

Another step closer on Carpentaria-2H test data

Empire Energy Group Limited (ASX:EEG) is an oil and gas producer/developer, with onshore Northern Territory (NT) and US oil/gas production assets. EEG has the largest tenement position in the highly prospective Greater McArthur Basin, which includes the Beetaloo Sub-basin. The NT energy basins are fast developing as strategic high-calorific gas bolsters for east coast Australia's future domestic requirements, growing Gladstone LNG ullage and potential supply for Darwin's expanding LNG export terminals, amid funding support from Territory and Federal governments. Empire Energy represents a pure, independent and highly leveraged exposure to the transformational potential of the NT basins. More data is coming to hand and we expect the economic confidence level to grow. EEG is sitting on an extensive and pervasive gas resource. The current phase of drilling and evaluation puts the company on the cusp of the commercial pathway and the timeline to early commercialisation remains on track. We expect the share price discount to materially unwind as the development model firms and the company moves towards a final investment decision (FID) and first gas over the next 18 months to two years.

Business model

Empire Energy Group Limited (EEG), is an oil and gas development and production company, focused on maturing its portfolio of onshore, long-life oil and gas opportunities. The key asset is the substantial tenement holdings across the world-class McArthur-Beetaloo basins in the NT where testing and evaluation data could support increased gas resource bookings to underpin an early gas development option. In practical terms the company can be considered to be in a pre-development phase. Success from this point should see EEG on an accelerated path to first gas. EEG holds a current cash balance of ~\$18.2mn with \$15mn in undrawn debt and \$7.6mn remaining against the Beetaloo Drilling Program grants.

Flow data is building the development model

We highlight the updated testing data from Carpentaria-2H, recording an IP8 average of 3.5mmcf/d (normalised), some 21% greater than the pre-soak testing on a lower decline rate – more gas with higher bottom hole pressures should translate to greater productivity over a longer well life. It feels like EEG is already at the economic threshold. Further data will derive a fresh IP30 type curve and underpin continuing FEED activity targeting a FID by around end-2023. We see the potential for a material de-risking across the portfolio across the next 12 months with success cases providing the platform for financing and potential partnering arrangements.

The valuation shows the size of the success case

Whilst valuing pre-development phase assets is a subjective exercise, particularly considering financing and the timing uncertainties, new data to hand and the likely material increase of 2C volumes supports a high degree of confidence in the commercial potential. The resource opportunity is massive based on consistent geology and the next twelve months could deliver material de-risking outcomes - type curve, first reserves, next step gas agreements and a gas project FID. We value the resources against a Darwin LNG netback gas price with a discretionary RaaS risk overlay to determine a low-high NAV range. We set a base case (mid-point) valuation of \$642mn (\$0.83/share) against the EEG portfolio, with an upside case to \$770mn (\$1.03/share). Against a reference share price of \$0.165/share, this suggests the market is risk weighting the EP 187 (Carpentaria option) at around 24% of our ascribed value. The success case at Carpentaria could deliver valuation upside well in excess of our base case...such is the nature and attraction of gas plays in the proof-of-concept phase.

Energy

10 March 2023

Share Details

ASX code	EEG
Share price (9-Mar)	\$0.165
Market capitalisation	\$128M
Shares on issue	773M
Cash (current)	\$18.2M
Free float	~47%

Share Performance (12 months)



Upside Case

- Success cases at currently evaluating Carpentaria (-2H, -3H and -4V) wells delivering above expectation testing data..
- Delivery of initial 'P' certification to underpin commercial development case.
- Securing a binding offtake agreement and/or a farm-in partner to offset market perceptions of future equity dilution.

