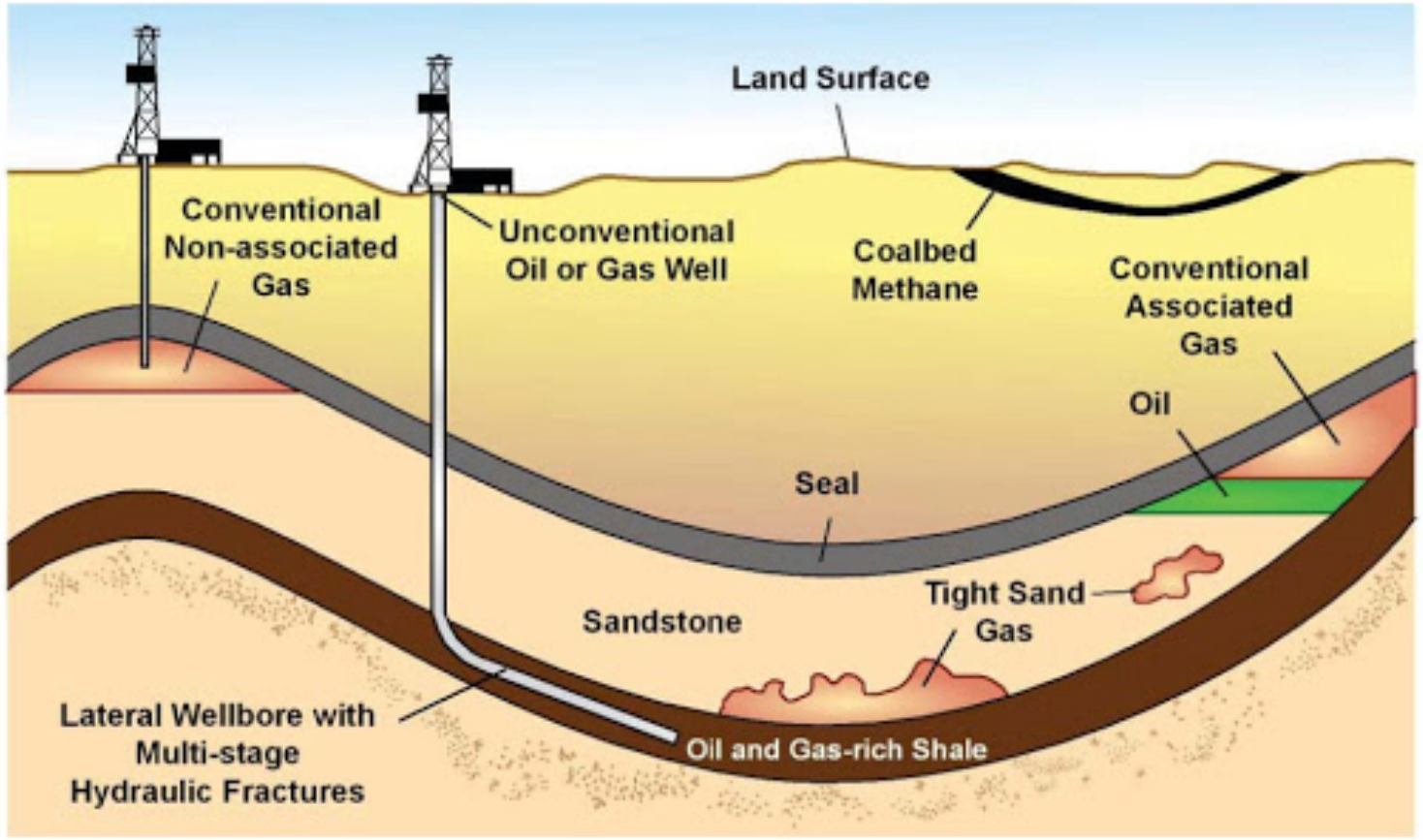
1. Objectives and Outcomes
2. Introduction
3. Coal Bed Methane Development
4. Fiscal Systems
5. Attracting International Investment
6. Economic Modeling and Results
7. Conclusions

Objectives and Outcomes

To provide Mongolian Ministry of Mining and Heavy Industry, and the Mineral Resources and Petroleum Authority with advice on fiscal systems applicable to CBM in Queensland, Australia and other relevant jurisdictions.

To assist Mongolian authorities in understanding their options and making decisions supportive of the development of the CBM industry in Mongolia.

Key Points – Understanding CBM



Source: EIA

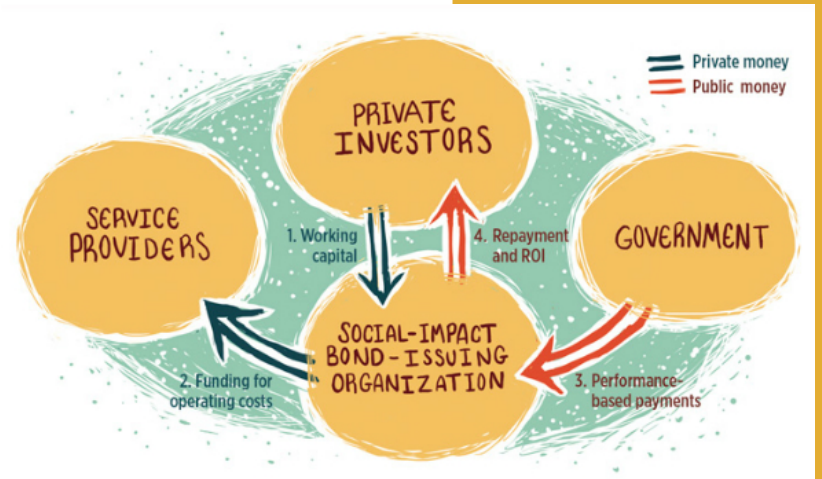
- Significant cost and risk differences between conventional gas and petroleum and CBM
- CBM reservoirs are highly variable over short distances

