Renergen Limited

Virginia Site Visit Gives us High Confidence on Project Delivery and Future Growth Potential

Impressive achievement to build SA's first LNG and helium plant

H&P visited Renergen's Virginia gas processing facility earlier this week. It is an impressive undertaking to have constructed this site in a remote location in the centre of South Africa, which will make it the country's first producer of LNG and helium. The scale of the achievement is all the greater given the challenges faced by working in the chronically undersupplied and bureaucratic energy and electricity market, which was evident from frequent load-shedding while we were in South Africa. For the Virginia gas plant, although there are individually complex pieces of kit, the overall production process is relatively simple, utilising proven technologies, which we detail in this note. Crucially in our view, all the critical equipment has been tested and is functioning as expected.

Initial teething problems resolved: we expect helium production within a month

There have been a few teething issues as is normal when starting up a new plant and Renergen has been extra-cautious so as not to cause any major damage which could happen by rushing start-up. The plant was actually producing LNG and pure gaseous helium and was hours away from producing liquid helium but as a precaution was shut-down due to an issue with the conduction oil system unit. This is used to heat the lubricants for the turbines and was found to be incorrectly installed by the manufacturer. This issue has now been fixed and is operational again. If all goes to plan with the restart we would expect LNG production to resume again shortly and helium production to commence within a month. There were several LNG trucks on site that had been filled with liquid methane waiting to be dispatched to customers.

Low cost drilling; well performance in line with expectations

The wells are producing as expected and new development wells continue to come online as predicted by Renergen's proprietary algorithm. These wells have been located 100m apart and there has been no noticeable interference (i.e. when one well cannibalises another). When looking at the well pads, what was striking was the tiny footprint that they occupy. Two slant wells can be drilled from one location at 90° to each other, to reduce the mobilisation costs. Given the shallow target depths, the drilling rigs used, which are designed for drilling boreholes, are much smaller than comparable onshore rigs in the US, resulting in much lower costs but also making them simpler to move around and there is ample availability of these rigs in the area. During the repairs, the Company has taken the opportunity to connect additional wells which were recently drilled.

Both helium pricing and LNG pricing above expectations

Given the strength of the helium spot market we see upside to Renergen's Phase 1 pricing. Renergen has only contracted ~80% of its helium to Linde, leaving the remainder for the spot market. Renergen's recent spot tender saw prices bid up to US$875/mcf versus our phase 1 forecast price of US$250/mcf in 2022. This is positive for the pricing for Phase 2 with the potential for a value uplift. Based on current South African diesel prices, Renergen will be selling its LNG at over US$25/mcf, which also suggests upside to our forecasts of US$16.5/mcf.

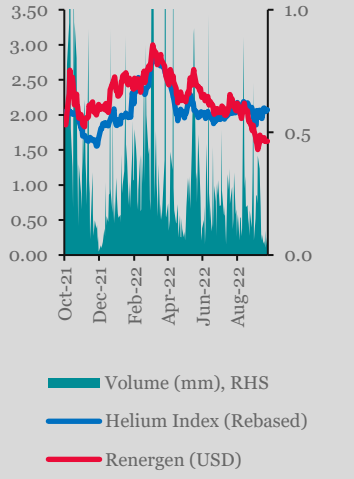
Valuation: increasing our risked NAV by 16% to A$6.7/sh or R77/sh

We have increased our risked NAV to A$6.7/sh (on marking to market FX moves), which implies ~185% upside from the current share price. Taking just the 2P value (excluding contingent resources and exploration upside) gives a risked value of A$6.1/sh or R70/sh, still implying ~160% upside. On a fully unrisked basis we see ~430% upside to the current share price. The main catalysts for Renergen in the coming months will be the first production of and sales of liquid helium, which given they are commissioning volumes may be sold on the spot market at high pricing. Renergen receiving Strategic Integrated Project (SIP) status would be a highly significant development as it would speed up all future Government approvals to a maximum of 57 days as opposed to many months or even years. It also enhances Renergen's first mover advantage in the region.

