Elixir Energy Limited (ASX: EXR)

Daydream-2 well to spud in October

Overview

Elixir offers exposure to large scale unconventional gas appraisal in Queensland (tight gas) and Mongolia (CBM), combined with potential green hydrogen production to supply China from high quality Mongolian wind and solar resources (Gobi H2 project). Near term activity is focused on the October spudding of the Daydream-2 well in Queensland to build on the existing 395 bcf of contingent resources and demonstrate commercial potential in gas-short eastern Australia. We estimate a mid-case valuation of $0.45/share based on market trading metrics for CBM and tight gas resource projects, with further upside possible from the Gobi H2 project.

Key points

Queensland gas resource increase: Daydream-2 has a high chance of increasing the existing 395 bcf 2C contingent resources contained in tight gas sands, as well as converting the 1,200 bcf of prospective resources expected in adjacent fractured coal seams, providing future supply into energy short eastern Australia. Initial results should be known before year end, with flow tests and resource updates in 1H 2024.

Large scale gas prospective resource close to China: Elixir holds 100% of the Nomgon IX CBM production sharing contract (PSC), covering ~30,000 km^2 ~400 km from China. The risked independent mid-case estimate of 14.6 Tcf recoverable gas can meet both domestic and export needs and is large enough to attract the interest of Chinese majors. The Nomgon pilot has delivered at flowrates of 200 kscf, encouraging for commercial potential.

High quality green hydrogen potential: The quality of renewable energy resources and proximity to market are the main drivers of green hydrogen competitiveness: on both fronts work undertaken indicates that Gobi H2 has world class potential. A June 2022 MOU and February 2023 JV term sheet with Japan's Softbank Energy Corp, owners of the nearby 50 MW Tsetsii windfarm, now rests with Toyota Tsusho following SBE's acquisition.

Likelihood of commercialization increasing: Ongoing Mongolian CBM results continue to be promising, with multiple areas demonstrating seam thickness, gas contents and gas composition potentially attractive for CBM development. Repeatability through further drilling and demonstration of well deliverability through pilot testing will continue to derisk a potential multi-tcf resource.

Funding: We expect Elixir will fund the cost of drilling, completing and stimulating the Daydream-2 well from existing cash reserves ($11m on 31st March 2023), fresh equity and loans secured against Federal Government R&D tax concessions (which will cover 43.5% of the well costs).

Price catalysts: (1) Daydream-2 well results (wireline logs Q4 2023, stimulation and flow testing H1 2024); (2) Mongolian CBM exploration results in further sub-basins: coal thickness, gas content, well repeatability (ongoing); (3) Nomgon area extensional drilling and pilot program results; (4) contingent resource upgrades in Australia and Mongolia (2024); (5) Toyota Tsusho progress to joint venture for Gobi H2 (FY24).

SHARE PRICE PERFORMANCE

Closing price as of 17th Jul 2023

CAPITALIZATION	
Last price	$0.08
52-week range	$0.076-0.215
Capitalization	$75m
Cash: 31st Mar	$12m
Debt: 31st Mar	nil
EV	$63m
Shares	912.4m
Options/rights	34.5m
Conv Notes	-
Balance date	June
RESERVES AND PRODUCTION	
1P (Nov 22)	0.0 MMboe
2P "	0.0 MMboe
3P "	0.0 MMboe
2C "	73.4 MMboe
FY21a	0.0 MMboe
FY22e	0.0 MMboe
FY23e	0.0 MMboe
LEADERSHIP	
Chairman	Richard Cottee
MD/CEO	Neil Young
NED	Steve Kelemen
NED	Anna Sloboda

Disclosure: This is a commissioned research report and K1 Capital will receive a fee for preparing this report.

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1. Valuation

Our equity valuation for Elixir is based on a sum-of-the-parts method for the Grandis Gas Project (tight gas sands and coals) and Nomgon CBM project using ASX-trading multiples. Underlying resource metrics are drawn from market trading multiples, shown in Appendix 5.2, and the estimated market capitalization has been cross-checked with ASX gas company acquisitions (Appendix 5.1).

At this stage we have not assigned value for the Gobi H2 Project. We expect the value will be of substance given the capitalization of ASX-listed hydrogen companies (shown in Appendix 5.3), and the high quality renewable resources and expected low transport costs via pipeline to the Chinese market.

Table 1 Elixir company valuation

Parameter	Units	Total	Nomgon CBM	Grandis FTMC	Grandis TGS	Comment
Resource value						
Resource estimate type	-		2U	2U	2C	2U = mid-case Prospective, 2C = mid-case Contingent
Working interest	%		100.0%	100.0%	100.0%	
Prosp'/Contingent gas (gross, unrisked)	bcf	**49,682**	48,000	1,287	395	Nomgon per ERP Equipoise, 9 Dec 2020; Grandis per EXR
Prosp'/Contingent cond. (gross, unrisked)	MMbbl	**29.3**	0.0	25.7	3.6	
Geological risk factor	%		30%	30%	100%	30% mid per ERP Equipoise, 9 Dec 2020
Prospective resources (gross, risked)	tcf	**15,250**	14,400	433	417	energy equivalent
Gas content (C1+)	vol %		90%	98%	98%	Nomgon per Elixir, 15 Jul 2020 & 14 Apr 2021
Prospective/Contingent (gross, risked)	PJ	**14,408**	13,537	444	427	= unrisked * geological risk factor * heating value
Conversion to "reserves"	%		30%	30%	80%	K1 Capital estimate
Commercial chance of success	%		50%	100%	100%	Nomgon per ERP Equipoise, 19 Nov 2018
Estimated future reserves (gross, risked)	PJ	**2,505**	**2,031**	**133**	**342**	= resources * reserves conversion * commercial chance
Gas resource unit value (energy equiv't)	$A/GJ		0.20	0.20	0.20	K1 Capital analysis of ASX companies (EV/2P+0.8*2C)
Time value adjustment to peers	years		0.0	0.0	0.0	K1 Capital estimate, yrs to similar maturity as peers
Base nominal discount rate (rb)	%		10.0%	10.0%	10.0%	K1 Capital estimate
Country risk premium adjust to peers (rc)	%		0.0%	0.0%	0.0%	Nomgon vs Mongolia peers, Grandis vs Aus peers
Time value adjustment factor	-		1.000	1.000	1.000	= (1+rb+rc)^-t
Risked gas resource value (net)	$m	**501**	**406**	**27**	**68**	
Company valuation						
Risked gas resource value (net)	$m	501.0				excludes Gobi H2 project value
Existing cash	$m	11.8				per Mar 2023 quarterly
Existing debt	$m	0.0				"
G&A costs	$m	-4.4				~$2.2m/yr, per FY23 YTD avg, for 2 years
FY24 work program Mongolia	$m	-5.0				K1 Capital estimate
Options: Nov 2024	$m	0.6				
Total	$m	**504**				estimated equity value
Estimated share price	$/sh	**0.45**				based on diluted share count
Capital structure						
Current share price	$/sh	0.081				13 Jul 2023 closing price
Shares on issue	000,000	912.4				
Incentive options	000,000	6.3				exercise price $0.10, expire 25 Nov 2024
Performance rights - Class C	000,000	0.0				28.2m on Nomgon FID approval, expire 16 Dec 2023. Unlikely
Future dilution	000,000	200.0				K1 Capital assumption
Assumed diluted shares	000,000	1,118.7				

