

New Beetaloo permits ensure EEG spoilt for choice

Empire Energy Group Limited (ASX:EEG) is a junior oil and gas producer and explorer with onshore Northern Territory (NT) and US oil & gas assets. EEG holds the largest acreage position (28.9m acres) in the highly prospective Greater McArthur Basin, which includes the Beetaloo Sub-basin. After a material uplift in its 2C/2U gas/liquids resource base, with the 100% buyout of the Pangaea-EMG JV Beetaloo tenements for ~\$67m (@35cps), 2C Contingent Resources now lie @ 199Bcf gas / 3.5mmbbls liquids. 2U (“best case”) Prospective Resource rose to 42.1Tcf gas/791mmbbls liquids. The NT region is fast developing as a gas-liquids rich strategic bolster for east coast Australia’s future energy needs and Darwin’s expanding LNG export terminals, amid strong policy support from both Territory & Federal governments. The Beetaloo alone is judged to contain recoverable unconventional shale dry gas volumes of >190Tcf, with liquids upside. EEG also owns conventional gas/oil producing assets in the US Appalachia, hedged via a mix of put options and swaps at minimum 2021 floor prices of US\$2.50/mcf. EEG’s 2021 Beetaloo Middle Velkerri Formation shale work program aims to firm-up well technicals & economics, to enable sales & distribution agreements. We also expect further resource upgrades to result from 2021’s drilling & regional seismic data, as well as approvals to delineate a 2022 work program on Pangaea’s tenements. Having recently raised additional cash, EEG’s 2021 work program is fully-funded.

Business model

Empire Energy Group (EEG) is a junior oil & gas producer/exploration company, focused on maturing its portfolio of onshore, long-life oil and gas fields. The company is the 2nd largest conventional gas producer in the US NY State and holds substantial exploration acreage (28.9m acres) in Australia’s Northern Territory McArthur-Beetaloo basin, considered world-class. Commercial gas flow rate successes from EEG’s Beetaloo 2021 work program could deliver reserves and allow cashflows within 24-36 months (RaaS estimate), assisted by liquids “credits”, assuming existing pipeline infrastructure links & upgrades are delivered in parallel; supported by generous Federal government “Basin Strategic Plan” funding.

2021 to focus on Beetaloo commercial development outcomes

With the Pangaea-EMG \$67m buyout largely concluded and 2021 funding fully secured, EEG can focus its attention on developing the commercial outcomes for its expanded Beetaloo tenement portfolio. Recent uplifts in US oil and gas asset prices may additionally renew M&A interest in EEG’s US Appalachia portfolio, which no longer looks a natural fit amid EEG’s increasingly NT-dominated portfolio. A sale could release cash for the NT drill programme. In the Beetaloo, we expect EEG to continue its NT-approved vertical hydraulic stimulation & flow testing plans for the Carpentaria-1 well, plus conduct infill and step-out 2D seismic on the SW area of the EP187 tenement, after observing liquids-rich gas within EEG’s EP187 middle Velkerri Formation shales in 2020, enabling sizeable prospective resource upgrades. The Pangaea tenements will also receive drilling attention, once access rights and EMP approvals are in place, likely by 2Q 2022’s dry season. Further expansions to EEG’s 2C resources will define the size/delivery schedule of potential sales agreements. A liquids component offers early commercialisation “credits” options, while installed pipeline infrastructure on EEG’s Beetaloo tenements offers ready-made transport options, both into Darwin (for processing/exports) and east coast consumer markets.

Resuming coverage with a valuation range of \$0.62-\$1.17

We have updated our model to incorporate the Pangaea-EMG Beetaloo tenement buyout. Our mid-point valuation has lifted by 207% to \$0.98/share (previously \$0.61/share). Our valuation range is now \$0.62-\$1.17/share. EEG has several event drivers over the next 6-12 months which we view hold potential to generate a sizeable uplift in NAV.

Historical earnings and RaaS Advisory estimates

Year end	Revenue (A\$m)	Gross Profit (A\$m)	NPAT reported (A\$m)	OCFPS (AUD cps)	EPS Adj (AUD cps)	Price/Book (x)
12/19a	7.8	1.7	(17.3)	0.69	(9.31)	4.3
12/20a	6.5	1.2	(7.7)	(0.61)	(2.73)	2.4
12/21e	6.4	1.6	(5.1)	(0.11)	(0.83)	1.8
12/22e	6.6	1.7	(4.8)	(0.08)	(0.77)	1.8

Source: Company data, RaaS estimates for FY21e & FY22e

Energy exploration & production

20th May 2021

Share details

ASX Code	EEG
Share price	\$0.32
Market Capitalisation	\$198M
Shares on issue	620M
Net cash at 12 May	~\$18.6M
Gross cash at 12 May	~\$27.6M

Share performance (12 months)



Upside Case

- EEG’s EP187 Carpentaria-1 Velkerri shale production/seismic program generates a substantial commercial gas/liquids business development case
- Further McArthur-Beetaloo work programs generate significant commercial outcomes
- EEG drilling success generates high-value LT strategic partnership(s) & funding options

Downside Case

- Beetaloo flow rates prove sub-commercial, negatively impacting regional permit values
- Equity issue financing becomes highly dilutive to future share capital growth
- Fracking success in NT/Qld pushes onshore energy prices to sub-economic levels

Board of Directors

Alex Underwood	Managing Director
Paul Espie AO	Non-Executive Chairman
Dr John Warburton	Non-Executive Director
Peter Cleary	Non-Executive Director
Louis Rozman	Non-Executive Director

Company contacts

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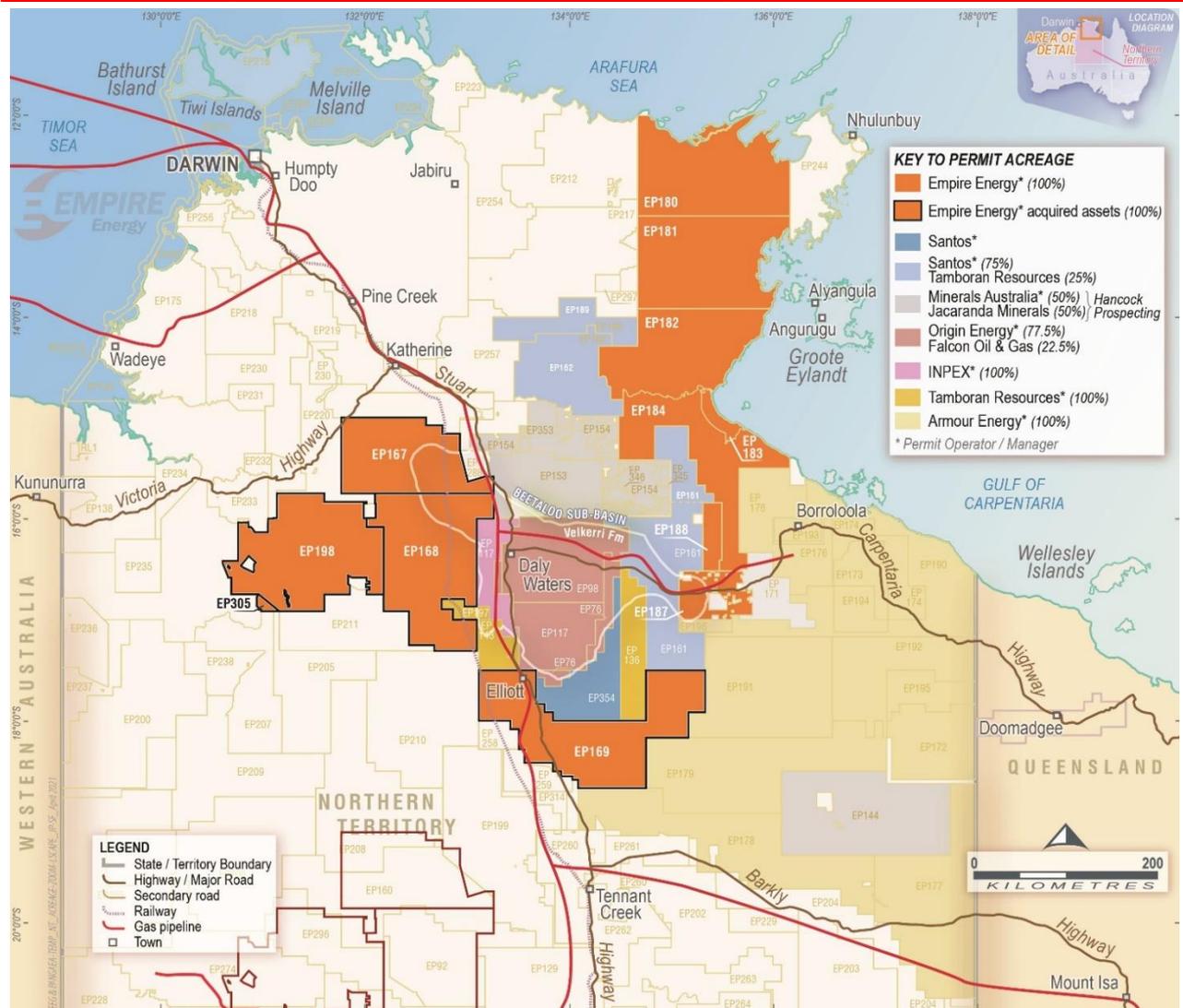
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*The analyst holds shares