GICS Sector	**Energy**
Ticker	ASX:RLT; JSE:REN
Market cap 25-Oct-22 (US$mm)	235
Share price 25-Oct-22 (AUD)	2.34

NAV summary (AUD $/sh)

Asset	Unrisked	Risked
Core NAV	1.2	1.1
Development	8.3	5.0
Exploration	3.0	0.6
Total	**12.5**	**6.7**



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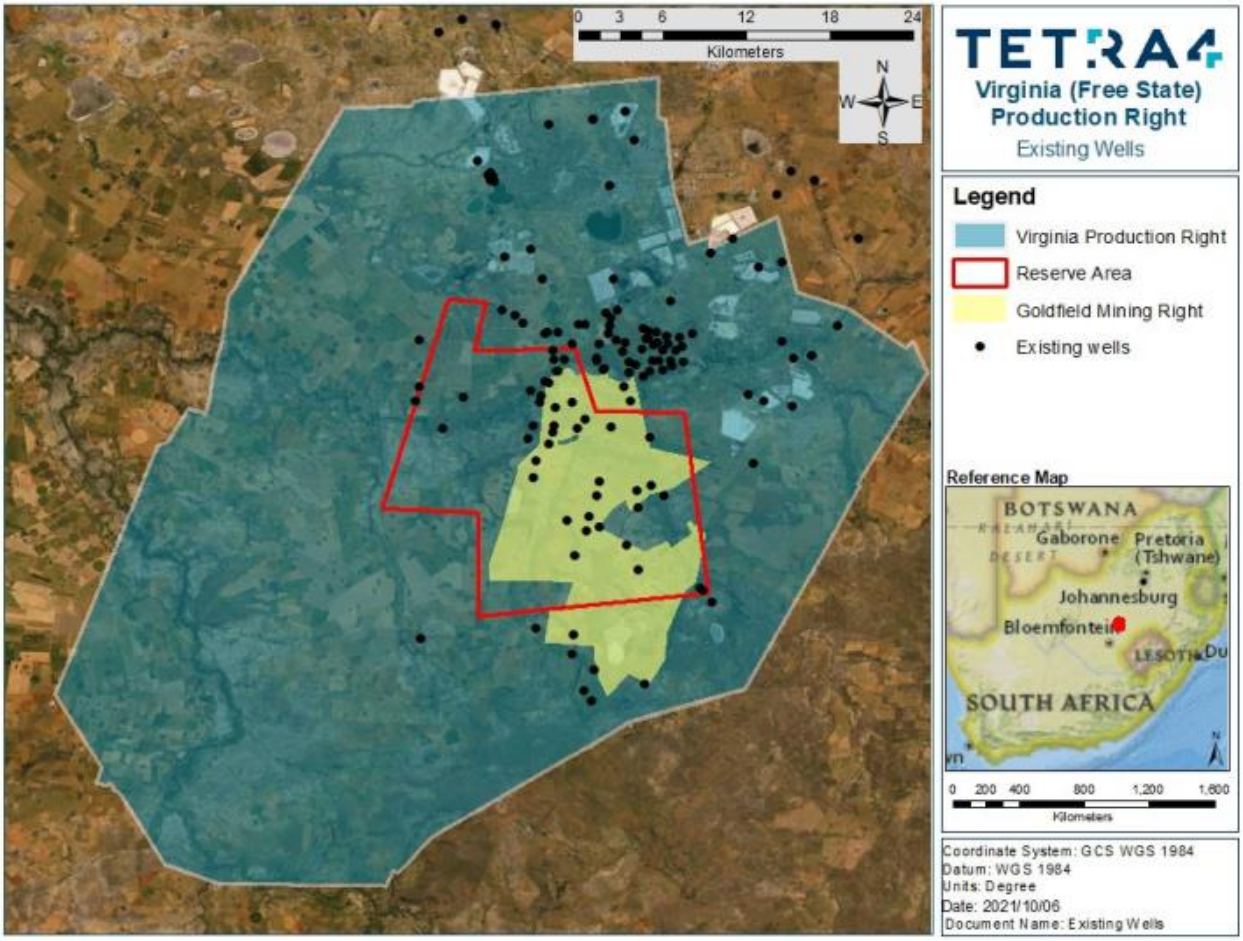
Renergen Virginia