Holistic Approach in Attracting Investment to Mongolia

- Prospectivity
- Geoscience data, access to data
- Reasonable level of return to investors
- Approval process and Regulatory stability
- Fiscal system, legislation
- Now

Modelling of Royalties vs PSC

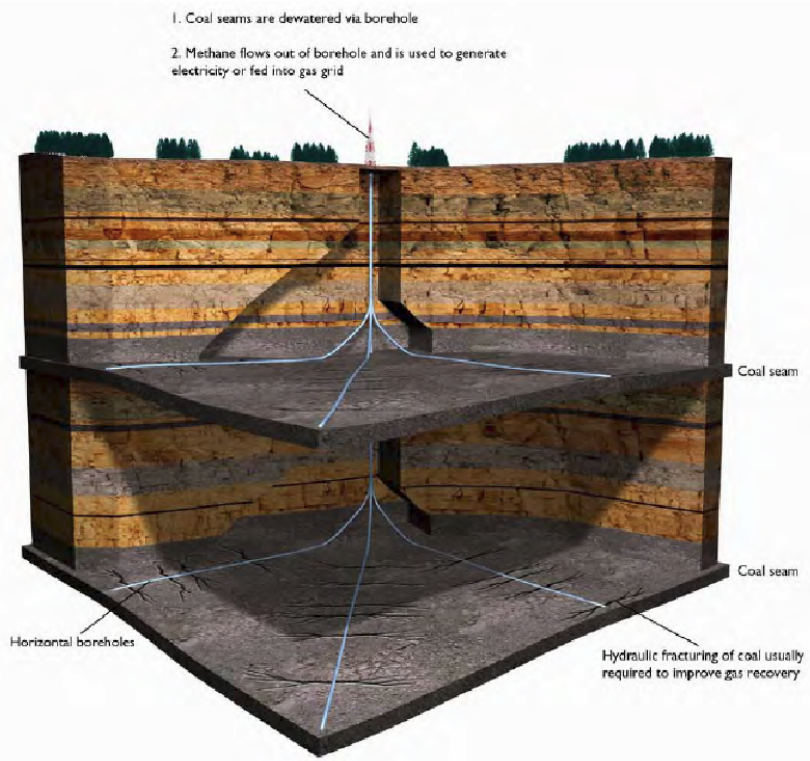
- Scale: low, mid, high cases
- Qualitative Factors
- Government and Investors
- Indonesia



Introduction

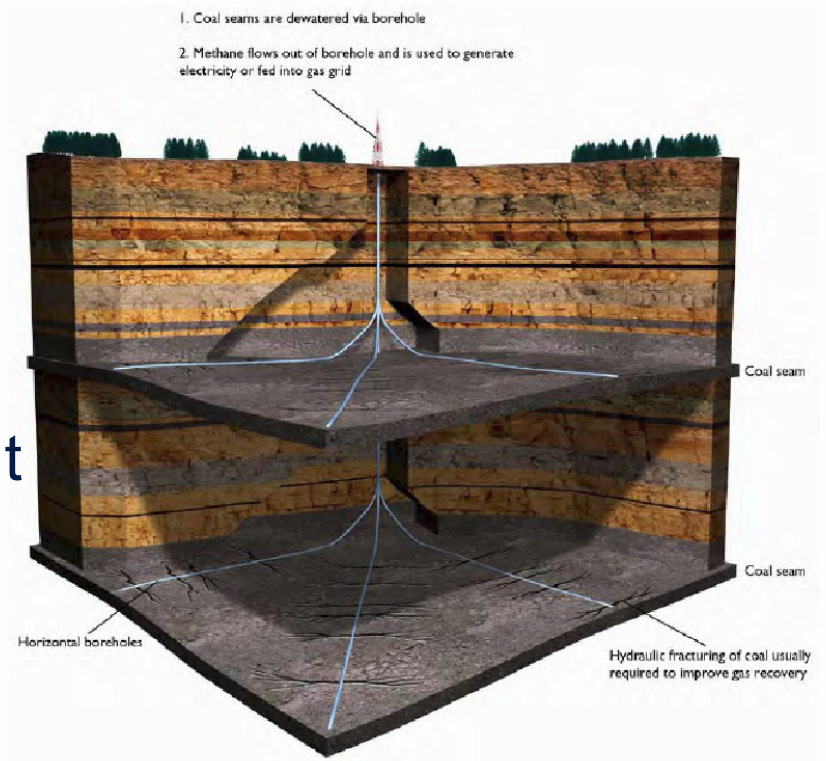
Coal Bed Methane Development

1. Dewatering phase
2. CBM well performance uncertainty is reduced primarily during the execution phase of a development
3. It is not unusual for well performance to vary significantly over short lateral distances (e.g. 500 – 1,000 m).
4. Experience in the Surat and Bowen Basins in Queensland, Australia, is that production from many wells (10's to 100's) is necessary to establish reliable production trends and reduce reservoir uncertainty from a larger pool of variable producers.



Coal Bed Methane Development (Cont.)

5. Number of wells: conventional gas vs. CBM;
6. Risk, uncertainties;
7. Under- or over-capitalising;
8. Higher technical risks;
9. Additional costs associated with the water treatment and disposal; and
10. Periodic workovers.



Fiscal Systems

GOVERNMENTS

- ✓Fair financial return;
- ✓Promote competition;
- ✓Market efficiency;
- ✓Limit administrative burden.