Beetaloo deal-making: EEG spoils for Velkerri development choice

Exhibit 1: EEG + Pangaea/EMG McArthur-Beetaloo tenement holdings



Source: Company data

EEG has substantially beefed up its Contingent and Prospective Resource base in what has the potential to become one of the richest gas (& liquids) provinces in the world, after concluding a deal to buy the Pangaea-EMG JV exploration tenement holdings in the Beetaloo Sub-basin in April 2021 for ~\$67m based on the reference price of \$0.35/share.

In our view, securing these five tenements - located in the north-western and southern sections of the McArthur Basin / Beetaloo sub-basin - deliver to EEG and its shareholders, several key strategic advantages:

- An obviously larger chunk of the highly prospective Beetaloo sub-basin (adding +14.3m acres), which cements EEG as the region's largest tenement holder (total greater McArthur Basin acreage post deal: 28.9m acres);
- \$110m of sunk cost regional assessment data across 7 drill holes and a host of seismic for ~\$66.5m, including an inventory of existing appraisal and "set-to-go" horizontal drilling locations across a clearly defined subsurface data set – subject to securing tenement access and EMP approvals. Of particular note, results from Pangaea's EP167/168 appraisal works on the thick organic rich sequences of the middle Velkerri shale appear to gel well with those of EEG's EP187, highlighting the highly consistent nature of the formation, despite there being ~275kms "as the crow flies" from Carpentaria-1 to the Tarlee-S3 well;

- c) A significant automatic uplift in 2C gas and liquids resources, highlighting the more advanced nature of Pangaea-RMG JV's appraisal works and the clear potential to build-up upon the portfolio's existing gas and liquid shows and knowledge base aimed at commercial development opportunities.

The resource upgrade highlights include:

- (1) An eye-catching 385% uplift in total 2C gas resources (from 41bcf to 199bcf), further along the development curve, centred in the organically-rich A/B/C shale zones of the middle Velkerri formation;
 - (2) a 682% uplift in 2U Velkerri formation gas resources (from 3.4tcf to 30.2tcf); the addition of Kyalla Formation secondary target 2C resources (+4.5bcf) – which had been de-emphasised by EEG as “too shallow” in EP187 following Carpentaria-1 drilling, versus the Origin/Falcon Lower Kyalla shale “notice of discovery” as a liquids-rich gas play;
 - (3) The “first-time” demonstration of a 2C contingent liquids resource (3.5mmbbls) as well as a 110% uplift in 2U liquids Prospective Resources to 791mmbbls.
- d) Improved reservoir diversity, accessing both (i) a different part of the basin's Velkerri Shale (2C 194 bcf) reservoir, in conjunction with (ii) offering improved commercial potential from the shallower Kyalla (2C 4.5bcf; 2U 857bcf) too;
- e) Access to a 2nd transport distribution network, the Amadeus Gas Pipeline, which feeds into the expandable Darwin LNG export hub, as well as connecting into Jemena's Northern Gas Pipeline, which feeds into Mt Isa and in turn the east coast Australian gas market. This key strategic access point adds to EEG's ready access to the McArthur River Mine Gas pipeline which crosses EEG's existing EP187 tenement.
- f) Greater funding security: adjoining the transaction, EEG also moved to raise a net \$37.2m (2-tranche placement \$30m +\$6m SPP +\$1.2m directors – subject to shareholder approval), delivering funding security to complete its approved 2021 EP187 work program. This will allow EEG to gain access rights and 2022 work plan approvals for Pangaea-EMG's EP 167/168 horizontal well extended flow test best-case options.

Exhibit 2: Empire Energy pre-acquisition resource and post consolidation

Shale Unit	EEG Pre Acquisition						Pangaea/EMG JV (100%)						EEG Post Consolidation					
	Low 1U		Best 2U		High 3U		Low 1U		Best 2U		High 3U		Low 1U		Best 2U		High 3U	
	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf
Kyalla							88	184	378	857	1,571	4,891	88	184	378	857	1,571	4,891
Mid-Velkerri	4	1,990	27	3,446	99	7,091	76	8,172	387	26,768	1,938	80,644	80	10,162	414	30,214	2,037	87,735
Barney Creek		1,633		11,053		45,380								1,633		11,053		45,380
Total	4	3,623	27	14,499	99	52,471	165	8,356	765	27,625	3,509	85,535	169	11,979	792	42,124	3,608	138,006
	1C		2C		3C		1C		2C		3C		1C		2C		3C	
	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf	Mb	Bcf
Kyalla							0.8	0.8	3.0	4.5	11.2	27.8	0.8	0.8	3.0	4.5	11.2	27.8
Mid-Velkerri				41.0		86.0	0.1	57.2	0.5	153.0	3.0	388.1	0.1	57.2	0.5	194.0	3.0	474.1
Barney Creek																		
Total	0	0	0	41.0	0	86.0	1.0	58.1	3.5	157.5	14.2	415.9	1.0	58.1	3.5	198.5	14.2	501.9

Source: Company data, RaaS Analysis

Valuation uplift from the acquisition

Exhibit 3: Valuation range of \$0.63-\$1.20 with mid-point of \$1.00/share							
	Risky Range			Low	Mid	High	A\$/share
	Low	Mid	High				
Northern Territory							
Contingent Resources (in A\$m)	\$149	\$186	\$214	\$0.24	\$0.30	\$0.34	
Scenario Weighting	3.25%	1.38%	0.56%				
Prospective Resources (in A\$m)	\$218	\$398	\$485	\$0.35	\$0.64	\$0.78	
US Onshore							
Appalachian	\$5	\$10	\$15	\$0.01	\$0.02	\$0.02	
Valuation pre debt/corporate (in A\$m)	\$371	\$594	\$714	\$0.60	\$0.96	\$1.15	
Net cash/(debt)	\$19	\$19	\$19				
Corporate costs	(\$5)	(\$5)	(\$5)				
Valuation (in A\$m)	\$385	\$608	\$728	\$0.62	\$0.98	\$1.17	
Shares on issue (mn)	620						
Source: RaaS analysis							

Our last reported valuation (17-November 2020) was \$198m or \$0.61/share, which was the mid-point in a range from \$143mn-\$406mn (\$0.44-\$1.26/share with 324mn shares on issue). Taking into account the Pangaea/EMG JV acquisition together with the recent capital raise has resulted in the valuation range increasing to \$385mn-\$728mn or \$0.62-\$1.17/share, with 620mn shares on issue post acquisition. **We use the mid-point of our valuation range, which results in a valuation uplift of 207% to \$608M or \$0.98/share.**

To derive our value estimate, we have applied steeply risk-adjusted discretionary commercial success probability weightings to EEG's post-deal contingent and prospective resources. These are further risk-adjustments to take account of a host of commercial factors, including, but not limited to, commodity prices; location; transport; price hub netbacks; funding; timelines to development and scale of future work programs. We highlight the significant subjectivity underpinning such valuations.