Renergen's assets



Source: Renergen

The Virginia Gas Project is located 250km southwest of Johannesburg and consists of 187,000ha of production rights across Welkom, Virginia and Theunissen, in the Free State. It has significant reserves of helium and natural gas. The gas composition is attractive for separating out helium as it contains no H2S, H2 or neon and low levels of CO2. Renergen has a production licence until 2042 with an option to extend this by a further 30 years. The fiscal terms are attractive with a 5% Government royalty and a further 1% royalty on certain wells within the Goldfields mining leases. The tax rate is 28% with favourable accelerated depreciation on inflated capex.

Drilling Rig

Source: Renergen, H&P

Given the shallow target depths, the drilling rigs used, which are designed for drilling boreholes, are much smaller than comparable onshore rigs in the US resulting in much lower costs but also making them simpler to move around and there is ample availability of these rigs in the area. There are 7 wells from the initial gas gathering on the farm where the plant is built, and in total the area of 187,000 hectares spans 5,000 farms. In total the gas gathering network spans a total of 52km at this stage, bringing in gas from 19 wells.

Renergen Virginia: earlier well (left) and more recent wells (right)

Source: H&P

When looking at the well pads, what was striking was the tiny footprint that they occupy. Two slant wells can be drilled from one location at 90° to each other, to reduce the mobilisation costs and after being drilled the well is marked by a small slab of concrete.

Renergen Virginia Gas Plant

Source: Renergen, H&P

Gas has been successfully flowing from these wells into the plant: the gas composition which is virtually all methane, nitrogen and helium and very little in the way of NGLs makes for simple processing. Renergen achieved first gas into its plant on 8th July. This allowed plant safety systems to be verified and full commissioning and operational testing of the flare systems.

Renergen Virginia: Air Separation Plant

Source: Renergen, H&P

There is a small pressure swing adsorption (PSA) air separation plant in place to produce the nitrogen required for the cooling process.

The gas coming in from the wells and the nitrogen produced on site are compressed to around 50bar pressure, which creates heat that is removed through an onsite heat exchanger.

Renergen Virginia: Amine plant and Cold Boxes

Source: Renergen, H&P

The only "contaminant" that needs to be removed is a trace amount of CO_2 which occurs through an amine wash. The amine is then recycled, releasing CO_2.

The clean gas is then fed into the LNG cold box, which is cooled using a mixed refrigerant, where the methane turns to LNG at -162°C and then flows through a pipeline direct to the truck loading facility. The LNG system is complete and the preliminary performance data show the LNG exceeds design specifications. The onsite storage tanks and virtual pipeline tankers are full.

The remaining gas mixture is helium and nitrogen flowing through the nitrogen cold box, which is then super-cooled to remove the nitrogen as liquid nitrogen at -196°C, leaving pure helium.

The helium is mixed into an emulsion allowing it to be compressed without losses, where once at high pressure the helium is removed from the emulsion and then supercooled at high pressure to -196°C. It is expanded using turbo-expanders to -265°C before the helium moves through the final stage, Joule-Thomson helium valves, where the gas is cooled to below -269°C and it becomes liquid. The helium train was tested, and all components are working as designed, with the microturbines creating the cooling effect as required.

The liquid helium can flow direct to a waiting truck's ISO container or can be stored in the onsite ISO tank for 21 days before there is any boil-off of the helium gas. It takes around 2-3 days to fill a helium ISO trailer.