Source: K1 Capital analysis.

2. Daydream 2 well: Grandis gas project (ATP 2044)

The Grandis Gas Project is a large unconventional gas project located in the Taroom Trough in Queensland, close to the Wallumbilla gas hub. Elixir holds a 100% interest. The project is appraising the basin centred gas (BCG)[1] play discovered by BG (now Shell) in 2012.

The Daydream-2 well is expected to spud in October 2023, with a key aim to significantly expand the existing 395 bcf mid-case (2C) contingent resource. The well will be drilled by a subsidiary of global oil field services SLB (previously known as Schlumberger). The rig and crew of SLB 185 have recently successfully drilled two nearby similar wells.[2]

The planned total depth is ~4,200m, targeting the gas saturated Permian-age (299-252 million years) section that was demonstrated at Daydream-1, ~5 km west, and Canyon-1&2 to the east. Daydream-2 will focus on tight gas sandstones (TGS)[3] and fractured thermally mature coals (FTMC).[4]

Omega reported the expected cost of the nearby Canyon-1&2 wells to be $9.5m each.[5] We think these costs appear low for drilling, completion, stimulation and testing and expect the cost of the Daydream-2 well will be higher. 43.5% of the total cost should be refunded through the Federal Government's R&D Tax Incentive mechanism, however, Elixir will need to cover the initial well cost.

2.1.1 Resource assessment

Grandis has an independently assessed mid-case (2C) contingent resource of 395 bcf and 3.6 MMbbl condensate in the TGS. No contingent resources have yet been assigned to the FTMC, however, Elixir estimates prospective resources of 1,287 bcf and 25.7 MMbbl condensate within these coals.

Figure 1 Grandis gas project contingent and prospective resources

ATP 2044 - GRANDIS GAS PROJECT Contingent Resources (100%)				
	Units	1C	2C	3C
Gas Initially In Place (GIIP)	Bcf	2,128	7,007	22,699
Recoverable Gas	Bcf	93	395	1,493
Recoverable Condensate	MMbbl	0.7	3.6	17.3

ATP 2044 - GRANDIS GAS PROJECT Prospective Resources (100%)				
Log Normal Distribution	Units	1U	2U	3U
Recoverable Gas	Bcf	401	1,287	4,135
Recoverable Condensate	MMbbl	4	25.7	165.4

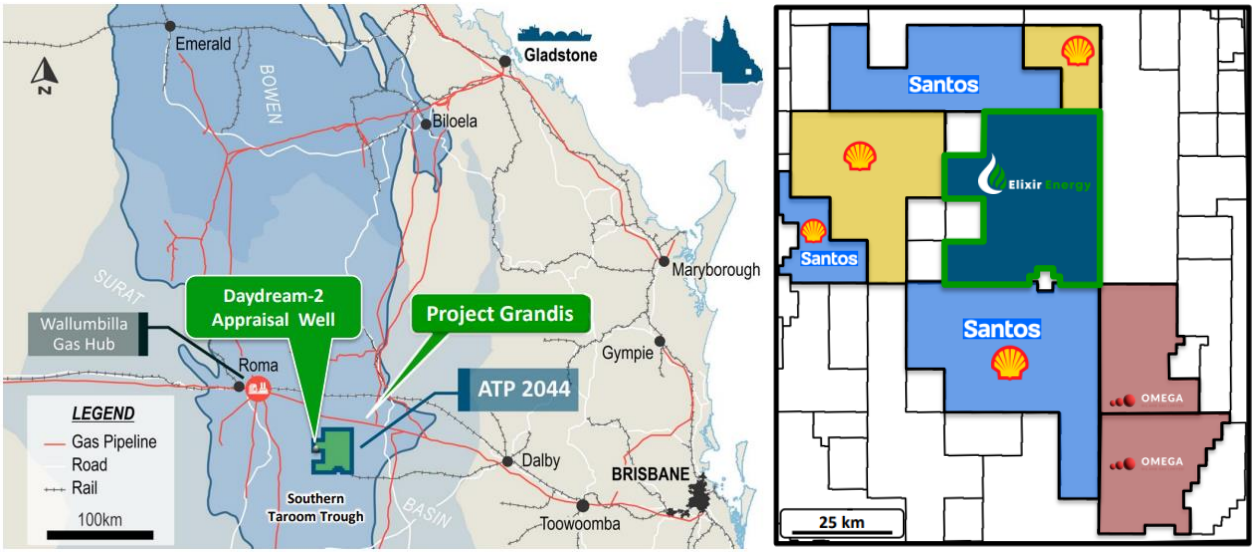
Source: Elixir Energy Limited, "DAYDREAM-2 WELL TO SPUD IN OCTOBER", 3rd July 2023, pp7-8.
Contingent Resources: ERC Equipoise Pte Ltd (ERCE), October 2022. Prospective resources: Elixir

[1] BCG is a regionally extensive unconventional gas resource where the gas is trapped in a "permeability jail" (<0.2 mD permeability) in low porosity rock. BCG plays require stimulation for commercial production.
[2] Canyon-2 (3,806 m, 23 days, ATP 2038) and Canyon-1 (4,000 m, 25 days, ATP 2037) for Omega (ASX: OMA)
[3] TGS are formations with <7% porosity that trap gas via stratigraphic or other means. Their low permeability means stimulation (hydraulic fracturing) is essential to commercial production.
[4] FTMC can contain significant free gas in fractures and cleats within the coal. All nearby wells have had high gas readings. The coals are the source of the gas and analysis indicates the coals are suitable for stimulation.
[5] Omega reported estimated costs for drilling, completion and stimulation of $9.5m/well for a 2-well program for 4,000 m TD wells (Replacement Prospectus, 21st October 2022, p 138).