We note that the vast majority of EEG's current market value is being driven by its Northern Territory exploration assets. These remain subject to significant value adjustments in either direction, following the results of planned further drilling and appraisal works to build an economic reserve, to confirm commercial viability.

The current reference price of \$0.32/share suggests that the market is giving a very low probability (~5%) of EEG converting its 2C resource to 2P, which, in our view is overly pessimistic.

On the plus side, the Northern Territory's Geological Survey estimates the Beetaloo Sub-basin holds more than 190tcf of gas, with the ability at that level to supply Australia's current gas demand requirements for decades.

The strong R&D evaluation phase for the Beetaloo as a whole may require additional time to understand the most optimal commercial well development designs. Only thereafter, can future transport access and customer offtake negotiations take shape to add value.

EEG, along with others in the sub-basin, are still to perform successful multi-stage horizontal drilling over an extended period to be able to conclude definitive commercial viability and/or whether the gas is "dry" or "liquids-rich". While all indicators to-date have been positive (including strong total organic carbon showings (typically 3-6%); good daily gas flows; good pore-pressure gradients (eg 0.52-0.55psi/ft; low CO2 content & high porosity), the Origin-Falcon Amungee NW-1H well, spudded in September 2016, remains the only horizontally fracture stimulated well to be extensively evaluated in the Beetaloo Sub-basin focusing on the Velkerri formation, which generated gas flows of 1-1.5MMscf/d. However, "extended production testing" only ran for 57 days and across 11 hydraulic fracture stages along a 1,100m section, although not all stages were successfully accessed for the production test. Far more work needs to be done.

Origin's Kyalla 117 N2-1H ST2 is planning an extended production test later this year, after issuing a "notice of discovery" on 19.01.21, recording gas flow rates over 17 hours of 0.4-0.6MMscf/day, focusing on the Kyalla formation.

Santos has commenced a two well Tanumbirini horizontal drilling campaign, with the recent spudding of Tanumbirini-2H. The well is prognosed to have a total length of 4800m, of which we estimate ~1000-1500m is likely to be a horizontal section. This frack campaign is planned over 10-20 stages. The wells be drilled

back-to-back, with results due for market release sometime in 3Q. These wells are expected to offer EEG look-through development drilling options, which in combination with EEG's own testing and other work throughout the basin, will allow EEG to define its commercial model.

Project economics can certainly be improved by introducing fracking, since the rocks are opened to allow hydrocarbons to flow more quickly, without fracking the wells would likely not flow at all. Given the depth, fracking can typically be far more repeatable along a chosen shale zone. Likewise net project economics would usually improve by having a liquids-rich (C3 upwards) development. A small incremental increase in operating costs would be offset by a large increase in potential production revenues.

In addition, from US experience, typical shale gas well flows take on a hyperbolic decline curve path, where production in the initial period (typically 3-6 months) is very high, relative to the average monthly production rate over the life of the well. A well's production rate declines rapidly from this initial production phase. Although an individual well may continue to produce for a long period of time (eg 20 years) at very low levels. Encouragingly, the Origin-Falcon Amungee NW-1H hole exhibited very little decline in gas rates over its 57-day test, offering potential upside for Beetaloo owners versus those tapping the US shale formations.

Valuation Risks & Caveats

Given the stage of exploration / appraisal, even though results by both EEG and regionally have been uber encouraging, there are still many risks that could hinder EEG in its goal to successfully reach and operate at full commercial production. These risks include: regulatory and governmental process; title; native title & aboriginal land; exploration; environmental; reserves; financing; commodity prices; key personnel; services risk; economic conditions; customer; competition; insurance; and production.

Being spoilt for choice can be a double-edged sword for EEG, given the balance sheet and operating depth of other Beetaloo explorers. There is only so much local NT and east coast domestic demand, with other Basins also vying to commercialise first: speed to market will be key. The eye must remain firmly on defining a commercial prize, then securing offtake and transport partners.

Already we are seeing some of the potential Asian gas demand cut from the Australian supplier opportunity list, due to strained trade relations with China. Turkmenistan is one country getting more attention instead. However other Asian countries, including Australia's nearest neighbours in South East Asia, are likely to trend at least a portion of their coal towards gas replacement as well as choosing gas for any electricity growth demands.

Meanwhile on the other side of the fence, the push for renewables means greater energy mix competition, as well as a growing anti-gas and anti-frack downstream customer base. While we believe renewable mass balances will take significantly longer to realise than the world is anticipating (in line with a recent EIA warning of significant resource supply bottlenecks to achieve the \$200 trillion global rebuild of 120 years of installed coal-based electricity supply chains), current consumer "Greta-factor" sentiment has its own building momentum, impatient for change. This adds risk to Beetaloo commercial developments.

Key Milestones for 2021

Event Drivers - Looking Ahead

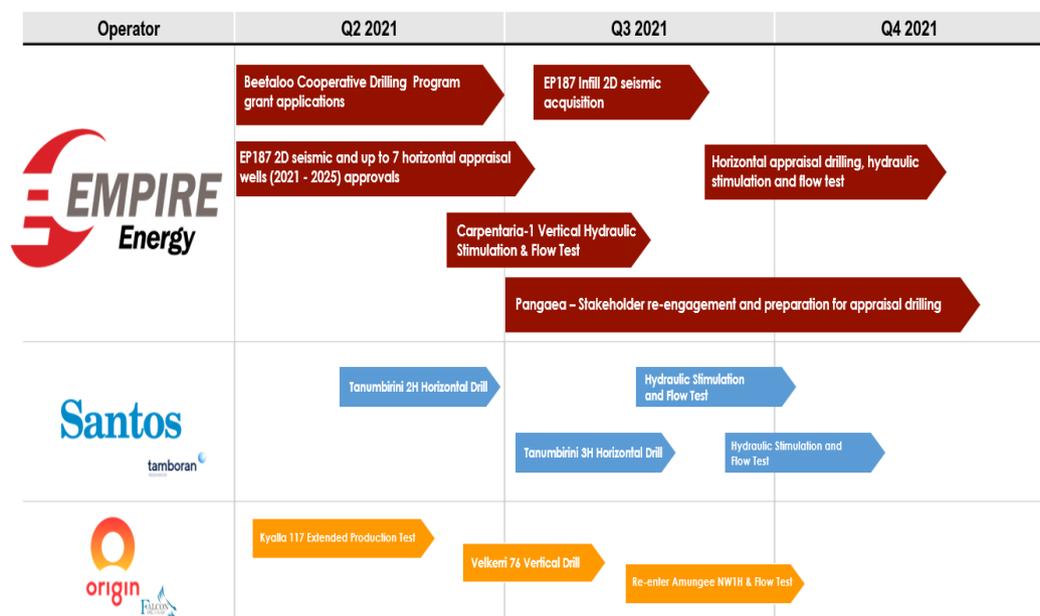
Without doubt, EEG's experienced board and management team will be operating a busy year in 2021. The company has delineated a number of key milestones for the year, aiming ultimately to deliver shareholders cashflow-positive commercial outcomes from its expanding oil and gas asset portfolio.