CONTRACTOR

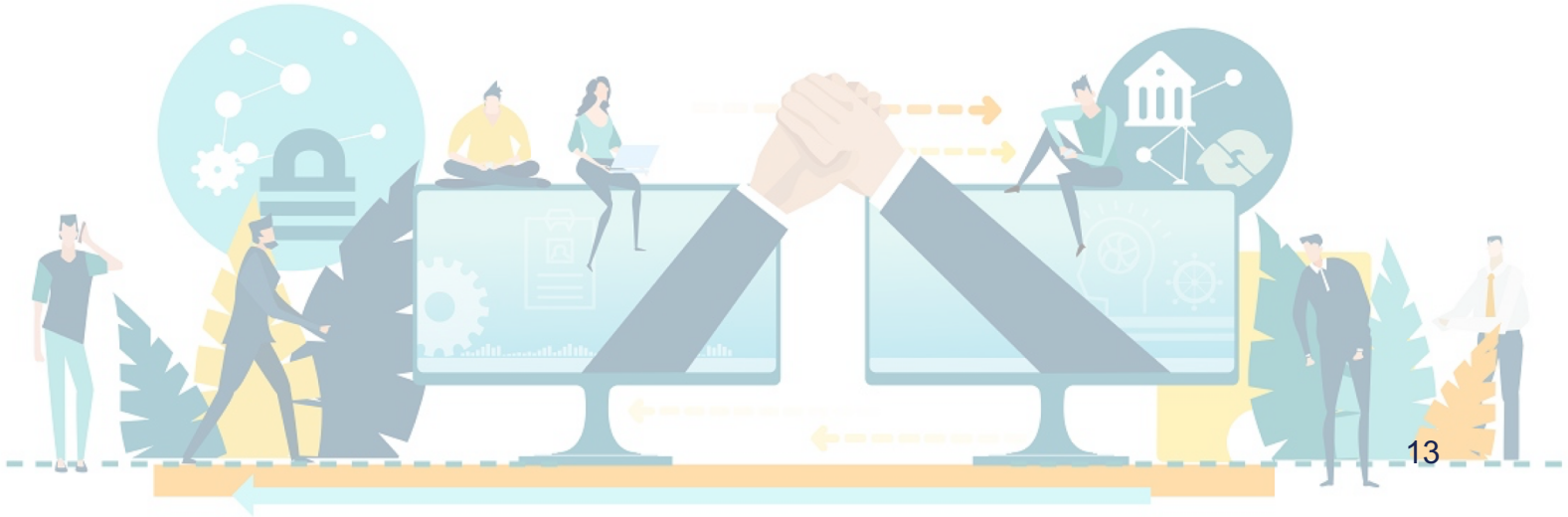
- ✓Equity; and
- ✓Maximise wealth.

Attracting International Investment: Investors

- Generally have a broad range of investment opportunities available to them;
- Ensure that risks and uncertainties can be adequately managed, and value realised;
- Typically invest in resource developments that align with their experience and capability;
- Prospectivity; and
- Keep development costs low.

Attracting International Investment: Key issues

- Economic Viability
- Prospectivity
- Political risk



Attracting International Investment: Political Risk

- ❖resource nationalisation;
- ❖expropriation of assets;
- ❖expanding Taxes;
- ❖progressive labour legislation;
- ❖future and land access that are subject to national or state government approvals;
- ❖unnecessary delays in granting approvals; and
- ❖changes in the fiscal terms.

Economic Modeling

Economic Modelling – Model Settings

Model Boundary Conditions / Settings	Agreed Model Settings (Final)
Project Start Date (development decision going forward excluding sunk cost)	2021
Project End Date	2060
Asset Life Duration (concept to abandonment)	40
Discount Date	1/1/2021
Discounting methodology	Mid-year
Discount rates	0, 7, 10, 15%
Macro Economic Assumptions	
Input and Reporting Currency (Royalty Tax model coverts $USD input to $AUD for evaluation)	$USD
$AUD to $USD Currency Exchange Rate	0.75
Inflation Rates for Capex and Opex	2.00%
Gas Pricing	USD$5.5 for domestic market USD$7.5 for export market
Price Escalation	2%

Economic Modelling - Cases

	LOW	MID	HIGH
			
1. Market	CBM to LNG production	80 MW gas fired power generation	Pipeline export to an international buyer
2. Capacity	Undeveloped 40 Bscf → 30-32 Bscf	Undeveloped 188 Bscf → 146 Bscf	Undeveloped 1,48 Tscf → 1.015 Tscf
3. Costs			
CAPEX	$USD 51 million	$USD 236 million	$USD 1,856.0 million
E&A	$USD 5 million	$USD 11 million	$USD 44 million

Economic Modelling – Assumptions

CAPEX and OPEX Assumptions	Basis and Unit Costs
Well and Facility CAPEX	$USD 0.450 MM/well
Gas Production Related OPEX (variable)	$USD 0.050 /Mscf raw gas
Water Treatment OPEX (variable)	$USD 0.100 /barrel of water
Workover, Maintenance & Field Operation OPEX	$USD 0.5 MM fixed per year and $USD 150,000 per online well
Gas Processing Tariffs (OPEX)	$USD 0.750 /Mscf raw gas
Abandonment Cost (ABEX)	6.5 % of well and facility CAPEX to be spent equally 5 years after the drilling campaign
Exploration and Appraisal	10 % of CAPEX for Low Case 5 % of CAPEX for Mid Case 2.5 % of CAPEX for High Case

Market	Netback Gas Price
Domestic Gas Sales for Low Case and Mid Case	$USD 5.50 /MMBtu
Export Gas Sales for High Case	$USD 7.50 /MMBtu

Economic Modelling – PSC Terms

Fiscal Terms	Petroleum Law	Assumptions in the Analysis
Royalty	5 % - 10 %	7.5 %
Cost Recovery Limit	For CBM - to be determined	70 %
Profit Sharing for Government		
0- 1 Million m^3/day	For CBM - to be determined	30.0 %
1-2 Million m^3/day		32.5 %
2-3 Million m^3/day		35.0 %
3-4 Million m^3/day		37.5 %
>4 Million m^3/day		40.0 %
Tax Rate	Exempted	0.0 %
Dividend Withholding Tax	Exempted	0.0 %
VAT and Customs Tariff	Exempted	0.0 %
Contractor Participating Interest	100 %	100 %
Signature Bonus	As proposed by Contractor	Not included
Production Bonus	As proposed by Contractor	Not included