2.1.2 Industry activity

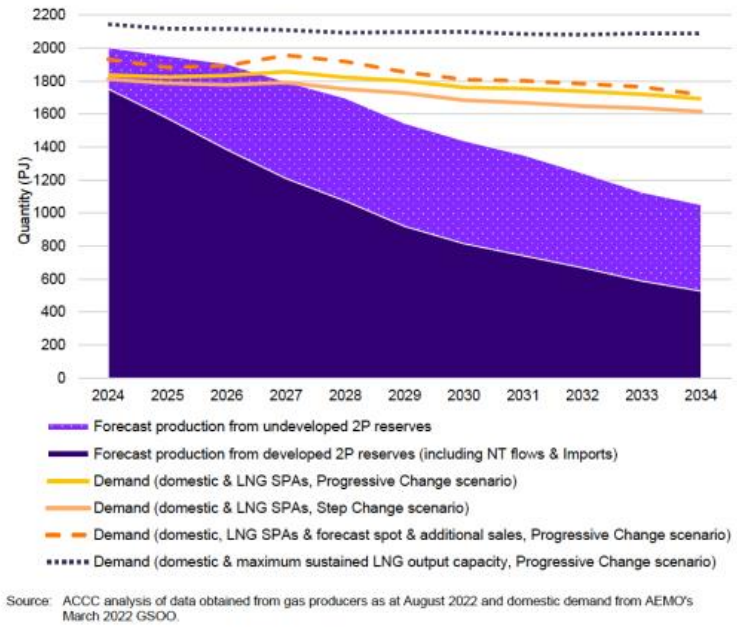
The Taroom Trough was last extensively drilled by BG (now Shell) approximately 10 years ago. Growing shortages of gas on the east coast and LNG plant spare capacity are now driving new drilling by Shell, Santos (ASX: STO) and Omega (ASX: OMA). The supply shortfall in the southern states is likely to require LNG imports to balance, placing a floor on eastern gas prices at LNG import parity.

Figure 2 Grandis gas project location and adjoining tenements



Source: Elixir Energy Limited, "DAYDREAM-2 WELL TO SPUD IN OCTOBER", 3rd July 2023, p 2 and p 9.

Figure 3 Eastern Australia gas supply / demand balance



Source: Elixir Energy Limited, March 2023 Quarterly Activities Report, 21st April 2023, p 2.

2.1.3 Project schedule

Daydream-2 is expected to spud in October 2023. Drilling will be followed by wireline logging to determine thickness and gas saturation of the target formations. Post-drill analysis is expected to take 2-3 months, with stimulation to commence in late Q1 2024 and flow testing to continue until mid Q2. An updated resource assessment should follow in H2 2024, with the likelihood of an initial reserves

determination. We expect further appraisal drilling will be required before a firm basis for field development can be developed. Large scale production could commence before the end of the decade.

3. Mongolian gas exploration and appraisal: Nomgon PSC

Elixir has a 100% interest in the Nomgon IX CBM PSC in Mongolia's South Gobi region. The large (30,000 km^2) PSC has a minimum ten year exploration period (ending in 2028) and a thirty year production period. The large (14.6 tcf mid-case prospective resource) is located only ~400 km from the Chinese border and major Chinese gas transmission lines.

Elixir is well ahead of its work program commitments under the PSC, having drilled 44 exploration and appraisal wells to the end of 2022 and acquired over 1,000 km of seismic.[6] Current activities are focused on production testing at the Nomgon Pilot Project, which reached flowrates of over 200 kscfd from two wells during Q1 2023. The pilot will provide information on well productivity (gas and water flow rates and decline parameters) to enable assessment of commercial development options.

Development of CBM in Mongolia should be aided by low drilling costs (low labour costs, expected simple vertical wells and relative shallow drilling depths); high domestic and export gas demand, able to be connected by pipelines rather than marine shipping; and high gas prices due to the marginal energy prices being set by LNG import parity prices.

3.1.1 Resource assessment

The Nomgon PSC has very large independently assessed prospective resources of 14.6 bcf (net risked mid-case). The initial 2C contingent resource assessment of 23 bcf is only for the area immediately adjacent to a proposed gas fired power project. We expect this to grow materially on successful completion of the pilot program and further exploration and appraisal drilling. Key contingencies relate to the ability to flow gas at commercial rates, the finalization of offtake arrangements and financing of project development.

Figure 4 Current Nomgon IX resource assessment (30th June 2021)

Contingent Resources (100% WI)			
Bcf	1C	2C	3C
Gas initially in place (GIIP)	13	60	242
Recoverable Gas	**5**	**24**	**104**

Prospect Volumetrics (in Tcf)	Gross Unrisked Prospective Resource				Working Interest	COS	Net Risked Prospective Resources			
	1U	2U	Mean	3U			1U	2U	Mean	3U
Nomgon IX CBM	17	48	66	133	100%	30%	5.0	14.6	19.9	40.3