In our view, EEG's **key 2021 deliverables** include the following:

- a) Completing and bedding down the Pangaea Beetaloo 5-tenement purchase (*incl. securing shareholder approvals at an EGM, to be convened once the Independent Experts Report is prepared and ASIC clearance has been received for release of the shareholder booklet. Expected shortly*);
- b) Completing the April 2021 \$30m (@30cps) fund raising (*including securing shareholder approvals on 27 May at the AGM*);
- c) Progressing the Beetaloo commercialisation plans:
 - i. EP187: Carpentaria-1 vertical / horizontal well appraisal – aiming to buildout Contingent Resources and achieve commercial (gas/liquid) flows (vertical testing was approved on

- 16 February, with a 5-year term & is expected to commence in early-June, using Schlumberger equipment);
- II. Regional EP187 infill and step-out seismic analysis to better delineate the tenement’s SW corner, as inputs to deciding the best well pad locations for a further 7-well horizontal approvals (including a horizontal section from Carpentaria-1), including 6 new well pads;
- III. Securing local pipeline transport route deals & gas/liquids sales arrangements.
- IV. Re-engaging with landholders across the key Pangaea tenement areas (primarily pastoral and traditional owners), in preparation to launch a 2022 work programme;
- d) Determining other pursuits, options and opportunities, including a potential US asset sale; together with further solar/wind energy lease arrangements for its US Appalachia tenements.
- e) Finalising negotiations with Macquarie Bank Ltd to refinance the US\$7.5m (A\$9.6m) US debt facility (US LIBOR +650bps), drawn to \$6.5m as at Q1 2021, on better terms, noting Macquarie agreed at the end of the first quarter to remove certain covenants, including the Interest Cover ratio and Adjusted P1 PV10 ratio, following an uplift in Henry Hub prices. Having closed 2020 at US\$2.54/MMBtu, prevailing prices are at ~US\$2.95/MMBtu.

Exhibit 4: Beetaloo 2021 regional exploration program summary



Source: Company data

In addition, we expect EEG’s shareholder value to gain additional read-through benefits from:

- a) regional late-stage exploration appraisal activities by the likes of Santos and Origin, which are expected to further progress the technical and economic standing of the basin;
- b) ongoing policy and investment support from both the Federal and NT state government authorities. We note EEG has already applied for a federal exploration funding grant of up to \$7.5m per wellbore;
- c) Improving energy prices as covid-stimulated global demand recovers and expands.

Bedding down the Pangaea Beetaloo tenement purchase

Exhibit 5: Pangaea acquisition deal terms: a mix of cash; scrip & 70cps options

Pangaea-EMG JV sellers	Paul Fudge	EMG	Totals	Total Value (\$) @30cps
Shareholding in Pangaea -EMG JV	82.5%	17.5%	100.0%	56,970,091
Cash	5,000,000	1,061,000	6,061,000	6,061,000
Shares issued by EEG	140,000,000	29,696,970	169,696,970	50,909,091
no escrow	10,000,000	4,681,818	14,681,818	
escrow 12 mths	55,000,000	11,666,667	66,666,667	
escrow 24 mths	75,000,000	13,348,485	88,348,485	
2024 Options (70cps)	8,000,000	1,696,970	9,696,970	
Shareholding post deal	23%	5%	28%	

Source: Company data, RaaS analysis

EEG first announced the acquisition of 82.5% of Pangaea NT Unit Trust's Beetaloo Sub-basin tenement portfolio for a mixture of cash (\$5m), scrip (140m EEG shares) and options (8m unlisted options exercisable at 70cps), in total representing ~\$55m (@\$0.35ps) on 14 April 2021.

The underlying seller, Paul Fudge, will join EEG's Board of Directors (his nominated alternative is Jacqui Clarke, a former Deloitte Australia partner). Mr Fudge is an experienced oil and gas sector investor, much admired for his Queensland coal seam gas first mover and Beetaloo investments. His EEG stake will represent 23% of the shareholder register (post deal & fund raising). Mr Fudge has agreed to voluntary escrow arrangements, with 55m shares in custody for no less than 12 months and the remaining 75m shares in escrow for no less than 24 months.

Subsequently, on 26 April 2021, Pangaea's remaining 17.5% minority shareholder, Texas-based Energy & Minerals Group (EMG), has accepted the same deal terms under the JV's "drag & tag" rights. EEG will pay a further \$1.06m cash; 29.7m EEG shares and 1.7m EEG unlisted \$0.70 options to EMG. EMG will represent 5% of the shareholder register.

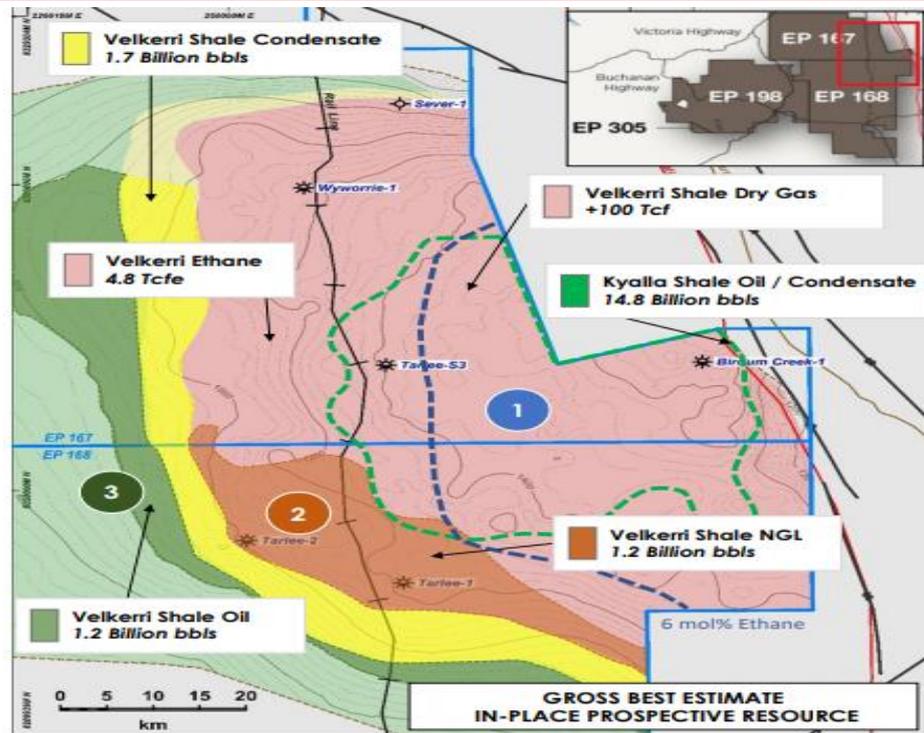
EEG also launched a further ~\$37m fund raising, including a two-tranche share placement and a shareholder SPP which was upscaled from \$3m to \$6m and closed on 7 May.

The entire deal remains subject to shareholder and regulatory (NT) approvals.

Question: What did EEG actually buy?

Answer: *More contingent & prospective gas; more contingent & prospective liquids; more gas and liquid hydrocarbons with upside potential both in the Velkerri and Kyalla at relatively shallow depths, with initial production testing demonstrating gas flows to surface. Refer Exhibit 2 for the resources.*

Exhibit 6: Pangaea data interpretation conclusions for the EP167/EP168 tenements



Source: Company data

Pangaea’s Beetaloo Sub-basin tenement portfolio holds 5 exploration permits, EP167, EP168, EP169, EP305 and EP198. Netherland, Sewell & Associates Inc, US-based petroleum consulting specialists, has estimated a 2C Contingent Resource of **158 BCF gas and 3.5 mmbbls liquids**, within a best estimate 2U Prospective Resource of **27.6 TCF gas and 765 mmbbls liquids**.

These NSAI resource estimation resulted from **~\$110m of exploration capex** invested over the years 2013-2016 (ahead of the NT unconventional moratorium: Sept 2016 – April 2018). The resulting data sets and acquired knowledge will now become valuable resources in EEG’s hands to leverage. The results were derived from the following appraisal works:

- (i) 1 exploration well (Hidden Valley S2);
- (ii) 4 appraisal wells (Birdum Creek-1; Tarlee-1; Tarlee-2; Wyworrie-1);
- (iii) 2 stratigraphic holes (Manbulloo-S1; Tarlee-S3);
- (iv) 1,764km of 2D seismic surveys;
- (v) 29,268 kms of airborne surveys;
- (vi) 3,500m of core samples.