Low: Small Scale CBM to LNG Production for Transportation Fuel to the Local Market

Development Metrics	Value	Unit
Raw Gas Production	40.6	Bscf
Total Sales Gas Produced	31.5	Bscf
Total Water Produced	19.2	MMstb
Development Wells Drilled	106	# Wells
Average Recovery Per Well (post fuel+flare use)	0.30	Bscf/Well
Revenues and Key Costs, $USD Millions	**Value**	**Comment**
Gross Revenue Total, nominal	244.4	
E&A CAPEX, real 2020 Values	5	
Development CAPEX, real 2020 Values	51	
OPEX, real 2020 Values	84	
If applicable, Government **Royalty**, nominal	16	Royalty-Tax
If applicable, Government **Royalty**, nominal	18	PSC
If applicable, **Bonuses** (Signing & Production), nominal	N/A	PSC
If applicable, **Cost Oil**, nominal	166	PSC
If applicable, **Profit Oil**, nominal	21	PSC
If applicable, Federal Government **Tax**, nominal	8	Royalty-Tax

HEADLINE VALUE METRICS

Discount Rate, %	NPVS & IRR	Royalty-Tax Regime		PSC Regime		Units
		Gross Project	Post-Tax	Pre-Govt Take	Post-Govt Take	
0%	NPV0	52	28	52	13	$USD Millions, Nominal
7%	NPV7	11	4	11	-2	$USD Millions, Nominal
10%	NPV10	5	1	5	-4	$USD Millions, Nominal
15%	NPV15	1	-2	1	-5	$USD Millions, Nominal
	$USD IRR	15.9%	10.8%	15.9%	5.3%	%

Profit/Investment Ratio, $USD NPV10	1.03	0.84	
Max Exposure	$USD-12.75 in year 2025	$USD-14.87 in year 2025	
Payback Year	2033	2039	

Low: Small Scale CBM to LNG Production for Transportation Fuel to the Local Market

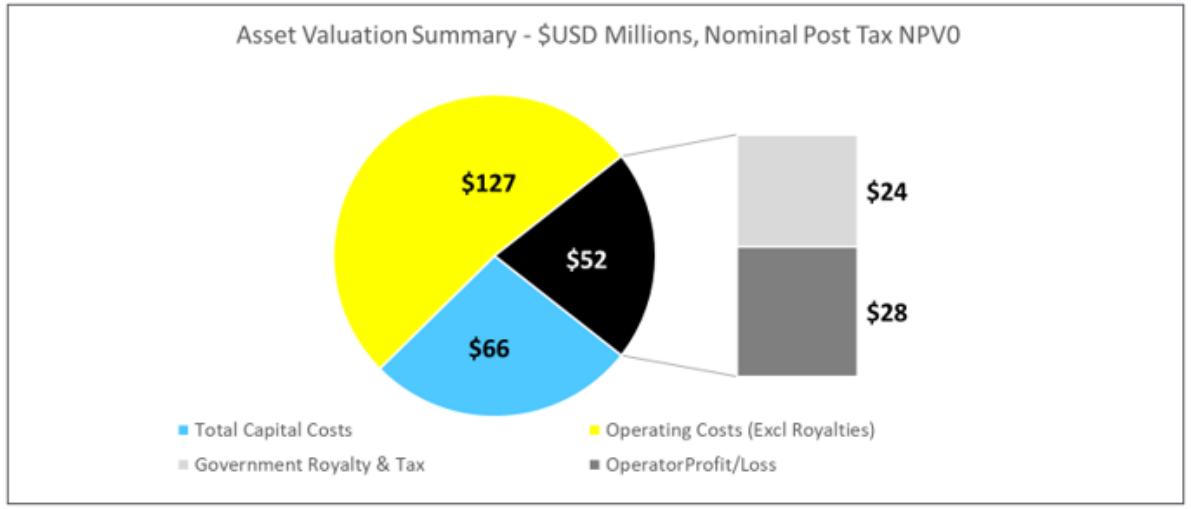


Figure 9: Low Case Asset Valuation, Royalty-Tax Pie Chart

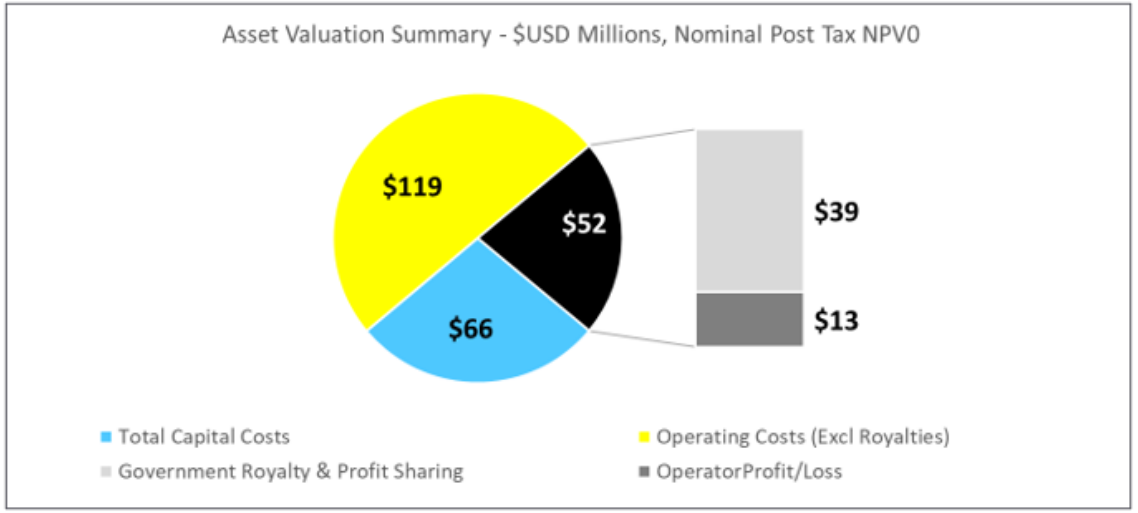


Figure 10: Low Case Asset Valuation, PSC Pie Chart

Mid Case - CBM for gas fired power generation for local market base load power at 80 MW