Downside Case

- Frack performance of C-3H in particular falls below expectations
- Extension of gas price cap scenarios to include 'new developments', negatively impacting project rates of return
- Continuing financing reliance through equity issues on weaker field data resulting in excessive share dilution

Catalysts

- Outcome of continued testing on Carpentaria-2H and definition of the IP30 type curve
- Upgraded resource certification by NSAI

Company Interview

[Empire Energy Group \(ASX:EEG\) RaaS Interview 9 March 2023](#)

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The Data (and gas) Is Starting To Flow - The Business Case Is Firming

As highlighted in the RaaS re-initiation report (17-Feb), EEG has released the first update from the testing of the Carpentaria-3H and -2H wells. The aim of the testing is to better define the drilling development model and provide productivity data to underpin firm commercial gas sales agreements as a precursor to an early sales project.

Whilst only a partial data set, we are encouraged by the results which support our confidence levels in an economic base case perhaps by end 2023.

The data already points to a high degree of confidence that the required economic gas rates can be delivered, if not already there -

- The current well design has significant operational optimisation upside;
- The 'sweet spot' in the mid-Velkerri-B sequence has still to be identified;
- EEG has a lower starting capital and operating cost base;
- EEG has a higher net interest (after royalty considerations); and
- Early-stage plays (the Beetaloo) come with low-hanging fruit in that future productivity gains and returns are higher in absolute and relative terms as the play becomes optimised through continuing local and regional activity...there is material value in climbing the knowledge curve.

The company enterprise value (~\$133mn) at the reference share price, reflects a discount of ~65% to our ascribed value of the mid-point 2C gas volumes only. The discount to the resource value likely reflects a bearish market sentiment to gas policy uncertainty, residual concerns on the economic case and perhaps anticipation of an equity raise...or just the small company discount in a market in a risk-off investing phase.

We would highlight that this discount is not unusual compared to the unit values the market is applying to the sector. However, **de-risking the type curves, material upgrades to gas resources and definitive progress through FEED to FID should close the 'value gap'** and underpin a resource rating as financed, commercial outcomes become more tangibly demonstrable.

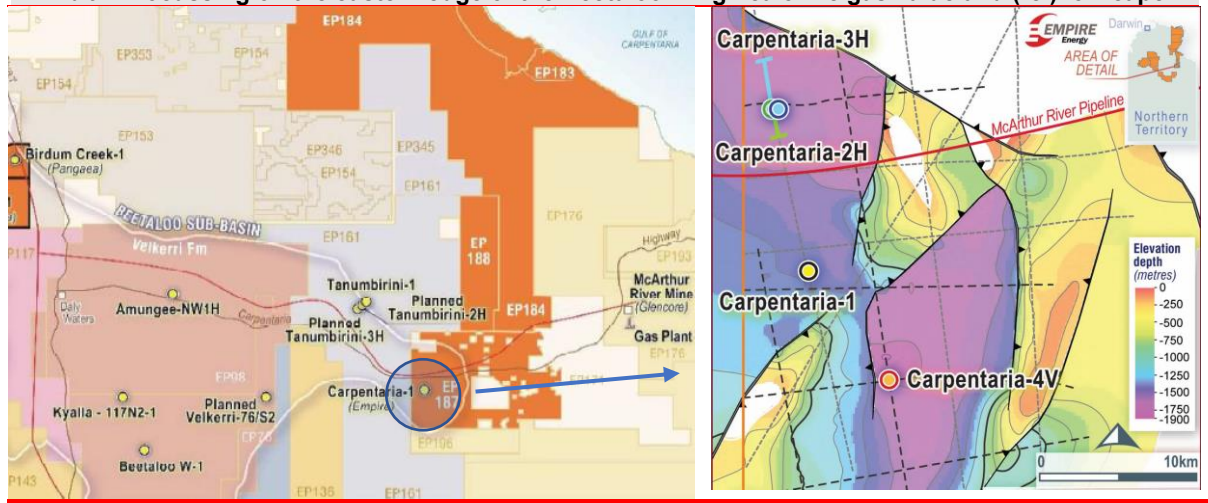
The value proposition lies in being able to unlock gas opportunity.