Exhibit 7: Pangaea-RMG JV tenements – historical drilling details

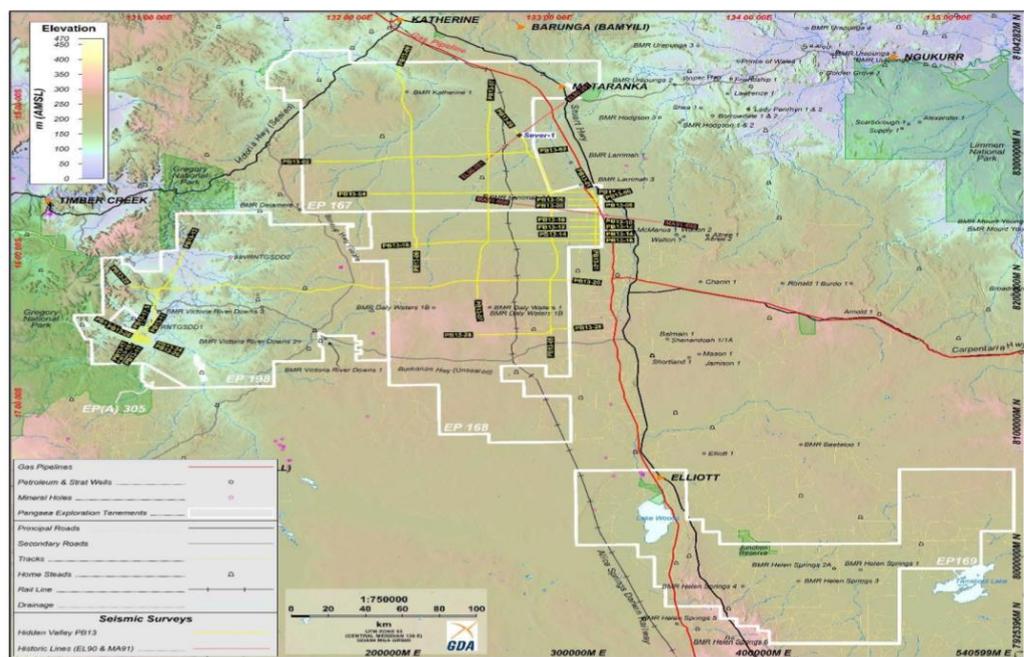
Well Name	Tenement	SPUD Date	Total V Depth	Well Type	Results
Pangaea-EMG JV works					
Hidden Valley - S2	EP168	26.05.14	1744	exploration	oil shows
Manbulloo-S1	EP 167	17.07.14	1236	stratigraphic core	oil shows
Tarlee-S3	EP 167	21.08.14	1650	stratigraphic core	oil & gas shows
Birdum Creek-1	EP 167	03.06.15	1935	appraisal	HC shows - Kyalla / Middle Velkerri (minimal)
Tarlee-1	EP 168	10.06.15	1388	appraisal	HC shows
Tarlee-2	EP 168	30.06.15	1180	appraisal	HC shows - Kyalla / Middle Velkerri
Wyworrie-1	EP167	26.07.15	1385	appraisal	oil & gas shows
Pacific Oil & Gas					
Sever-1	EP167	1.09.1990	1260	stratigraphic	no shows

Source: NT Open Source file data

Of particular note, a gas discovery was declared at Wyworrie-1 over the shales of the middle Velkerri Formation, while Tarlee-S3 highlighted live oil shows in the Kyalla Formation shale, together with gas shows from the middle Velkerri Formation shales. The middle Velkerri highlighted 3 thick organic-rich shale zones (with total organic content (TOC) up to 10% in the B shale).

Pangaea had conducted a substantial exploration program across its EP 167/168/198 tenements in 2013, which included acquiring over 1,377 line kms of 2D seismic and 29k line km of airborne full-tensor gravity-radiometry in the Hidden Valley region. One of the key findings from this work, together with the drilled Hidden Valley-S2 and Manbulloo-S1 wells, was to confirm the Birrindudu and McArthur basins as one continuous basin and the middle Velkerri Formation as only present in EP167 and EP168, but not extending into EP198. From reviewing the well completion reports of these past work program, we expect EEG’s next step focus on Pangaea’s assets will be to conduct extended vertical and horizontal production tests proximal to the Tarlee-S3 area.

Exhibit 8: Pangaea-EMG 2D seismic acquisition



Source: Company data

EEG 2021 Funding position

In conjunction with the Pangaea acquisition, the raising’s core benefit is that it will leave the company fully-funded for its expanded 2021 Beetaloo commercial appraisal plans. With ~\$11m applied to fund the cash component of the Pangaea-EMG purchase, stamp duty and transaction costs; we expect the remaining ~\$24-25m funds will combine with EEG’s \$11m existing gross Australian cash holdings to total ~A\$35m.

We anticipate the following near-term allocations:

- i. \$6m for Carpentaria-1 vertical appraisal drilling & flow testing;
- ii. \$2m on EP 187 step-out seismic surveying; and
- iii. Working capital

Empire is also funded to horizontally drill, hydraulic stimulate and flow a well in the Carpentaria Area. The well costs are expected to be supported by the Australian Government’s Beetaloo Cooperative Drilling Program grant funding.

We assume EEG’s US Appalachia onshore conventional energy production business will remain self-funding.

Other Cash options :

EEG also has 18.4m unlisted options issued, of which ~15.6m are in-the-money with the share price trading above 30cps. This could raise EEG up to an additional A\$4.92m.

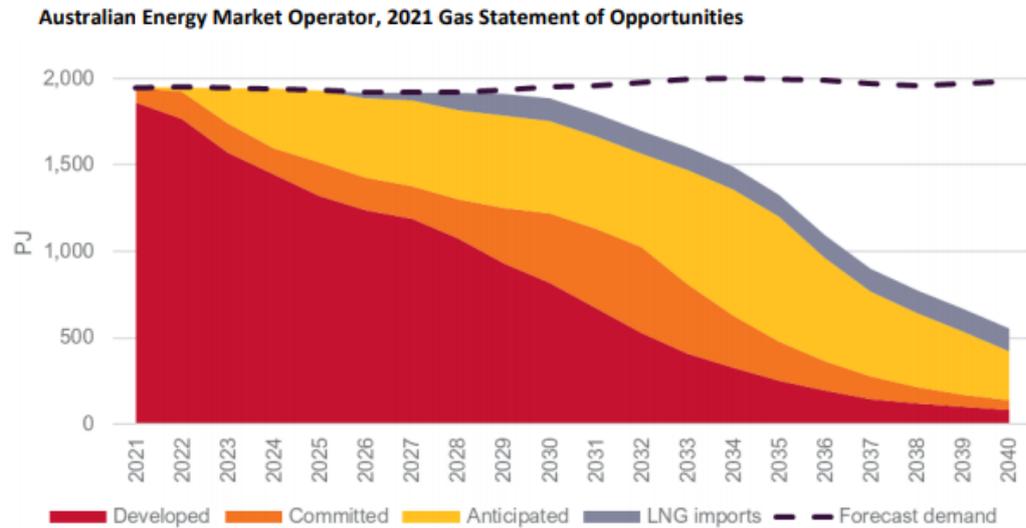
Exhibit 9: EEG unlisted option details (total: 18.4m; ITM 15.6m)					
Date	Option Class	Issued No	Exercise price A\$	Gross Cash Value A\$	
30/12/2021	Unlisted	1,300,000	0.30	390,000	
30/12/2021	Unlisted	600,000	0.30	180,000	
31/12/2021	Unlisted	12,000,000	0.32	3,840,000	
30/12/2022	Unlisted	1,700,000	0.30	510,000	
30/12/2022	Unlisted	2,800,000	0.60	1,680,000	

Source: Company data (as at 31 December 2020)

Note: the Pangaea-EGM 2024 70c option issuance is still to be approved, targeted for the June 2021 EGM