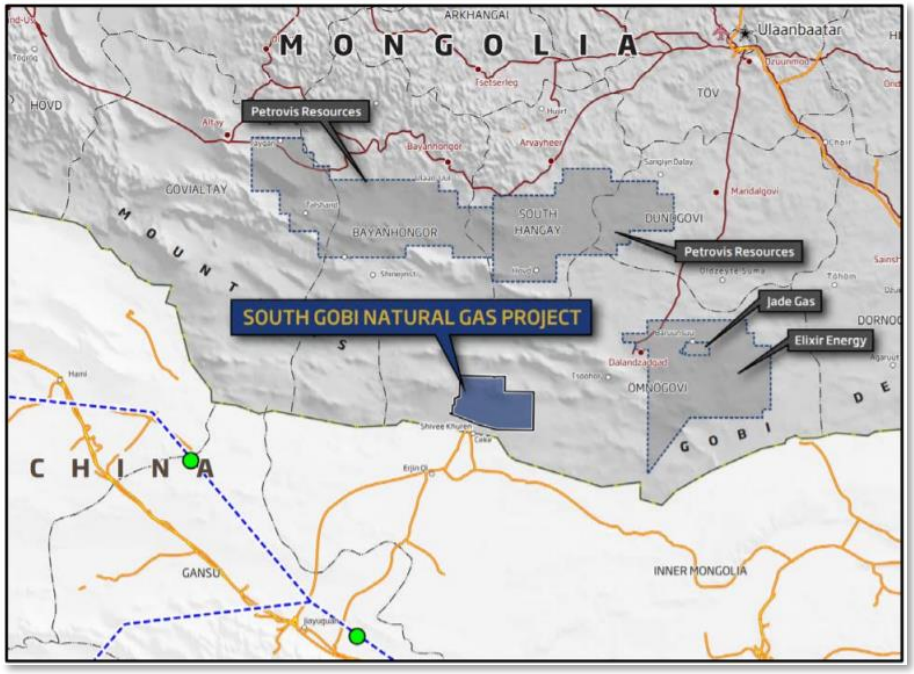
Source: Elixir Energy Limited, "2021 Annual Report", 17th August 2021, pp 7-8. Mid-case 2C gas recovery = 40%. Mid-case 2U prospective resource assumes 30% geological risk.

[6] 2019-2020: 10 wells; 2021: 17 wells; 2022: 17 wells.

3.2 Other industry activity

Interest in Mongolian CBM exploration continues to build, with three ASX-listed companies, in addition to Elixir, progressing exploration and appraisal programs. All four companies have announced contingent resources, totalling 1,484 bcf (gross) / 1,386 bcf (net), and are progressing exploration and appraisal drilling. Two pilot programs are active (EXR's Nomgon pilot and TMK/TPD's South Gobi pilot). Total market capitalization of the four ASX-listed companies is $310m as of 11th July 2023, with enterprise value of ~$263m. If one adjusts for Talon's Perth Basin interests, current market valuation for Mongolian CBM resources is ~$0.19/GJ (EV/2C basis).[7]

- TMK Energy Limited (ASX: TMK): Market Cap'n = $73m. 67% interest in the Gurvantes XXXV Coal Seam Gas Project in the South Gobi Basin, 20 km from the Chinese border. Farm-in agreement with Talon Energy (ASX: TPD). 1,214 bcf 2C Contingent Resource (gross); seven recent exploration wells, all encountering thick coals with high gas content and saturation. 2,500 coal drillhole dataset covering much of the license area. A three-well pilot program commenced April 2023.
- Talon Energy Limited (ASX: TPD): Market Cap'n = $110m. 33% interest in the Gurvantes XXXV Coal Seam Gas Project in the South Gobi Basin, plus onshore Perth Basin interests: 45% of the Waylering gas project (L23/EP447, 24 PJ net 2P, 33 TJ/d gross); 25% of L7/EP437 (gas targets on trend with Waitsia and West Erregulla gas projects); 100% Condor gas prospect (EP511/EP512, 408 bcf/20 MMbbl 2U prospective resources).
- Jade Gas Holdings Limited (ASX: JGH): Market Cap'n = $52m. 60% interest in the Tavan Tolgoi XXXIII CBM project ("TTCBM", 246 bcf 2C gross), in the South Gobi Basin, with high gas contents (12-18 m3/t, 92-98% CH4). Further drilling is underway for resource expansion. 100% interest in Shivee Gobi and Eastern Gobi CBM permits, near coal deposits and existing mines.
- Petrovis Resources is a Mongolian company exploring tenements with a private partner to the northwest of Elixir's PSC.



Source: Talon Petroleum Limited, "Annual Report for the Year Ended 31 December 2020", p 9

[7] Pro-rated TMK value assigned to TPD's Mongolian interests.

4. Mongolian green hydrogen project: Gobi H2

4.1.1 Project status

The Gobi H2 green hydrogen[8] project is located in Southern Mongolia. The project is being progressed by Elixir and Japan's Terras Energy Corporation following the sale of Elixir's previous partner, SB Energy Corp, to Toyota Tsusho Group to form Terras Energy Corporation. Toyota Tsusho Group is one of Japan's largest renewable power generators, with ~4.5 GW of wind and solar capacity, and is the 100 % owner of Eurus Energy, a global renewable energy company.

The term sheet between Elixir and Terras provides a pathway to enter a binding 50/50 joint venture at the front-end engineering & design (FEED) stage of the proposed Gobi H2 pilot project. Whilst formation of the JV with SB Energy had been expected by mid-2023, the timeframe is likely to be delayed and the continued involvement by Terras is less certain.

Elixir completed a pre-feasibility engineering study (PFS) into a 10 MW green hydrogen pilot project with global infrastructure consulting firm, AECOM in early 2023, and continues to collect high quality wind and solar data to support expansion to GW-scale production. Elixir and Terras continue to engage with potential hydrogen offtakers for pilot production.

4.1.2 Markets

The location of the Gobi H2 project provides ready access to rapidly growing Chinese H2 markets. Elixir commissioned a China market study from global energy consultants Rystad Energy, which concluded "the scale of ramp up will likely open up imports from beneficial production sites like Elixir's". Regional H2 transmission infrastructure is already emerging, with Sinopec recently announcing a 400 km 100 ktpa H2 pipeline from Inner Mongolia to Beijing.

Elixir has identified seven requirements for hydrogen project success, including high quality renewables, low capex, green certification compliance, proximity to market, operational skills, access to capital and scalability. The Gobi H2 project is well positioned on these parameters.