Exhibit 1: Testing data is firming the business case

Carpentaria-3H (C-3H)	<p>The well has been flowed tested for 27 days and has been shut-in for 'soaking', referencing the improved performance of the C-2H well after a period of pressure re-balance and soaking.</p> <p>The well had been flow tested for 27 days (IP27) delivering between 2-3 – 5.7mmcf/d (ave 2.6mmcf/d).</p> <p>EEG successfully completed a 40 stage frack programme on a 50m spacing and we note that frack optimisation is still a work in progress.</p>
Carpentaria-2H (C-2H)	<p>The well placed a hz section of 927m in the Velkerri B and was initially flow tested for 51 days before being shut-in.</p> <p>EEG has reported an IP(8) rate of 3.24mmcf/d, noting this was 21% higher than the corresponding initial test result with a lower rate of decline.</p> <p>On an extrapolated basis (per 1,000m) the test rate normalises to 3.5mmcf/d.</p> <p>It is intended for the well to be continuously tested (to the limit of the NT regulatory approvals) to define an early production type curve to support ongoing FEED works.</p> <p><i>It's also worth reminding that C-2H was completed with four different frack designs and in this regard is certainly not optimised on a development model basis.</i></p> <p><i>The initial IP30 for the well was 2.1mmcf/d and the average rate over the flow period (IP51) was 2.2mmcf/d.</i></p>
Carpentaria-4V (C-4V)	<p>EEG has reported that petrophysical analyses of C-4V has confirmed that "...net pay in the mid-Velkerri B is 20% greater and ~150m deeper than at the C-2H, -3H location".</p> <p><i>The C-4V well reached a total depth of 2,000m and has been cased and completed with the option to add a lateral (horizontal) section at a later date.</i></p>
	<p>Flow data and C-4V results are currently being incorporated into a updated resource assessment expected to be released perhaps by end-Mar but certainly before mid-2023.</p> <p>We suggest that the well data could be sufficient to underpin a material uplift in certified 2C volumes.</p>
Financing position remains comfortable	EEG holds a cash balance of ~\$18.2mn with \$15mn in undrawn debt and \$7.6mn remaining against the Beetaloo Cooperative Drilling Program grants.

Source: Company data; RaaS commentary

Exhibit 2: Focussing on the eastern edge of the Beetaloo – high calorific gas value and (rel) low capex



Source: Company data

Flow rates will always be the headline...but in context

The critical consideration the market wants to see to underpin commercial certainty and a re-rating are definitive flow rates and we suggest the early data is strongly supportive of the economic case, particularly within the context of Carpentaria activity still being in early-phase.

Carpentaria-3H (C-3H)

The C-3H well is the first extended horizontal well in the Beetaloo, **completing a 2,632m lateral in the Velkerri-B horizon** with over 90% contained within the target horizon.

C-3H was drilled from the same well pad as the C-2H well, but in the opposite direction, in effect providing a quasi-3,500m lateral in the 'B' shale with the toe-end of C-3H approximately 150m deeper than in the C-2H.

A 40 stage frack programme on a 50m spacing was completed in the C-3H lateral and utilised approximately twice the water volume and proppant as C-2H.

- Frack fluid recovery as at the date of the report is ~30% and the well can be considered as being in a clean-up phase.
- The well is 'slugging'...effectively seeing a gas build up **because the well wants to flow after stimulation**, but is fighting to push through and past the denser frack fluid build-up, resulting in intermittent pulses of gas.
- The well has been shut-in to allow for a period of re-balance and natural flow back of excess fluid prior to resume testing at a future date.

Given the -3H and -2H wells are utilising the same pad and facilities, only one well can be flowed at a time and we wouldn't expect a resumption of testing for at least 30 days, after the completion of C-2H works.

Carpentaria-2H (C-2H)

The horizontal section of this well was successfully placed entirely within the Velkerri B target zone, reaching some 927m with 21 frack stages.