Australian Government Policy support for the "world-class" Beetaloo

Exhibit 10: Australia could experience gas supply deficits relative to demand



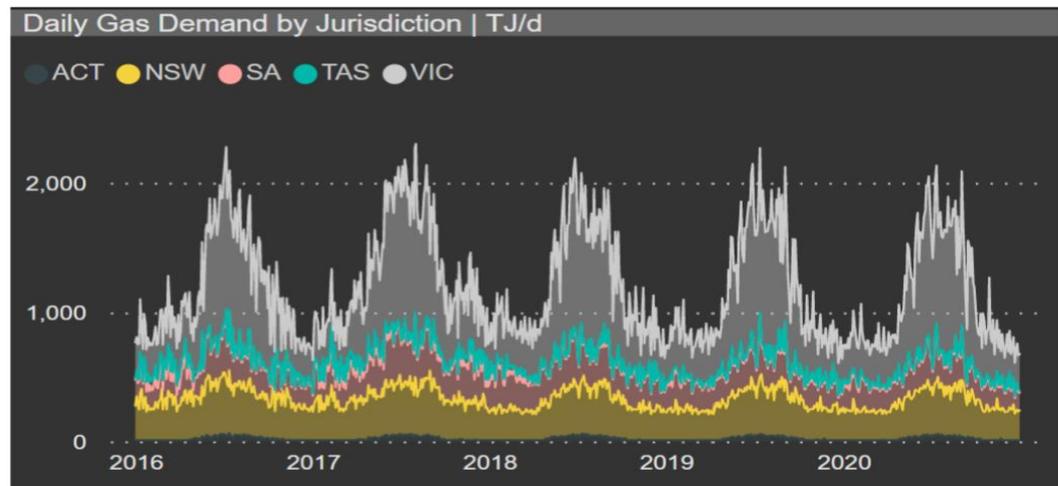
Source: Australian Energy Market Operator 2021 Gas Statement of Opportunities

A further funding source for EEG’s near-term exploration development work could come from the Australian Federal Government. The government announced a \$224m Beetaloo strategic basin funding package, as part of its 5-basin gas-led COVID economic recovery plans, underpinning its belief in the region developing into a “world class” energy province, employing up to 6,000 people over 20 years and capable of feeding the potentially energy-deficient eastern coast states. The government’s funding support, designed to fast-track regional private investment to grow energy reserves, includes the following key features:

- a) \$50m in Cooperative Drilling Program grants (up to \$7.5m each) to support \$200m (least 10 additional exploration wells) of regional exploration expenditure prior to December 2022;
- b) \$173m in NT infrastructure funding to improve regional roads (wet season) and rail access.

The Government is keen to see final investment decisions by upstream operators by 2025, if not earlier, to assist with the east coast deficit. At the moment, all of the Beetaloo’s upstream owners are focused at the exploration drilling appraisal stage and the speed race to market is on to ensure they do not become “stranded assets”, beaten commercially by other basins / other supply options.

Exhibit 11: East Coast Gas Demand (2016 – 2020)



Source: Core Energy

2021 Beetaloo tenement appraisal plans – aiming to book proved and probable reserves by year end

Carpentaria-1 well flow tests: Empire Energy Group (EEG) recently received 5-year EMP regulatory approval from the NT government to commence vertical hydraulic stimulation and flow test exploration activities in the Carpentaria-1 well. The well is located on the western boundary of its EP187 tenement, which in turn is located at the south-eastern tip of the highly prospective Beetaloo Sub-basin, a region considered to rival the best of US shale locales.

Having received NT EMP approvals in mid-February, EEG plans to commence the vertical fracture stimulation and flow test appraisal work program of the Carpentaria-1 well in June.

Appraisals will be focusing on further evaluating the most promising intervals of the middle Velkerri Formation shales, with the aim of firming up the commercial gas in place flow rate values (TJ/day) of the well (including average flow & decline rates & hydrocarbon volumes), as well as assess the best coordinates from which to commence horizontal stimulation of the well, anticipated for later this year.

Of note, EEG's vertical drilling of Carpentaria-1 in October 2020 delineated the thickest section of stacked of middle Velkerri Formation shales of any well drilled in the basin to date, with the highest liquids to gas ratio too.

We note that Santos/Tamboran JV achieved **average flow rates of 2.4 TJ/day** from the EP161 Tanumbirini-1 well tested over the first 90-hours during vertical hydraulic stimulation last October.

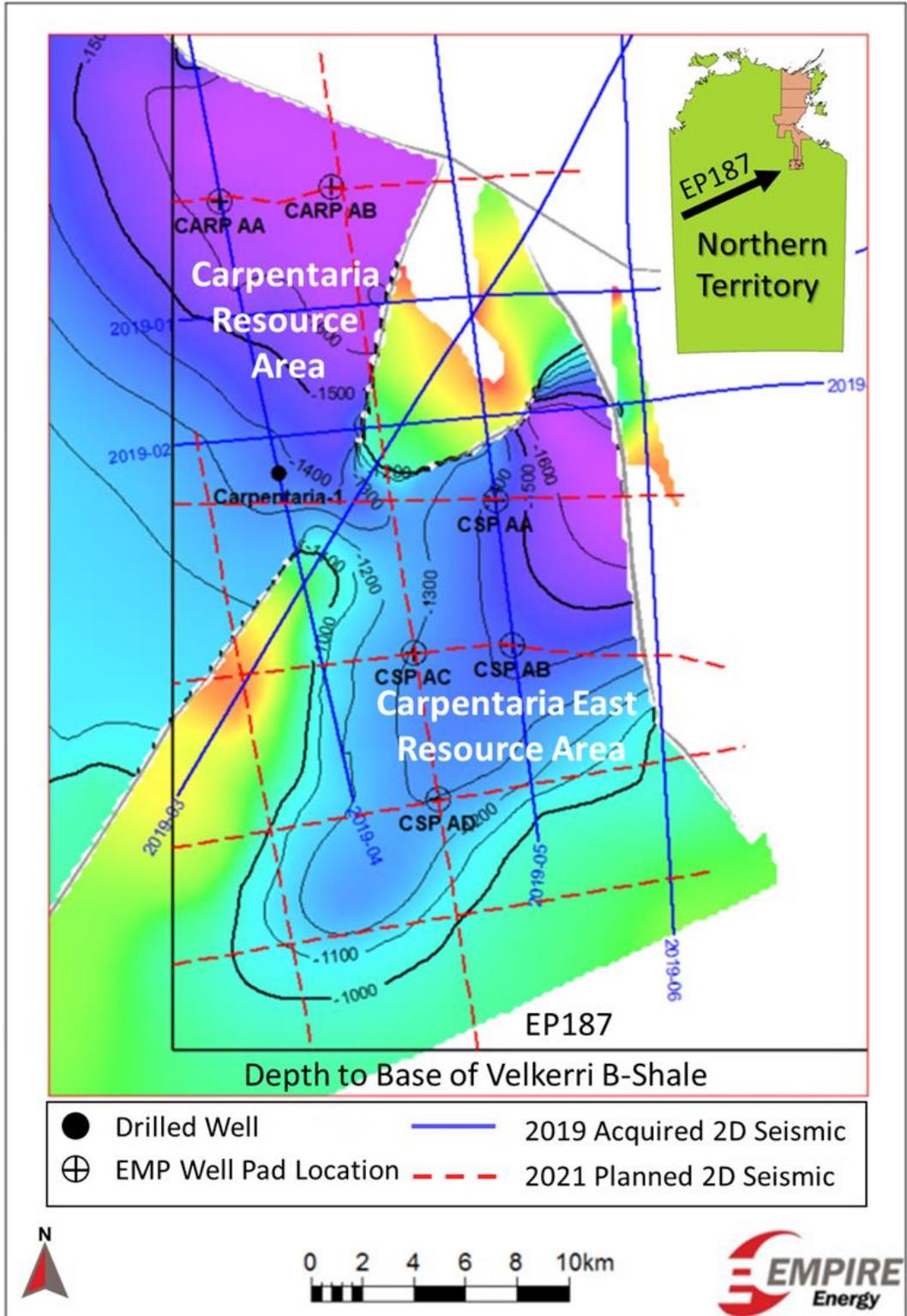
Horizontal wells typically produce higher flow rates than vertical fracture stimulated wells, because they expose larger volumes of hydrocarbon-rich rock surface areas. The JV holds high hopes that its next step horizontal wells targeting the middle Velkerri will be "on par or better than wells in the core Marcellus Shale, currently the most prolific unconventional gas shale play in North America". High hopes, indeed.