1. High quality renewable resources – these are superb for *Gobi H2* – top tier globally

2. Cost of renewable energy installations – favourable proximity to manufacturers in China & buying power of Terras

3. Green certification – *Gobi H2* meets emerging global (including Chinese) standards

4. Proximity to market – no location better placed to service Chinese import requirements. ***This is Gobi H2's key competitive advantage***

5. Operational skills – Terras existing wind-farm in the Gobi and Elixir's stakeholder engagement expertise in the region

6. Access to capital – *Gobi H2* is well advanced in engaging the IFIs (e.g. ADB, EBRD, etc) in Mongolia over project finance

7. Scalability – ultimate renewable resources in the Gobi are many, many GWs – and long run demand in China under its net zero plans is enormous

Source: Elixir Energy Limited," Asia Clean Energy Forum 2023, Potential for Green Hydrogen Production and Export from Mongolia", 14th June 2023, p 4.

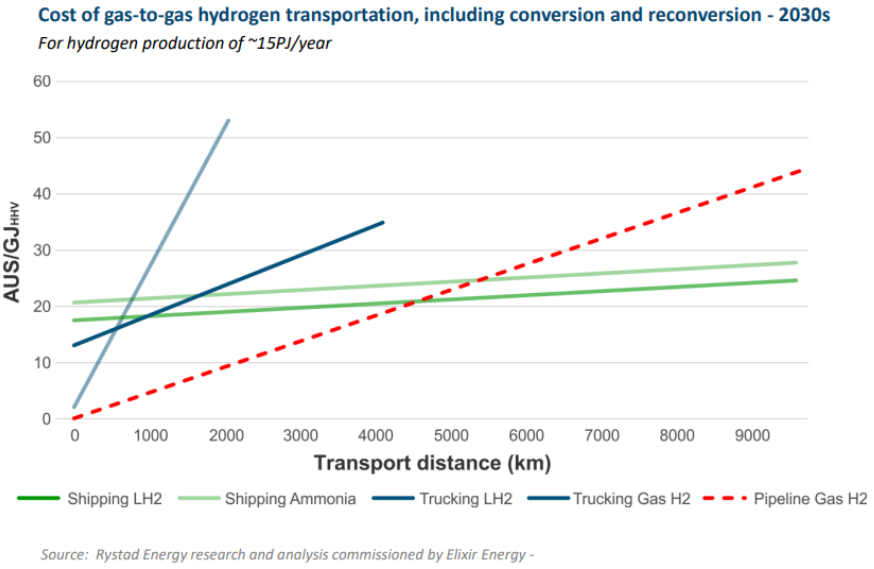
[8] Green hydrogen is hydrogen produced from renewable energy, such as solar and wind.

4.1.3 Transportation

Rystad Energy estimates shipping hydrogen by boat (~$20/GJ) costs much more than shipping the same energy as LNG (~$5/GJ), due to hydrogen's low volumetric energy density and challenging storage conditions (very low temperatures or very high pressures).

The delivered cost of hydrogen is strongly dependent on the quality of renewable energy (which drives production costs) and the cost of delivery. Access to markets by pipeline is massively advantaged over seaborne supplies, and Mongolia can supply hydrogen to China by pipeline. Importantly, our analysis indicates producing hydrogen in Mongolia and piping it to China is more energy efficient than transmitting power to China for hydrogen production at the point of consumption.

Figure 5 Hydrogen transport costs



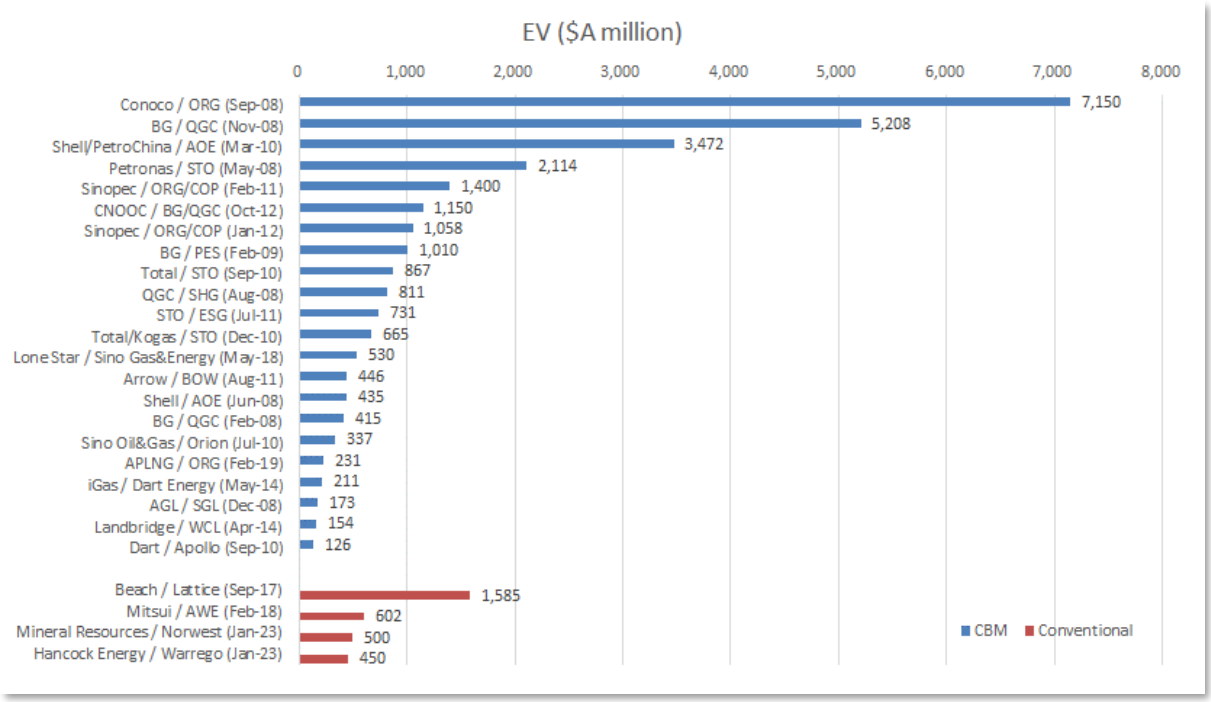
Source: Elixir Energy Limited," Asia Clean Energy Forum 2023, Potential for Green Hydrogen Production and Export from Mongolia", 14th June 2023, p 5.