Pre-soaking, the well recorded strongly encouraging flow rates, settling to a stable rate of 1.8mmcf/d after 51 days. Over the testing period the gas rate averaged around 2.2mmcf/d (extrapolated to 2.4mmcf/d/1,000m) with a peak rate of >11mmcf/d.

Second phase testing began on 25 Feb and has **delivered materially improved rates and productivity**

- IP8 gas rate is 3.25mmcf/d (3.5mmcf/d/1,000m[equivalent]) and the company expects to be able to broadly maintain that rate for another 5-7 days.

- Importantly the **gas rate is 21% higher** than delivered during the initial (pre-soak) testing phase with **lower pressure decline**.

...more gas at higher pressure equals greater gas recovery.

- Gas flow with lower water rates and no slugging.
- Upon advice the well is being deliberately choked back and managed to better optimise reservoir pressure and daily flow rates as important input data to establish per well gas recovery assumptions (EUR).

There no need to push a well to the maximum rate if the required production rates can be delivered in a managed operational context delivering extended well life and higher EURs.

We have previously referenced comments from the Falcon Oil and Gas CEO, Philip O’Quigley who indicated in an investor presentation that it considered the commercial threshold for the Beetaloo to be an IP30 rate of 3mmcf/1,000m, which would also underpin an EUR of 12Bcf/well (assuming a 3,000m lateral).

...and we have previously commented that if the IP30 can be considered to be the operational benchmark, then EEG with a materially lower capital and operating cost base sits comfortably under that requirement **and in many respects the current C-2H data suggests the company is already there**.

The well will continue to be tested for another 25-30 days to derive an updated IP30 curve to be incorporated into FEED studies and commercial evaluation.

It’s worth highlighting that EEG is continuing to evaluate frack methods for optimisation, with both the -2H and -3H wells trialling a number of different styles.

Frack Style	Slickwater	Crosslinked Gels	Hybrid*	HVFR**	Total Stages
Carpentaria-3H	3 stages	16 stages	21 stages	nil	40
Carpentaria-2H	7 stages	8 stages	4 stages	2 stages	21

* Slickwater and Crosslinked Gels

** High Viscosity Friction Reduction

It’s fair to suggest that the new IP30 curve will represent an understated outcome with intrinsic upside to be readily achievable from the yet to be optimised operational areas outlined on **p.2**.

It is worth reflecting on anecdotal commentary pertaining to the development history of a number of US onshore shale plays suggesting that whilst individual wells can provide variable results the play (*the Beetaloo in this case*), is cum ‘...**the technical and financial productivity gains**’ evidenced in equivalent unconventional plays, as more wells gets drilled and the benefits of economies of scale become entrenched.

Whilst gas prices are the critical sensitivity, **the other fundamental element that supports the economics of unconventional plays is the capital (new and sustaining) and operating cost base of development**. This is a direct function of play maturity - the cost of new wells reduces as more wells are drilled, completions become optimised in design and practice and; logistics bases evolve to better service increasing activity.

In early-stage plays well costs tend to be higher, but historically as evidenced by US analogue development areas, these costs trend down over time. Naturally, activity levels also heavily influence costs, with a significant scale up of operations delivering efficiency savings – this is not specific to onshore, unconventional plays and applies to portfolio drilling of any kind. However, given the high-density drilling that is the norm for these developments in the long-run, the **capital cost gains can be material in absolute terms**.

Carpentaria-4V (C-4V)

The C-4V well (refer Exhibit 2) was cased and completed at a total depth of 2,000m, intersected the target sequence as prognosed approximately 150m deeper than at the C-3H location.

The well has been completed with the option to add a lateral (horizontal) section at a later date.

Importantly the mid-Velkerri-B target is some 20% thicker at this location and being deeper has a higher bottom hole pressure.

The critical immediate aspect of the C-4V well is its contribution to the revised reserves and resources analyses being undertaken by Netherland Sewell and Associates (NSAI) and expected to be to hand perhaps as early as end-March but certainly before mid-2023.