EP187 2D seismic

EEG also awaits approval to commence a regional infill and step-out 2D seismic mapping program on the southern section of its EP187 tenement, designed to support further prospective resource assessment and well planning.

The seismic program will tie with Empire's 2019 2D seismic survey to further confirm the extent of the Velkerri shale resource in the targeted acreage, as well as identify the potential thickness and any faulting, ahead of finalising the best locations for future drilling. Exhibit 12 on the following page sets out the company's 2021 2D seismic plan for EP187.

Exhibit 12: EEG's 2021 2D seismic plans

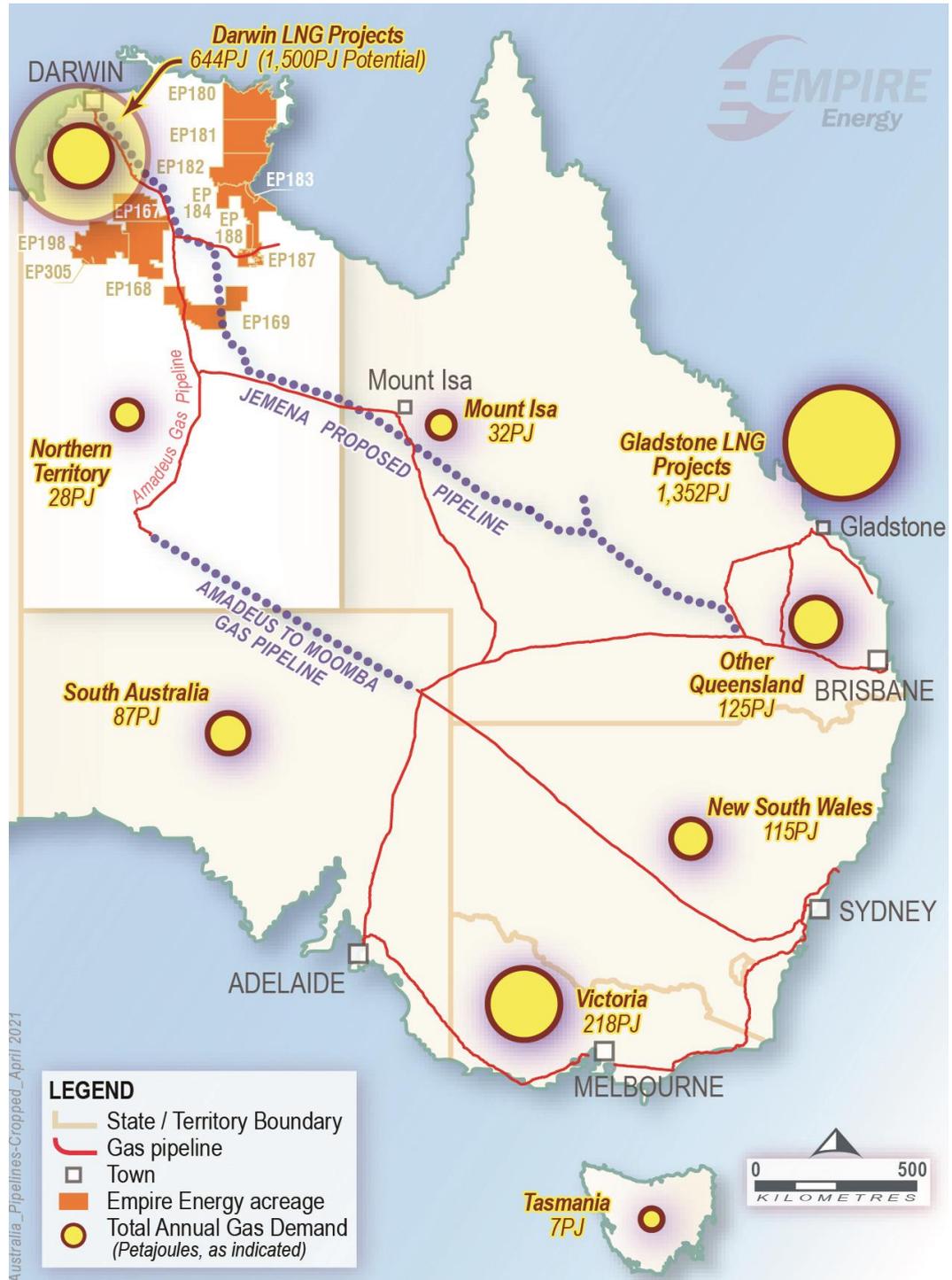


Source: Company data

EEG's Other NT Land Holdings - valuation uplift opportunities

EEG holds the largest acreage position in the McArthur Basin/Beetaloo Sub-basin area, amounting to over 28.9m acres. We are keen to see EEG making inroads with local landowners to gain access rights to its other regional exploration tenements, EPA180, EPA181, EPA182, EPA183, EP184, EPA185 and EPA188.

Exhibit 13: Regional pipeline infrastructure: Darwin export hub and East Coast options



EEG's early commercialisation investigations

EEG management is investigating early strategic commercialisation options for EP187. Arranging transportation offtake arrangements is a crucial part of securing a route to market – either into Asia, via the Darwin LNG hub or into the Australian east coast demand centres.

Progressively developing enough gas transmission pipeline capacity to link the Beetaloo's expected commercial gas flows to domestic and international markets will be a crucial necessity to underpin EEG's cashflow generation future.

The Daly Waters to McArthur River mine (MRM) pipeline, owned by NT Power & Water Corporation, with a nameplate capacity of 16 TJ/day, runs through EEG's EP187 tenement, just 5.7km from the Carpentaria-1 well head, running alongside the Carpentaria Highway. The Glencore-owned McArthur River mine is serviced by a 77MW gas-fired power plant supplied by the pipeline, which consumes ~9.0 TJ/day. Customers in Daly Waters in the other direction meanwhile can have total consumption requirements of up to 16 TJ/day. EEG may therefore experience difficulties gaining access.

Alternatively, gas pipeline and infrastructure developers continue to explore facilitation expansion options to transport gas into both Darwin and key East Coast markets. Jemena is keen to expand its existing gas pipeline network from NT's onshore and offshore gas fields into Queensland and has already signed a binding MOU gas offtake agreement last November with Tamboran Resources.

Meanwhile the presence of liquids expands EEG's early commercialisation options, especially as shallower depths as well as greater saturations & porosities suggest cheaper drilling expenses and stronger vertical flow rates than first anticipated. *C⁴ and above heavier grade sales can readily be fed* into Asian spot markets, while C² (ethane) and C³ (propane) can provide feedstock supplies for the petrochemical processing plants planned for Darwin. Santos announced that it will proceed with the NT-offshore US\$3.6bn Barossa gas & condensate project.

The Amadeus Gas Pipeline, which already feeds into the expandable Darwin LNG export hub, as well as connecting into Jemena's Northern Gas Pipeline, which in turn feeds into Mt Isa and further into the east coast Australian gas markets is also considering building another pipeline down into Moomba. This would allow NT gas to filter into South Australia, Victoria and NSW more directly, achieving lower transport costs.

EEG's US operations

Exhibit 14: EEG US Appalachia reserves and resources

Reserves - As of Dec 31, 2020	Oil (Mbbbls)	Gas (MMcf)	MBoe	Capex \$M	PV0 \$M	PV10 \$M
Reserves (Reserves)						
Proved Developed Producing	32	25,729	4,320	-	\$14,139	\$8,630
Proved Developed Non-producing					\$(62)	\$(28)
Proved Behind Pipe		-				
Shut-in	-	-	-	-	\$(563)	\$(255)
Proved Undeveloped						
Total 1P	32	25,729	4,320	-	\$13,514	\$8,347
Probable	-	10,087	1,680	\$7,809	\$16,545	\$1,992
Total 2P	32	35,816	6,000	\$7,809	\$30,059	\$10,339
Possible	158	3,880	805	\$5,102	\$11,085	\$1,780
Total 3P	190	39,696	6,805	\$12,911	\$41,144	\$12,119

USA Reserves by: Graves & Co Consulting

Source: Company data – valued on basis of energy sector forward curves over 8 years to 2028

EEG's US Appalachia operations, which feed US east coast electricity and heating demand, continued throughout the 2020 covid-lockdown periods as an essential service. Gross gas output for the year reached 2.11Bcf, down from 2.22Bcf in 2019, noting that some production was temporarily shut during periods of low gas pricing. Some natural field decline also occurred.