5. Appendices

5.1 CBM transaction metrics

Assuming discovered resources continue to increase and project risks continue to diminish, Elixir's value is likely to be set by acquisition by a large national or international energy company, with the financial, organizational and operational resources to develop a multi-tcf gas projects. Examination of past CBM transactions provides an indication of the transaction sizes that have previously occurred. These values, shown below, provide a cross-check on the market capitalization of gas companies for various levels of project maturity and resource size.

Table 2 Selected CBM and conventional gas transaction values for ASX-listed companies/projects



Source: K1 Capital analysis

5.2 CBM and tight gas trading metrics

Our market multiples are based on price adjusted reserves and resources to better account for the value differences between oil and gas, and gas prices in different markets. Energy thermal equivalent values are also shown for comparison.

Trading metrics for ASX-listed gas companies vary due to different project maturities, jurisdictions and project portfolio composition. Current trading metrics for ASX-companies with Mongolian CBM operations range from $0.11 to $0.69/GJ 2P+0.8*2C, with an average of $0.23/GJ. Domestic focused CBM companies are currently trading at lower levels, perhaps due to higher perceived country risk with respect to approval of future development projects.

Australian tight gas exploration and appraisal companies are currently trading at ~$0.20/GJ; we believe Omega's higher value is due to the absence of announced contingent resources for the recent discoveries at its Canyon-1 & 2 wells. These wells are adjacent to Elixir's ATP 2044 Grandis gas project.

The enterprise value of Falcon Oil & Gas ($108m) and Tamboran Resources ($236m) provides a guide to current expectations for shale and tight gas projects.

Table 3 Reserve & resource spot price equivalence factors

Commodity	units	Price 13-Jul-23	Price $US/boe	Price factor	Source
USD/AUD forex	$US/$A	0.6709	-	-	Reserve Bank of Australia
Brent	$US/bbl	80.11	80.11	1.00	Bloomberg
WTI	$US/bbl	75.81	75.81	0.95	"
Henry Hub	$US/mmBtu	2.65	15.37	0.19	"
EC Australia	$A/GJ	8.95	36.75	0.46	AEMO Wallumbilla benchmark 13 Jul 23
WC Australia	$A/GJ	10.02	41.14	0.51	gasTrading spot price Jun '23
Europe	$US/mmBtu	10.35	60.03	0.75	World Bank, Netherlands TTF, Jun '23
SAfrica	$US/mmBtu	8.55	49.60	0.62	est. field gate price @ $US80 Brent
LNG	$US/mmBtu	11.74	68.09	0.85	85% of Brent (14.7% slope)
LNG JPN/KOR spot	$US/mmBtu	13.17	76.39	0.95	World Bank, Japan, Jun '23
LPG	$US/t	466	40.88	0.51	Argus Saudi Propane - Aug '23

Table 4 Reserve and resource trading metrics (energy price equivalent basis)

Company	Code	Last Price 13-Jul-23	Total Shares (million)	Mkt Cap M$A	EV M$A	2P Price equivalent PJe'	2C Price equivalent PJe'	EV/2P $A/GJe	EV/ (2P+0.8*2C) $A/GJe	Gearing D/(D+E) %
Elixir Energy	EXR	0.081	932	75	64	-	497.9	-	0.16	-
ASX oil & gas producers (4)				**95,278**	**97,317**	**64,731.9**	**149,541.1**	**1.50**	**0.53**	**14**
Beach Energy	BPT	1.465	2,281	3,342	3,438	2,043.7	1,625.5	1.68	1.03	9
Cooper Energy	COE	0.145	2,629	381	449	249.7	254.0	1.80	0.99	29
Santos	STO	7.570	3,248	24,586	28,045	19,547.2	37,413.8	1.43	0.57	22
Woodside Energy Group	WDS	35.270	1,899	66,969	65,384	42,891.4	110,247.7	1.52	0.50	10
ASX junior gas producers (3)				**102**	**151**	**331.8**	**183.7**	**0.46**	**0.32**	**42**
Armour Energy	AJQ	0.003	4,921	15	47	204.9	55.3	0.23	0.19	70
Central Petroleum	CTP	0.053	729	39	54	76.4	62.5	0.70	0.42	43
Vintage Energy	VEN	0.057	859	49	50	50.5	65.9	1.00	0.49	17
ASX conv. gas appraisers (2)				**1,221**	**1,221**	**447.5**	**1,052.5**	**2.73**	**0.95**	**2**
Strike Energy	STX	0.440	2,532	1,114	1,131	416.9	691.3	2.71	1.17	2
Talon Energy	TPD	0.170	627	107	91	30.7	361.3	2.95	0.28	-
ASX Australian CBM (4)				**305**	**285**	**273.9**	**4,846.4**	**0.81**	**0.07**	**3**
Blue Energy	BLU	0.029	1,851	54	50	79.0	1,419.0	0.64	0.04	-
Comet Ridge	COI	0.175	1,010	177	172	194.9	384.9	0.88	0.34	5
Galilee Energy	GLL	0.100	339	34	23	-	2,507.5	-	0.01	-
State Gas	GAS	0.180	225	40	39	-	535.0	-	0.09	-
ASX Africa/Indonesia CBM (4)				**167**	**152**	**242.2**	**3,108.6**	**0.30**	**0.06**	**2**
Botala Energy	BTE	0.130	136	18	15	-	309.7	-	0.06	0
Kinetiko Energy	KKO	0.087	781	68	63	-	2,463.3	-	0.03	-
Tlou Energy	TOU	0.035	1,026	36	26	56.8	298.7	0.46	0.09	-
NuEnergy Gas	NGY	0.031	1,481	46	47	185.4	37.0	0.25	0.22	6
ASX Mongolia CBM (3)				**259**	**223**	**30.7**	**1,185.0**	**2.95**	**0.23**	**0**
Jade Gas Holdings	JGH	0.052	1,576	82	70	-	126.8	-	0.69	0
TMK Energy	TMK	0.014	5,025	70	63	-	696.9	-	0.11	-
Talon Energy	TPD	0.170	627	107	91	30.7	361.3	2.95	0.28	-
ASX Australian tight gas (5)				**472**	**413**	**206.6**	**2,364.4**	**0.32**	**0.20**	**9**
Armour Energy	AJQ	0.003	4,921	15	47	204.9	55.3	0.23	0.19	70
Falcon Oil & Gas (TSX)	FO.V	0.128	1,044	133	108	-	683.4	-	0.20	-
Tamboran Resources	TBN	0.170	1,705	290	236	-	1,616.0	-	0.18	4
Omega Oil & Gas	OMA	0.195	153	30	20	1.7	9.6	11.46	2.10	-
Icon Energy	ICN	0.005	755	4	2	-	-	-	0.00	-