Building resources and reserves...we anticipate an upgrade

The NSAI analysis, will be focussed on the EP 187 and currently only includes the area covered by the Charlotte 2D seismic survey seismic and the Carpentaria-1 and -2H wells; and represents only a very restricted part of the company's tenement portfolio.

NSAI will include the current testing data from the C-2H well and petrophysics from C-4V.

Currently 2C volumes stand at 396Bcf but with more testing and well data to come to hand, we'd expect a material de-risking and upgrading of certified resources in accord with company expectations.

That current attribution is already a very good number and represents a strong base for commercial planning and early production options.

Exhibit 3: The numbers are large with higher 'C' and maybe 'P' to come (Carpentaria Only)

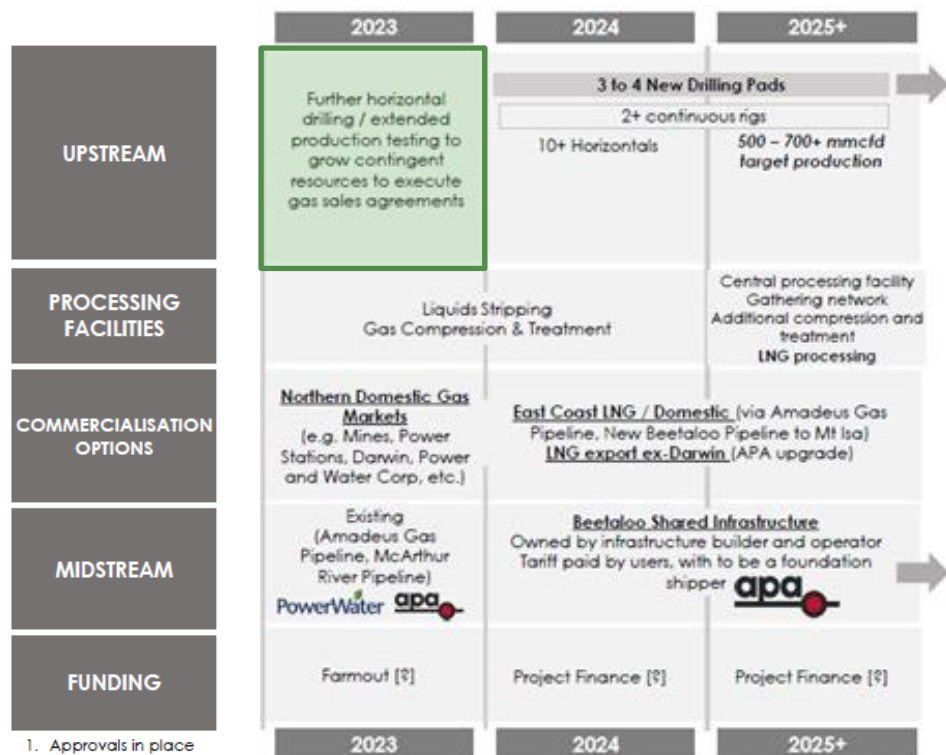
Area	Reservoir	Contingent Resource (100%) Net Sales Gas (BCF)		
		Low Estimate (1C)	Best Estimate (2C)	High Estimate (3C)
Carpentaria	Velkerri C	21	84	319
Carpentaria	Velkerri B	60	295	938
Carpentaria	Velkerri Intra A/B	-	7	14
Carpentaria	Velkerri A	-	10	21
Total*		81	396	1,292

Source: Company data

Gas Data To Support The Timeline To First Gas

We suggest the testing data from C-2H supports the company's timeline to a project FID and start-up by end-2023 – early-2024.

Exhibit 4: A timeline and a plan to first production



Source: Company data

Any-development project will probably be undertaken on a phased basis, with local gas supply supporting an extended commercial proof of concept and providing important early cash flow and operational experience.

The company has identified a number of opportunities in local power generation for township and mining operations that could aggregate to a 'starter' project of up to 25TJd (9PJ pa) of high calorific gas.