There is external power to the plant from state electricity company Eskom's line that is not subject to load shedding.

Path to full production

Renergen Virginia: Conduction Oil System

Source: Renergen, H&P

The plant was producing LNG and pure gaseous helium but as a precaution was shut-down due to an issue with the conduction oil system (see above). This is used to heat the lubricants for the turbines and was found to be incorrectly installed by the manufacturer. This issue has now been fixed and the unit has been reinstalled, tested and is operating reliability and within specification.

With the plant having been turned off to complete this repair, the Company has taken the opportunity to connect additional wells which were recently drilled, which will thus increase the output of the plant and brings the plant closer to within full design specification.

The process from here is to pressurise the pipeline, prime the utilities and turn on the plant for steady state production, with LNG commencing first, and liquid helium turning on thereafter.

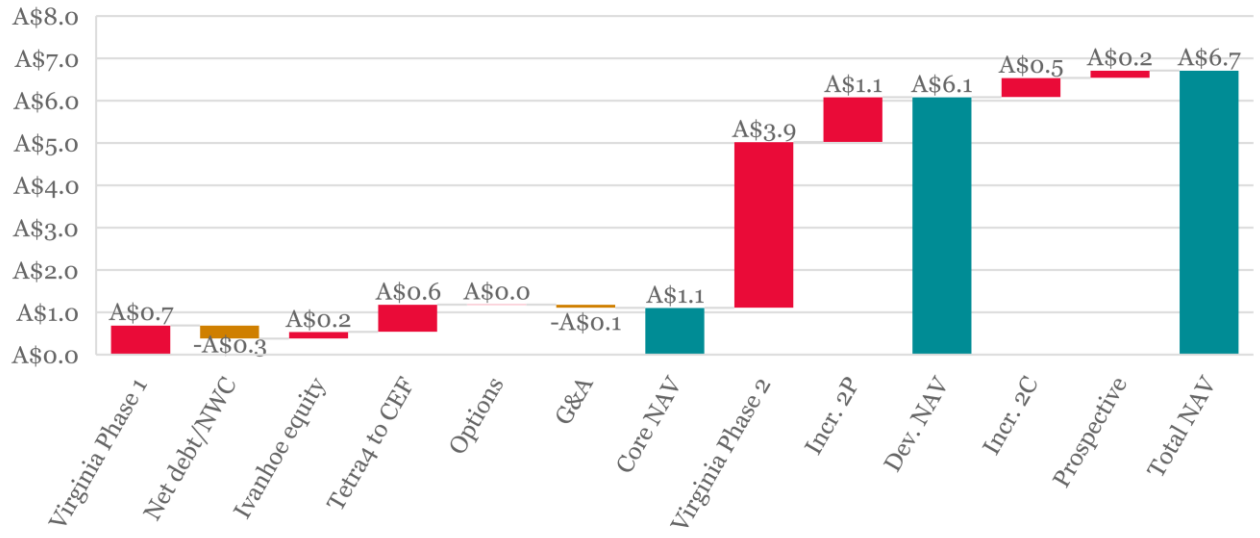
Valuation

NAV

Asset	Net bcf	NPV US$/mcf	Unrisked US$m	Unrisked R/sh	Unrisked A$/sh	Risking CoS	Risked US$m	Risked R/sh	Risked A$/sh
Net debt			-U$26	-R3.5	-A$0.3		-U$26	-R3.5	-A$0.3
Equity raise			U$13.3	R1.8	A$0.2		U$13.3	R1.8	A$0.2
Tetra4 sale to CEF			U$55.6	R7.4	A$0.6	€ 0.90	U$55.6	R7.4	A$0.6
Options and warrants			U$0.3	R0.0	A$0.0		U$0.3	R0.0	A$0.0
G&A @ 3x			-U$6.4	-R0.9	-A$0.1		-U$6.4	-R0.9	-A$0.1
Net working capital			-U$0.9	-R0.1	A$0.0		-U$0.9	-R0.1	A$0.0
Virginia Phase 1	19	$3.5	U$66	R8.8	A$0.8	90%	U$59	R7.9	A$0.7
Core NAV	**19**	**$5.4**	**U$102**	**R14**	**A$1.2**	**94%**	**U$95**	**R13**	**A$1.1**
Virginia Phase 2	309	$1.8	U$561	R75.0	A$6.5	60%	U$337	R45.0	A$3.9
Incremental 2P reserves	51	$3.0	U$153	R20.4	A$1.8	60%	U$92	R12.2	A$1.1