Source: K1 Capital analysis of company data. Expressed relative to the spot east coast Australian gas price of $8.95/GJ.

Table 5 Reserve and resource trading metrics (energy thermal equivalent basis)

Company	Code	Last Price 13-Jul-23	Total Shares (million)	Mkt Cap M$A	EV M$A	2P Energy equivalent PJe'	2C Energy equivalent PJe'	EV/2P $A/GJe	EV/ (2P+0.8*2C) $A/GJe	Gearing D/(D+E) %
Elixir Energy	EXR	0.081	932	75	64	-	476.1	-	0.17	-
ASX oil & gas producers (4)				**95,278**	**97,317**	**34,759.6**	**79,341.2**	**2.80**	**0.99**	**14**
Beach Energy	BPT	1.465	2,281	3,342	3,438	1,748.6	1,327.5	1.97	1.22	9
Cooper Energy	COE	0.145	2,629	381	449	241.7	225.9	1.86	1.06	29
Santos	STO	7.570	3,248	24,586	28,045	10,272.1	19,453.4	2.73	1.09	22
Woodside Energy Group	WDS	35.270	1,899	66,969	65,384	22,497.1	58,334.4	2.91	0.95	10
ASX junior gas producers (3)				**102**	**151**	**307.3**	**156.6**	**0.49**	**0.35**	**42**
Armour Energy	AJQ	0.003	4,921	15	47	183.3	28.6	0.26	0.23	70
Central Petroleum	CTP	0.053	729	39	54	73.5	62.1	0.73	0.44	43
Vintage Energy	VEN	0.057	859	49	50	50.5	65.9	1.00	0.49	17
ASX conv. gas appraisers (2)				**1,221**	**1,221**	**396.6**	**1,040.2**	**3.08**	**0.99**	**2**
Strike Energy	STX	0.440	2,532	1,114	1,131	370.6	610.7	3.05	1.32	2
Talon Energy	TPD	0.170	627	107	91	25.9	429.5	3.49	0.25	-
ASX Australian CBM (4)				**305**	**285**	**273.9**	**4,846.4**	**0.81**	**0.07**	**3**
Blue Energy	BLU	0.029	1,851	54	50	79.0	1,419.0	0.64	0.04	-
Comet Ridge	COI	0.175	1,010	177	172	194.9	384.9	0.88	0.34	5
Galilee Energy	GLL	0.100	339	34	23	-	2,507.5	-	0.01	-
State Gas	GAS	0.180	225	40	39	-	535.0	-	0.09	-
ASX Africa/Indonesia CBM (4)				**167**	**152**	**142.1**	**2,933.9**	**0.52**	**0.06**	**2**
Botala Energy	BTE	0.130	136	18	15	-	229.4	-	0.08	0
Kinetiko Energy	KKO	0.087	781	68	63	-	2,463.3	-	0.03	-
Tlou Energy	TOU	0.035	1,026	36	26	42.1	221.3	0.62	0.12	-
NuEnergy Gas	NGY	0.031	1,481	46	47	100.0	20.0	0.47	0.41	6
ASX Mongolia CBM (3)				**259**	**223**	**25.9**	**1,423.6**	**3.49**	**0.19**	**0**
Jade Gas Holdings	JGH	0.052	1,576	82	70	-	153.0	-	0.57	0
TMK Energy	TMK	0.014	5,025	70	63	-	841.0	-	0.09	-
Talon Energy	TPD	0.170	627	107	91	25.9	429.5	3.49	0.25	-
ASX Australian tight gas (5)				**472**	**413**	**184.1**	**2,332.4**	**0.36**	**0.20**	**9**
Armour Energy	AJQ	0.003	4,921	15	47	183.3	28.6	0.26	0.23	70
Falcon Oil & Gas (TSX)	FO.V	0.128	1,044	133	108	-	683.4	-	0.20	-
Tamboran Resources	TBN	0.170	1,705	290	236	-	1,616.0	-	0.18	4
Omega Oil & Gas	OMA	0.195	153	30	20	0.8	4.4	24.98	4.58	-
Icon Energy	ICN	0.005	755	4	2	-	-	-	0.00	-

Source: K1 Capital analysis of company data. 1 boe = 5.8 MMBtu = 6.12 GJ.

5.3 Market capitalization of ASX-listed hydrogen companies

Enterprise values for companies predominantly focused on hydrogen technology or hydrogen production range from $4m (Lion Energy, green hydrogen production and supply to bus networks in Queensland) to ~$100m (Hazer Group, hydrogen production via methane pyrolysis). Frontier Energy is probably the closest ASX-listed peer with respect to green hydrogen production. Frontier is currently valued at $65m EV / $99m market capitalization, based on its Bristol Springs solar PV-backed electrolyzer project in Western Australia. We expect the Gobi H2 project will have a larger ultimate scale and better renewable resources.