This may only require 3-4 wells from one drilling pad and be in production sometime in 2024. **At a gas price of say \$10-12/gj, a project at this scale could generate \$90-108mn pa** at ramped supply, at low operating cost with the gas likely requiring only minimal processing and compression.

A successful Phase 1 project would represent an important 'proof of project' model providing a substantial operational and finance base on which to build, delivering important initial cash flow to would support further financing (debt and partnering options) whilst minimising dilution of the capital base.

Our Valuation Remains Unchanged In The Range Of \$502mn-\$770m

We ascribe a value range for EEG from \$0.68-1.03/share **with a mid-point (base case) of \$0.83/share**, noting the closing share price of \$0.165/share (6-March) represents a 84% discount to the low end of the NAV range and in isolation can be considered a risk weighting of ~65% to our assigned value of the 2C resources.

Exhibit 5: The risked NAV range represents a material premium to the market price

	Risked range (A\$m)			
	Low	Mid	High	
Northern Territory				
Contingent Resources	\$328	\$378	\$479	2C volumes certified to 554Bcf of which 396Bcf (~70%) are attributed to EP 187 and 295Bcf to the mid-Velkerri B zone.
Prospective Resources	\$147	\$202	\$242	2U volumes are largely associated with ex EP 187 and ex-Pangaea tenements and represent longer-dated gas potential. The geological confidence level is relatively high on the look-through, but realisation will require extensive drilling campaigns.
US Onshore	\$39	\$48	\$66	Benefitting from higher US gas prices...these assets are self-funding.
	\$514	\$629	\$788	
Net cash/(debt)		\$17		
Corporate		(\$5)		
TOTAL	\$525	\$640	\$799	
Shares issued (mn)	773	\$0.68	\$0.83	\$1.03

Source: RaaS analysis; Risked ranges based on discretionary RaaS risk adjustments

We would highlight that this discount is not unusual compared to the unit values the market is applying to the sector. However, **flow data and updated reserves declarations due before mid-year, should close the 'value gap'** and underpin a resource rating as commercial outcomes become more tangibly demonstrable.