Development Metrics	Value	Unit
Raw Gas Production	188.2	Bscf
Total Sales Gas Produced	146.1	Bscf
Total Water Produced	89.1	MMstb
Development Wells Drilled	492	# Wells
Average Recovery Per Well (post fuel+flare use)	0.30	Bscf/Well
Revenues and Key Costs, $USD Millions	**Value**	**Comment**
Gross Revenue Total, nominal	1,135.1	
E&A CAPEX, real 2020 Values	11	
Development CAPEX, real 2020 Values	236	
OPEX, real 2020 Values	319	
If applicable, Government **Royalty**, nominal	75	Royalty-Tax
If applicable, Government **Royalty**, nominal	85	PSC
If applicable, **Bonuses** (Signing & Production), nominal	N/A	PSC
If applicable, **Cost Oil**, nominal	793	PSC
If applicable, **Profit Oil**, nominal	103	PSC
If applicable, Federal Government **Tax**, nominal	74	Royalty-Tax

HEADLINE VALUE METRICS

Discount Rate, %	NPVS & IRR	Royalty-Tax Regime		PSC Regime		Units
		Gross Project	Post-Tax	Pre-Govt Take	Post-Govt Take	
0%	NPV0	353	203	353	165	$USD Millions, Nominal
7%	NPV7	84	38	84	24	$USD Millions, Nominal
10%	NPV10	48	17	48	6	$USD Millions, Nominal
15%	NPV15	17	0	17	-7	$USD Millions, Nominal
	$USD IRR	22.9%	15.1%	22.9%	11.8%	%

Profit/Investment Ratio, $USD NPV10	1.16	1.06	
Max Exposure	$USD-52.5 in year 2025	$USD-57.88 in year 2025	
Payback Year	2031	2033	

Mid Case - CBM for gas fired power generation for local market base load power at 80 MW