Table 6 Capitalization and enterprise value of selected Australian companies with hydrogen interests

Company as of 17-Jul-23	Code	Share price $A/share	Mkt Cap M$A	EV M$A	Description
Hydrogen technology (8)					
Environmental Clean Tech'gies	ECT	0.008	20	20	Coldry lignite drying, Bacchus Marsh, VIC; zero emission hydrogen from lignite Yallourn, VIC; JV with GrapheneX targeting hydrogen, formic acid, DME and electricity.
Eden Innovations	EDE	0.003	9	16	Methane pyrolysis to hydrogen and carbon nanotubes; EdenCrete concrete additive; Hythane H2/nat gas blends; OptiBlend H2/diesel fuel systems.
Provaris Energy	PV1	0.076	42	35	Evaluating comp. H2 exports for PRL's HyEnergy Project, WA; Tiwi Green H2 Export project (2.8 GW, 100 kt/yr CH2 exports); comp. H2 and CNG marine shipping vessel
Hazer Group	HZR	0.600	102	99	Methane pyrolysis to H2/graphite, iron ore catalyst. Demo. plant Woodman Point Waste Water Treatment Plant, WA. Burrard Hazer JV, BC, Canada, 2.5 kt/yr H2/9.0
Southern Green Gas	SGG'	0.000	0	0	Unlisted. Renewable methane via direct air capture; partnership with Uni. of Sydney; ARENA/APA Group funding for Wallumbilla demo project. Proposed E-Methanol
Sparc Technologies	SPN	0.262	22	19	Single step hydrogen production via photocatalytic water splitting; partnership with University of Adelaide and Fortescue Future Industries.
SRJ Technologies	SRJ	0.052	5	6	Engineering services and pressure containment; partnership with Curtin Uni regarding hydrogen compatible weld-free pipeline coupling technology.
Synergen Met	SYN'	0.000	0	0	Planned mid-2022 IPO deferred. Thermal pyrolysis technology (hydrogen from methane, PFAS destruction, sodium cyanide production, etc.)
Green hydrogen via electrolysis (11)					
ADX Energy	ADX	0.007	25	23	Conv. Oil & gas; Vienna Basin Green H2 and Zistersdorf Solar projects, Austria (1.5 MW, 80 tpa H2, with underground storage); geothermal project using existing
Elixir Energy	EXR	0.081	75	64	Nomgon IX CBM PSC, South Gobi Basin, Mongolia; Gobi Green H2 project, Mongolia; Grandis tight gas project, Taroom Trough, Queensland.
Lion Energy	LIO	0.025	11	4	2 PSCs in Indonesia; planned H2 refuelling for Qld buses/FCEV 2Q 2024; agreements with BLK Auto (FCEV), Pulitano Group (bus services) & Foton Mobility (zero emission
Countrywide Renewable Hyd.	CRH'	0.000	0	0	Unlisted. H2TAS (10 MW, 4.5 tpd H2 in Tasmania); Melb Hyd Hub (green H2, fuel cell bus fabrication, nat gas blending); H2PORT (10 -> 250 MW, Portland, Vic)
Frontier Energy	FHE	0.350	90	65	Proposed H2 via Alkaline Water Electrolysis, Bristol Springs Solar Project, WA. Stage One 114 MW solar, 36.6 MW electrolyzer, 4.4 kt/y H2 @ $2.83/kg (inc. capex).
Infinite Green Energy	IGE'	0.000	0	0	Unlisted. MEG HP1, Northam, WA, 2-4 t/d H2. Arrowsmith HP1 & 2, Geraldon, WA, 23->42 tpd H2, wind/solar/battery, -> 294 tpd; proposed projects in VIC, Italy and NZ.
Montem Resources	MR1'	0.000	0	0	Tent Mountain Renewable Energy Project (100 MW wind/elect'yzer, 320 MW/2,560 MWh pumped hydro), Alberta, acquired by Transalta Feb 2023. Ceased listing 26 Apr
Province Resources	PRL	0.041	48	32	Suspended. Gnama Ni-Cu Project, WA; Skane Va Project, Sweden; MOU with Total Eren for HyENERGY green H2 (8 GW, Carnarvon, WA); CH2 marine exports with PV1.
QEM Limited	QEM	0.215	32	30	Julia Creek Vanadium-Shale Project, Qld; 250 MW renewable generation for shale oil upgrading and green hydrogen. Close to Copper String 2 transmission line.
Tivan Limited	TVN	0.072	107	104	Prev. TNG Ltd. Mount Peake Va-Ti-Fe Project, NT; JV with AGV Energy & Tech. for H2 via HySustainTM technology, Darwin; JV with V-Flow Tech, for Va-redox flow battery.
Green hydrogen via pyrolysis (5)					
Patriot Hydrogen	PAT'	0.000	0	0	Modular biomass-to-energy project developer (with CAC-H2). Biowaste to syngas, biochar, wood vinegar via pyrolysis. Kimberley Clean Energy (Q3 2022), Port Anthony
Pure Hydrogen	PH2	0.185	63	53	RLE/SXA merger 2021. Qld CBM/tight gas; Serowie CBM Botswana; 20.3% H2X Global FCEV; turquoise/emerald hydrogen production; JVs with bus/marine/other businesses.
Tlou Energy	TOU	0.035	36	26	100% Lesedi and Mamba CBM projects, Botswana. Developing 10 MW gas fired power gen + potential solar PV. Evaluating Synergen Met methane pyrolysis prototype.
Sweetman Renewables	SWR'	0.000	0	0	Unlisted. Conversion of waste biomass to hydrogen and biochar. Partnership with Singapore's CAC-H2 to supply Verdant Earth Technologies' Hunter Valley power
Verdant Earth Technologies	VET'	0.000	0	0	Unlisted. Conversion of coal-fired Redbank Power Station to 150 MW waste biomass plus 60 tpd H2 production. Strategic alliance with Port of Darwin for exports.
Blue hydrogen (3)					
Pilot Energy	PGY	0.057	29	24	Formerly Earth Heat Resources/Rampart Energy. Perth basin onshore/offshore oil & gas; planned conversion of Cliff Head oil field to CCS, with blue/green H2 and NH3.
Hexagon Energy Materials	HXG	0.019	10	8	Suspended. McIntosh Ni-Cu-PGM expl'n, WA; Halls Creek Au/Base; Ceylon Graphite, Alabama, USA; WAH2 project (NWS WA gas to H2, 21->71 TJ/d, 250->800 ktpa H2)

Source: K1 Capital analysis

Disclosure:

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Separate to this research engagement, K1 Capital has provided consultancy services to Elixir for oil & gas, renewable energy and green hydrogen evaluation.

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