Exhibit 6: Financial Summary

EMPIRE ENERGY GROUP LTD		EEG					
YEAR END		Dec					
NAV	A\$m	\$0.68					
SHARE PRICE	A\$cps	\$0.165 priced as of close trading 6-Mar					
MARKET CAP	A\$m	128					
ORDINARY SHARES	M	773					
OPTIONS	M	10					
COMMODITY ASSUMPTIONS							
		2020	2021	2022E	2023E		
Realised oil price	US\$/b	39.48	67.98	94.25	79.32		
Realised gas price	US\$/mcf	1.96	3.72	6.42	4.21		
Exchange Rate	A\$:US\$	0.6989	0.7514	0.6946	0.6819		
RATIO ANALYSIS							
		2020	2021	2022E	2023E		
Shares Outstanding	M	324	612	773	773		
EPS (pre sig items)	US\$cps		(2.41)	(0.54)	(0.14)		
EPS	A\$cps	(2.73)	(2.41)	(0.54)	(0.14)		
PER	x		na	na	na		
OCFPS	A\$cps	(0.61)	(5.35)	37.40	2.11		
CFR	x		na	na	na		
DPS	A\$cps						
Dividend Yield	%						
BVPS	A\$cps	13.4	23.8	23.7	24.2		
Price/Book	x			0.7x	0.7x		
ROE	%			na	na		
ROA	%			na	na		
(Trailing) Debt/Cash	x						
Interest Cover	x						
Gross Profit/share	A\$cps	3.7	5.7	5.9	7.6		
EBITDAX	A\$m	2.9	3.0	6.7	6.8		
EBITDAX Ratio	%						
EARNINGS							
	A\$000s	2020	2021	2022E	2023E		
Revenue		6,464	8,502	12,662	11,421		
Cost of sales		(5,266)	(5,005)	(8,135)	(5,534)		
Gross Profit		1,198	3,497	4,527	5,887		
Other revenue							
Other income		1,039	1,606	1,927	293		
Exploration written off							
Finance costs		(755)	(568)	(677)	(668)		
Impairment		0	0	(2,705)	0		
Other expenses		(8,682)	(14,332)	(8,511)	(6,764)		
EBIT		(7,013)	(11,305)	(1,851)	166		
Profit before tax		(7,485)	(10,835)	(3,983)	(877)		
Taxes		(200)	(213)	(213)	(200)		
NPAT Reported		(7,684)	(11,048)	(4,196)	(1,077)		
Underlying Adjustments		0	0	0	0		
NPAT Underlying		(7,684)	(11,048)	(4,196)	(1,077)		
CASHFLOW							
	A\$000s	2020	2021	2022E	2023E		
Operational Cash Flow		(1,970)	(7,044)	13,796	1,686		
Net Interest		(755)	(568)	(677)	(455)		
Taxes Paid		(200)	(213)	(187)	(120)		
Other							
Net Operating Cashflow		(2,924)	(2,460)	20,082	1,110		
Exploration		(856)	0	0	(4,181)		
PP&E		(12)	0	(133)	(5)		
Petroleum Assets		(12,841)	(12,965)	(54)	0		
Net Asset Sales/other		0	0	0	0		
Net Investing Cashflow		(12,841)	(24,443)	(50,419)	(7,500)		
Dividends Paid							
Net Debt Drawdown		(1,845)	(817)	(793)	(500)		
Equity Issues/(Buyback)		17,640	39,359	28,928	0		
Other							
Net Financing Cashflow		15,795	38,542	28,550	(500)		
Net Change in Cash		29	11,639	(1,786)	(6,890)		
BALANCE SHEET							
	A\$000s	2020	2,021	2022E	2023E		
Cash & Equivalents		14,146	25,650	24,092	17,202		
O&G Properties		46,442	34,900	85,635	93,429		
PPE + ROU Assets		1,716	1,306	1,328	860		
Total Assets		66,563	158,823	207,710	207,609		
Debt		7,824	8,027	8,120	7,307		
Total Liabilities		36,327	49,502	80,232	80,020		
Total Net Assets/Equity		30,236	109,320	127,477	127,589		
Net Cash/(Debt)		6,322	17,622	15,972	9,895		
Gearing dn/(dn+e)							
NET PRODUCTION							
		2020	2021	2022E	2023E		
Crude Oil	kb	2	2	2	2		
Nat Gas	mmcf	1,630	1,676	1,727	1,727		
TOTAL	kboe	273	282	290	290		
RESOURCES and RESERVES							
		Contingent Resources			Prospective Resources		
		1C	2C	3C	1U	2U	3U
Northern Territory							
Gas (Bcf)		138.8	553.5	1,707.8	12,561	42,928	139,488
Liquids (Mb)		0.9	5.0	14.1	170	797	3,633
TOTAL (Mboe)		24.0	97.2	298.8	2,264	7,952	26,881
US Onshore							
		1P	2P	3P			
Gas (Bcf)		28	38	42			
EQUITY VALUATION							
		Risky Range			Low	Mid	High
	A\$m	Low	Mid	High			A\$/share
Northern Territory							
Contingent Resources		328	378	479	\$0.42	\$0.49	\$0.62
Scenario Weighting		3%	2%	1%			
Prospective Resources		147	202	242	\$0.19	\$0.26	\$0.31
US Onshore							
Appalachian		39	48	66	\$0.05	\$0.06	\$0.09
TOTAL		514	629	788	\$0.66	\$0.81	\$1.02
Net cash/(debt)				17			
Corporate costs				(5.0)			
TOTAL		525	640	799	\$0.68	\$0.83	\$1.03
Shares on issue (mn)		773 mn					

Source: RaaS Advisory, company data



FINANCIAL SERVICES GUIDE

RaaS Advisory Pty Ltd

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of

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Effective Date: 6th May 2021

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