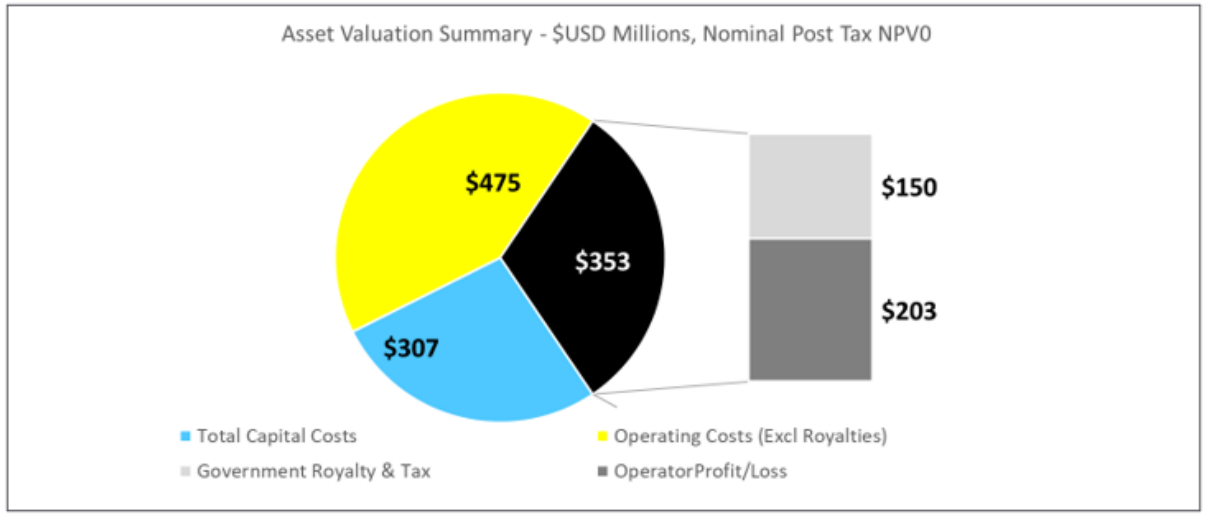


Figure 15: Mid Case Asset Valuation, Royalty-Tax Pie Chart

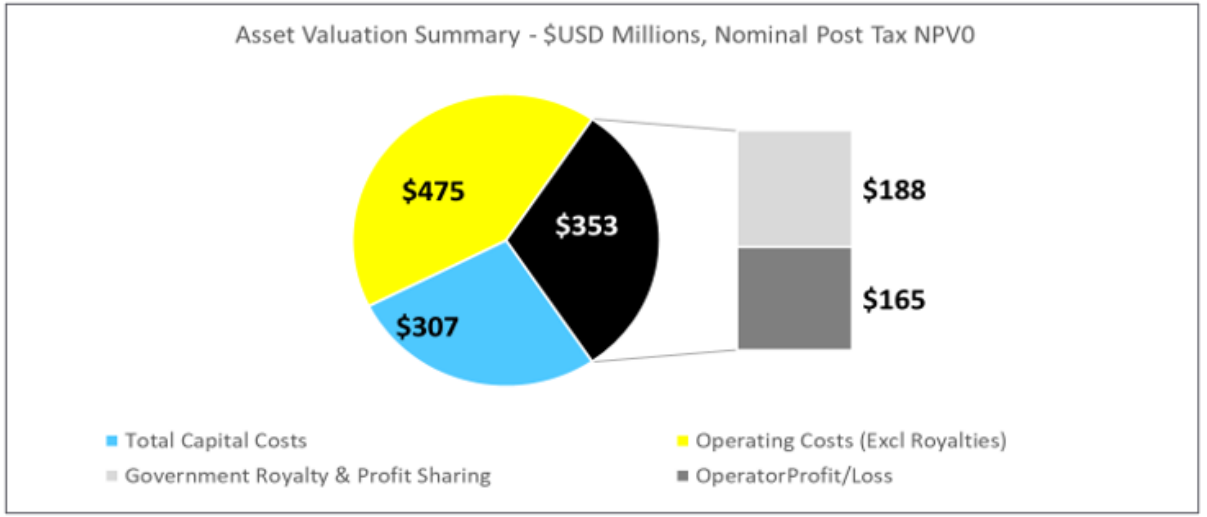


Figure 16: Mid Case Asset Valuation, PSC Pie Chart

High Case - CBM for Pipeline Export to an International Buyer

HEADLINE VALUE METRICS						
Discount Rate, %	NPVS & IRR	Royalty-Tax Regime		PSC Regime		Units
		Gross Project	Post-Tax	Pre-Govt Take	Post-Govt Take	
0%	NPV0	6,057	3,435	6,057	2,844	$USD Millions, Nominal
7%	NPV7	1,496	769	1,496	636	$USD Millions, Nominal
10%	NPV10	877	425	877	348	$USD Millions, Nominal
15%	NPV15	382	161	382	127	$USD Millions, Nominal
	$USD IRR	45.0%	29.8%	45.0%	26.6%	%

Profit/Investment Ratio, $USD NPV10	1.60	1.51	
Max Exposure	$USD-411 in year 2030	$USD-450.64 in year 2030	
Payback Year	2033	2033	

Development Metrics	Value	Unit
Raw Gas Production	1,477.6	Bscf
Total Sales Gas Produced	1,147.0	Bscf
Total Water Produced	700.2	MMstb
Development Wells Drilled	3,872	# Wells
Average Recovery Per Well (post fuel+flare use)	0.30	Bscf/Well
Revenues and Key Costs, $USD Millions	**Value**	**Comment**
Gross Revenue Total, nominal	12,207	
E&A Capital, real 2020 Values	44	
Development Capital, real 2020 Values	1,856	
OPEX, real 2020 Values	2,373	
If applicable, Government **Royalty**, nominal	1,161	Royalty-Tax
If applicable, Government **Royalty**, nominal	916	PSC
If applicable, **Bonuses** (Signing & Production), nominal	N/A	PSC
If applicable, **Cost Oil**, nominal	6,193	PSC
If applicable, **Profit Oil**, nominal	2,298	PSC
If applicable, Federal Government **Tax**, nominal	1,461	Royalty-Tax