Development NAV	**360**	**$2.0**	**U$714**	**R95**	**A$8.3**	**60%**	**U$429**	**R57**	**A$5.0**
Incremental 2C reserves	224	$0.5	U$112	R15.0	A$1.3	35%	U$39	R5.2	A$0.5
Prospective resource	299	$0.5	U$149	R19.9	A$1.7	10%	U$15	R2.0	A$0.2
Contingent / Exploration	**523**	**$0.5**	**U$261**	**R35**	**A$3.0**	**21%**	**U$54**	**R7**	**A$0.6**
Total NAV	**523**	**$2.1**	**U$1,077**	**R144**	**A$12.5**	**54%**	**U$578**	**R77**	**A$6.7**

Source: H&P estimates

Risked NAV build up for Renergen (AUD/sh)



Source: H&P estimates

Risked NAV (A$/sh) at different gas prices and discount rates

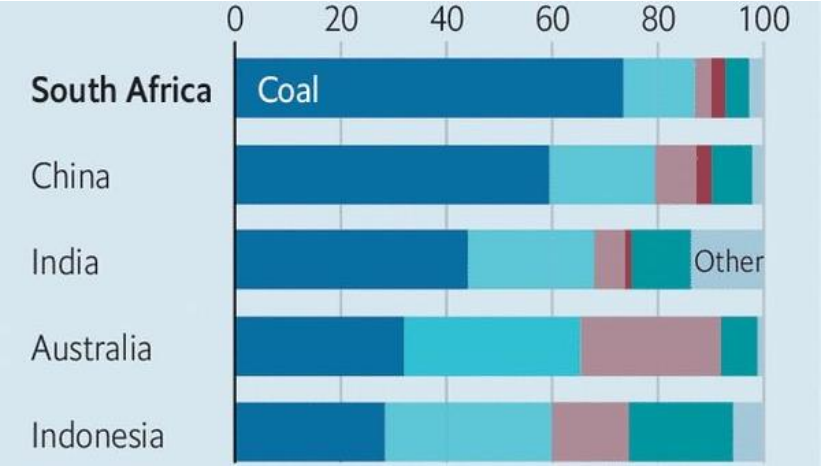
		Helium Price ($/mcf)				
		$150	$200	$250	$300	$350
LNG price $/mcf	$11.5	A$9.9	A$10.7	A$11.5	A$12.4	A$13.2
	$14.0	A$7.5	A$8.1	A$8.7	A$9.4	A$10.0
	$16.5	A$5.7	A$6.2	A$6.7	A$7.2	A$7.7
	$19.0	A$4.4	A$4.8	A$5.2	A$5.6	A$6.0
	$21.5	A$3.5	A$3.8	A$4.1	A$4.4	A$4.8

Source: H&P estimates

South African Natural Gas Market

South Africa is in the midst of an energy crisis as it has a significant fuel deficit and a reliance on coal. South Africa's economy is one of the most carbon-intensive in the world, with a fleet of 15 coal-fired power plants providing more than three-quarters of the nation's electricity. The country is already seeing rolling blackouts due to failing electricity infrastructure, which makes rewiring it a more urgent priority. The national power generation company Eskom is struggling with load shedding and with generation capacity. The country is already short of gas and in addition there are significant barriers to importing any other form of energy. Most of South Africa's gas comes through a pipeline from Mozambique (where production is in decline) all the way to Johannesburg and Sasol sells it at a significant premium to what the international market is paying, under normal market conditions.