For 1Q21, revenues totalled A\$1.44m, generating a positive EBITDA of US\$61k, up from US\$43k in 4Q 2020.

The Company also executed its first deal to install third party solar and wind farms 30 acres, in return for a one-off lease payment of US\$30k. Other deals are expected.

Hedging continues to provide EEG with a buffer against low gas price action. 1Q21 sales prices lifted from US\$2.67/Mcfe to US\$2.77/Mcfe, while total lift costs were US\$1.31/Mcfe.

Exhibit 15: EEG US Henry Hub Nymex natural gas commodity hedge contracts (2021-2023)

Period	Volume (mmbtu/month)	Contract type	Strike Price	Premium
Apr-Dec 2021	25000	Puts	US\$2.50	US\$0.23 -USD\$0.41
Apr-Sep 2021	50000	Swap	US\$2.85	
Oct-Dec 2021	50000	Swap	US\$3.10	
Jan-Dec 2022	75000	Puts	US\$2.50	US\$0.35-USD\$0.41
Jan-Dec 2023	25000	Puts	US\$2.50	US\$0.41

Source: Company data as at 31 March 2021

Exhibit 16: Henry Hub gas 12-month historical price series (USD/MMBtu)



Source: EIA data; NGI

Exhibit 17: Financial Summary

EMPIRE ENERGY GROUP LTD		EEG				
YEAR END		Dec				
NAV	A\$m	\$0.98				
SHARE PRICE	A\$cps	0.32		priced as of close trading 19-May		
MARKET CAP	A\$m	198				
ORDINARY SHARES	M	620				
OPTIONS	M	57				
PROFIT & LOSS						
	A\$000s	2019	2020	2021E	2022E	
Revenue		7,763	6,464	6,375	6,561	
Cost of sales		(6,026)	(5,266)	(4,725)	(4,885)	
Gross Profit		1,737	1,198	1,650	1,676	
Other revenue						
Other income		224	1,039	262	262	
Exploration written off						
Finance costs		(916)	(755)	(747)	(730)	
Impairment		(1,677)	0	0	(2,465)	
Other expenses		(18,806)	(8,682)	(6,749)	(6,460)	
EBIT		(13,783)	(7,013)	(3,868)	(1,121)	
Profit before tax		(17,069)	(7,485)	(5,100)	(4,784)	
Taxes		(194)	(200)	0	0	
NPAT Reported		(17,263)	(7,684)	(5,100)	(4,784)	
Underlying Adjustments		(5,971)	0	0	0	
NPAT Underlying		(23,234)	(7,684)	(5,100)	(4,784)	
CASHFLOW						
	A\$000s	2019	2020	2021E	2022E	
Operational Cash Flow		1,822	(1,970)	569	618	
Net Interest		(2,712)	(755)	(571)	(556)	
Taxes Paid		(194)	(200)	(50)	(100)	
Other						
Net Operating Cashflow		(1,084)	(2,924)	(51)	(38)	
Exploration		0	(856)	0	0	
PP&E		0	(12)	0	(133)	
Petroleum Assets		(2,658)	(12,841)	(6,061)	0	
Net Asset Sales/other		27,698	0	0	0	
Net Investing Cashflow		25,040	(12,841)	(18,388)	(10,000)	
Dividends Paid						
Net Debt Drawdown		(26,943)	(1,845)	(1,170)	(1,222)	
Equity Issues/(Buyback)		11,562	17,640	35,240	153	
Other						
Net Financing Cashflow		(15,381)	15,795	33,320	(1,069)	
Net Change in Cash		8,575	29	14,881	(11,107)	
BALANCE SHEET						
	A\$000s	2019	2020	2021E	2022E	
Cash & Equivalents		14,106	14,146	29,027	17,920	
O&G Properties		37,505	46,442	125,485	135,748	
PPE + ROU Assets		711	1,716	1,198	1,181	
Total Assets		56,594	66,563	156,588	155,484	
Debt		9,251	7,824	7,826	7,104	
Total Liabilities		37,089	36,327	45,113	45,461	
Total Net Assets/Equity		19,505	30,236	111,475	110,023	
Net Cash/(Debt)		4,855	6,322	21,201	10,816	
NET PRODUCTION						
		2019	2020	2021E	2022E	
Crude Oil	kb	89	2	2	2	
Nat Gas	mmcf	1,778	1,630	1,679	1,729	
TOTAL	kboe	385	273	282	290	
Product Revenue	A\$m	7.8	6.5	6.4	6.6	
Cash Costs	A\$m	(6.0)	(5.3)	(4.7)	(4.9)	
Ave Price Realised	A\$/boe	20.16	23.64	22.64	22.64	
Cash Costs	A\$/boe	(15.65)	(19.26)	(16.78)	(16.86)	
Cash Margin		4.51	4.38	5.86	5.78	
nm = not meaningful na = not applicable						
COMMODITY ASSUMPTIONS						
		2019	2020	2021E	2022E	
Realised oil price	US\$/b	59.76	39.48	59.48	56.84	
Realised gas price	US\$/mcf	2.44	1.96	2.71	2.63	
Exchange Rate	A\$/US\$	0.6958	0.6989	0.7644	0.7623	
RESOURCES and RESERVES						
		Contingent Resources		Prospective Resources		
		1C	2C	3C	1U	2U
				3U		
Northern Territory						
Gas (Bcf)		58.1	198.5	501.9	11,979	42,124
Liquids (Mb)		1.0	3.5	14.2	169	792
TOTAL (Mboe)		10.6	36.6	97.8	2,165	7,813
US Onshore						
		1P	2P	3P		
Gas (Bcf)		24	34	38		
		0	Mb	24		
		0	Mb	24		
TOTAL (Mboe)				86	109	
US						
Gas			Bcf	34.4	38.2	
EQUITY VALUATION						
		Low	Mid	High	Low	Mid
					High	
NT						
Contingent		\$149	\$186	\$214	\$0.24	\$0.30
Prospective		\$218	\$398	\$485	\$0.35	\$0.64
US Onshore						
Appalachian		\$5	\$10	\$15	\$0.01	\$0.02
TOTAL		\$371	\$594	\$714	\$0.60	\$0.96
Net Cash (Debt)		\$22	\$22	\$22		
Corporate Costs		-\$5	-\$5	-\$5		
TOTAL		\$388	\$611	\$731	\$0.63	\$0.98
Shares on Issue		620 mn				
RATIO ANALYSIS						
		2019	2020	2021E	2022E	
Shares Outstanding	M	263	324	618	619	
EPS (pre sig items)	UScps			(0.83)	(0.77)	
EPS	Acps	(9.31)	(2.73)	(0.83)	(0.77)	
PER	x			na	na	
OCFPS	Acps	0.69	(0.61)	(0.11)	(0.08)	
CFR	x			na	na	
BVPS	Acps	7.5	13.4	18.0	17.8	
Price/Book	x	4.3x	2.4x	1.8x	1.8x	
ROE	%			na	na	
ROA	%			na	na	
Gross Profit/share	Acps	6.6	3.7	2.7	2.7	
EBITDAX	A\$m	2.7	2.9	2.5	2.6	
EBITDAX Ratio	%	34.2%	44.6%	40.0%	39.3%	

Source: RaaS Advisory



FINANCIAL SERVICES GUIDE

RaaS Advisory Pty Ltd

ABN 99 614 783 363

Corporate Authorised Representative, number 1248415

of

BR SECURITIES AUSTRALIA PTY LTD

ABN 92 168 734 530

AFSL 456663

Effective Date: 6th May 2021

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