High Case - CBM for Pipeline Export to an International Buyer

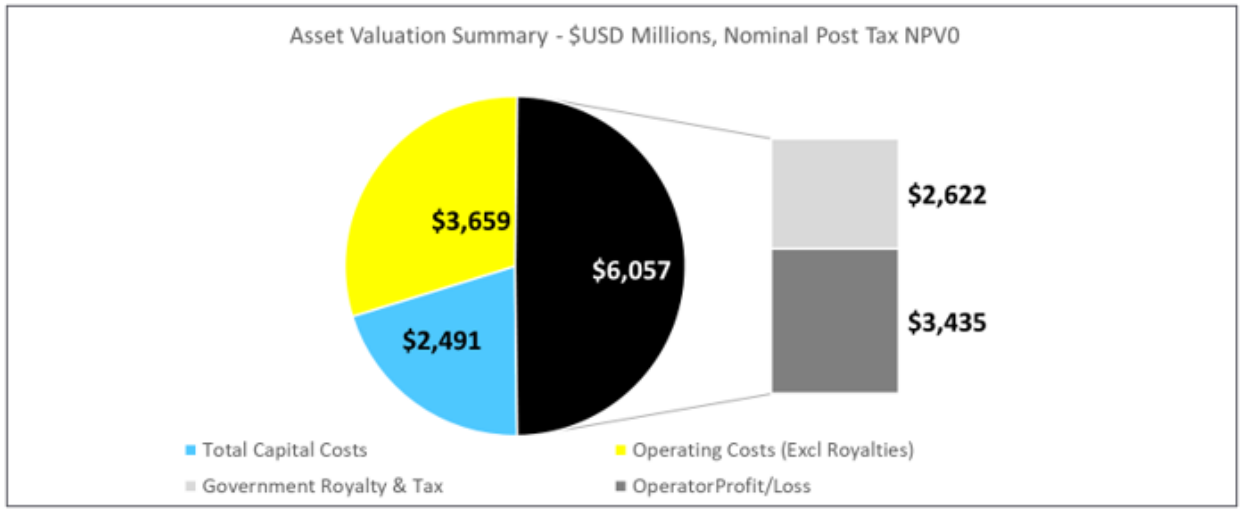


Figure 21: High Case Asset Valuation, Royalty-Tax Pie Chart

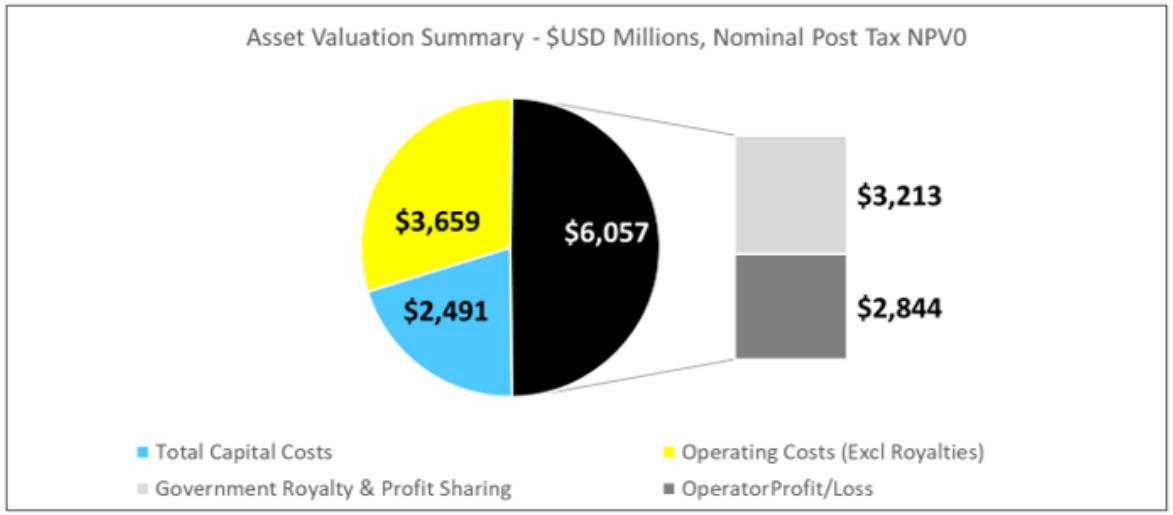


Figure 22: High Case Asset Valuation, PSC Pie Chart

Conclusions - General

A number of measures would be required to attract significant and sustained investment in CBM in Mongolia. Those are:

- fiscal system,
- legislation,
- prospectivity,
- data access and
- administrative procedures of the licensing system.

Conclusions – Fiscal Systems

- A fiscal regime for CBM should take this difference in cost and risk between CBM and conventional gas/petroleum into account.
- Both the quantitative and qualitative assessments in this study indicate that the royalty tax regime would help attract investment for potential CBM business opportunities more than an equivalent PSC regime.
- The barriers to entry identified are expected to have the effect of limiting the number of companies prepared to invest or subsequently impact their ability to raise funds to develop CBM.
- Smaller and highly entrepreneurial companies may be prepared to take on significant risk in relation to early and limited investments.
- However, the global norm is for junior companies to establish the value of a resource and then rely on attracting a larger company to invest or acquire the development opportunity to enable the project to achieve its full scale.
- These high levels of investment risk may result in only attracting a few investors.
- The pool of investors will also shrink over time as investment shifts away from fossil fuels and into renewables. The window for attracting investment and developing CBM projects is expected to progressively diminish in line with this trend.

Conclusions – Economic Modelling

- December 2020
- Scale: Low, mid, high
- In all cases, the royalty-tax regime yields significantly higher undiscounted cashflows and rates of return to investors, compared to the PSC regime.
- The fiscal regime should be designed to encourage new investments which will result in multiple project developments and optimized government cashflow at an aggregate level.

Conclusions – Economic Modelling (cont.)

LOW

- From an investor / operator / contactor perspective, projects exemplified by the Low case could not be supported under the PSC and yielded only marginally economic results under the royalty tax terms.
- The impact of this is that under the PSC regime there will be less gas supply that can be developed compared to a royalty-tax regime.
- Natural resource opportunities tend to follow distributions where there are far more “low case” opportunities than “high case” ones.
- The fiscal model chosen influences how many opportunities are economic. Ultimately, lower supply will tend to cause higher gas prices and thus fewer opportunities for economic development.

MID

- Similarly, marginal projects under a PSC framework, as demonstrated by the Mid-Case would struggle to pass through the internal decision-making process for most companies unless returns could be supported by further technical improvement and/or commercial improvement and/or some type of fiscal incentive.
- The Mid Case project yielded economic results under the royalty-tax regime terms and could proceed under this fiscal regime.

Economic Modelling: High Case

- Projects like the High Case could proceed on the economic merits, but the reality i
  decisions are not made on economic merits alone.
- For most successful businesses, a range of decision criteria are used for their investr
- Decisions of this scale, or requiring entry into a new country, would normally be suppor
  comprehensive risk and opportunity assessment that is both quantitative and qualitative i
  i.e. would include a range of non-technical risks.
- These risk and opportunity assessments would include thorough evaluations of the technical, commercial, political, legislative, financial and fiscal, environmental, security and geographical risk
  for conducting a new business venture in a developing, non-OECD country.
- Compared to the PSC regime, the royalty-tax regime treats smaller scale, lower value projects less harshly than larger scale, more profitable projects.
- At the same time, the royalty-tax regime still provides a “good” level of return to the investor / operator / contractor for those large-scale, more profitable cases.

Economic Modelling: High Case (cont.)

- For the larger scale projects exemplified by the High case, the returns are high under both regimes, with better after-tax returns for the operator under the royalty tax regime at all discount rates considered.
- The high returns for such a large-scale venture would be considered commensurate with the higher capital exposures (i.e. larger amounts of capital placed at-risk) involved, the longer lead timings to first production, the commercial complexity of the project and higher risks in a new resource play in a new business environment.
- Other criteria such as fiscal certainty, transparency and consistency of the terms and potential future fiscal liabilities for an investor/ operator / contractor would also be considered.
- In most instances, these more qualitative criteria would have a significant weighting in the decision-making process for non-OECD countries where the regimes are still maturing.
- If the fiscal regimes themselves were deemed to pose significant uncertainty and risks to the investor, then these factors alone would deter many potential international investors, even if the economic returns and quantitative outcomes looked highly attractive at face value

Conclusions – Benchmarking

- The quantitative assessment was based on four parameters:
    1. Undiscounted and Discounted Cashflow
    2. Profit Investment Ratio
    3. Payback Year
    4. Internal rate of Return
- The economic results derived from the Royalty-Tax regime attained the best quantitative relative ranking of 3 compared to the 1.4 ranking attained by the Mongolian PSC based results.