Top-5 coal-intensive G20 countries, 2020 by primary energy supply (%)



Source: Climate Transparency

The governments of South Africa, France, Germany, the UK and the US, along with the EU, in 2021 announced a Partnership to support South Africa's decarbonisation efforts, with a focus on the electricity system. It will mobilise an initial commitment of US$8.5bn for the first phase of financing, through various mechanisms including grants, concessional loans and investments and risk sharing instruments, including to mobilise the private sector. It aims to prevent 1-1.5 gigatonnes of emissions over the next 20 years, to move away from coal and to accelerate its transition to a low emission, climate resilient economy.

There is a >200mmcf/d gas shortfall in Johannesburg with a further 60mmcfe/d of LPG demand and potential for LNG for trucking. Therefore, there are ample opportunities for Renergen to tap with its initial Phase 2 production plans of ~40mmcf/d of natural gas with confidence that it could further grow the business in the longer-term. A new Gas Master Plan is being developed to increase the share of gas in the power mix. There are environmental benefits of switching from coal to gas and plans to add >8GW of new gas/diesel generation capacity by 2030. Significant offshore gas discoveries could stimulate the creation of a much larger domestic gas market but these will take time to develop.

Renergen is looking to build a vertically integrated business from wellhead to tank. Around the Virginia Gas project there is access to existing infrastructure for

transport and consumption of natural gas (power stations, liquefaction plants, rail networks, etc.). Renergen is South Africa's first LNG producer and has access to a supply constrained market providing reliable long term offtake agreements.

Why LNG is one of the most environmentally friendly solutions in South Africa

In South Africa, LNG is both a cleaner source of fuel and more cost competitive than diesel, without the need for any legislative involvement or changes, making it a more obvious, immediate solution than battery-electric vehicles (BEVs) or hydrogen. An LNG heavy vehicle (such as a bus or truck) is 25% cheaper and 8% more fuel efficient than diesel, and the carbon emissions are around 30% less.

Converting to running trucks off electric batteries is not feasible in South Africa, in our view. The energy density in a battery is not sufficient to be able to run trucks on the road under South African conditions where they would run for 10-14 hours a day carrying combination payloads of 50 tons. This cannot be achieved with a BEV and furthermore the electricity grid is too constrained and unreliable. The only other clean option is hydrogen, but this will require large quantities of platinum per truck for South Africa's payloads, which would be cost prohibitive, as would be the cost of producing the green hydrogen, again given the lack of low-cost reliable power.

Utilising LNG has further enhanced benefits for vehicles with refrigeration. Renergen has developed a zero-emission solution for the cold chain logistics industry deploying LNG. The innovative concept utilises the fact that LNG is stored at ultra-low temperatures in the truck's tank and must be brought to room temperature before being consumed in the engine. In heating the gas, the cold energy of the gas is transferred to the refrigeration compartment of the trailer, providing free cooling and reducing combined greenhouse gas emissions by up to 96t p.a. per truck. The added benefit is reducing running costs by up to 23% compared to the total fuel bill for a truck using standard refrigeration technology.

There is a substantial South African truck fuel market that Renergen is seeking to tap consisting of 400k heavy duty trucks. Renergen's own trials in 2017 on dual fuel trucks (diesel-CNG) showed a 13-14% improvement in consumption and 25-26% reduction in direct fuel costs over diesel-only vehicles. Market estimates suggest ~50,000 trucks could potentially convert to LNG over the next 10 years. 1mmcf/d of gas produced supplies ~250 trucks. Phase 1 will see the supply of fuel for ~450 trucks, which means that supply is unlikely to outstrip demand.

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