Conclusions – Quantitative Benchmarking

FISCAL COMPARISON

Relative rankings: *1 = worst result* *2 = mid, inconclusive, neutral* *3 =best result*

Quantitative Ranking	Royalty-Tax Low Case	PSC Low Case	Royalty-Tax Mid Case	PSC Mid Case	Royalty-Tax High Case	PSC High Case	Weightings	Royalty-Tax	PSC
Cashflow	3	1	3	1	3	1	25%	0.8	0.3
P/I Ratio	3	2	3	2	3	2	25%	0.8	0.5
Payback	3	1	3	2	3	2	25%	0.8	0.4
IRR	3	1	3	1	3	1	25%	0.8	0.3
					Quantitative Relative Ranking			3.0	1.4

Table 18: Quantitative Assessment and Rankings

The qualitative assessment was based on five parameters:

1. Transparency of fiscal framework
2. Consistency of application of terms
3. Certainty of Terms
4. Stability/Maturity of fiscal terms
5. Capacity for risk mitigation

Conclusions – Qualitative Benchmarking

Conclusions – Qualitative Benchmarking

Qualitative Ranking	Royalty-Tax	PSC	Royalty-Tax	PSC	Royalty-Tax	PSC	Weightings	Royalty-Tax	PSC
	Low Case		Mid Case		High Case				
Transparency	3	1	3	1	3	1	20%	0.6	0.2
Consistency	3	1	3	1	3	1	20%	0.6	0.2
Certainty of terms	3	1	3	1	3	1	20%	0.6	0.2
Stability / Maturity	3	1	3	1	3	1	20%	0.6	0.2
Capacity for Risk Mitigation	3	1	3	1	3	1	20%	0.6	0.2
					Qualitative Relative Ranking			3.0	1.0

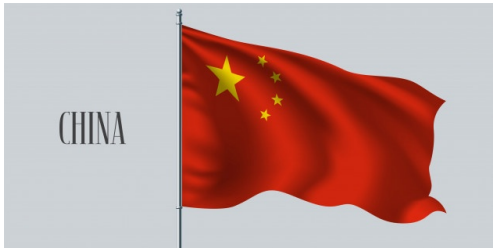
Table 19: Qualitative Assessment and Rankings

Conclusions – International Benchmarking

Indonesia

- favourable geological conditions (prospectivity) in Indonesia for CBM Fiscal regime not supportive for the industry development

China



- The fiscal terms for CBM in China from 2006 - 2010 were favourable to contractors but the production targets were not achieved.
- Approx. 70% of exploration expenditures were from foreign companies but most had low market capitalisation and limited capacity.

Conclusions – CBM Prospectivity

We would perceive CBM prospectivity in Mongolia to be

low and limited information available.

- Gas content;
- Gas saturations;
- Permeability;
- Permeability distribution; and
- Water content.

Conclusions – CBM Data

- Data Requirements (Queensland example)
  - studies,
  - seismic,
  - Well data,
  - Production data,
  - Laboratory reports.
- Data must be submitted in a defined form within a defined period.
- Data is made available publicly after a defined period of confidentiality; provides explorers an opportunity to utilise and learn from historical data acquired.

Conclusions – Barriers to Entry

1. ”Barriers entry,"
2. CBM Prospectivity,
3. Data Access,
4. Technical Risk,
5. Legislation.

Conclusions – Barriers to Entry (cont.)

- The Law of Mongolia on Petroleum (the new addition) raises a number of issues that would act as potential barriers to entry.
  - The PSC Profit Sharing provisions
  - A contractor is required to submit the reserve estimate to the Petroleum Authority 90 days before the expiry of the exploration period for review.
  - international standards such as Society of Petroleum Engineers - Petroleum Reserves Management System (SPE-PRMS) needed

Conclusions – Barriers to Entry (cont.)

- The Law of Mongolia on Petroleum (the new addition) raises a number of issues that would act as potential barriers to entry
- PSC terms are to be negotiated at the time an exploration licence is awarded. There are no clear guidelines as to how these terms and conditions are evaluated and agreed by authorities and there is no provision to amend PSC terms subsequent to the award of an exploration licence.
- The PSC Profit Sharing provisions are based on a production rate threshold but are not graduated. This would potentially lead to investors considering the terms to be distortionary in that decisions and alignment on the sizing of a plant may be influenced by the profit sharing terms.
- A contractor is required to submit the reserve estimate to the Petroleum Authority 90 days before the expiry of the exploration period for review.
- Based on international standards such as Society of Petroleum Engineers - Petroleum Reserves Management System (SPE-PRMS) it is unlikely that reserves could be estimated (booked) in the absence of a plan of development and appropriate approvals to exploit. It is unlikely this requirement could be met.

Conclusions – Barriers to Entry (cont.)

- **Legislation**: Overlapping Licenses
- **Infrastructure**:
  - Gas infrastructure is limited in Mongolia. There is no pipeline network in Mongolia and accordingly transportation of gas to markets will necessarily be linked to specific gas developments as they evolve unless pre-investment in infrastructure is undertaken by the GoM.
  - Any pre-investment in infrastructure would be high risk due to poor knowledge of the resources that could potentially be developed.
  - It is noted that an initiative to develop a Methane Gas Supply Chain Development Master Plan has commenced. Whilst this report will address infrastructure amongst other issues it is anticipated that the absence of a good understanding of the CBM resource will pose a challenge.

Questions?

Australian Aid

THRE360 ENERGY
OPERATIONS MANAGEMENT

AMEP
Australia Mongolia Extractives Program