Tlou Energy Limited

Research Report

November 2022

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Executive summary

Overview
Tlou Energy is a Botswana-based energy company focused on delivering secure, reliable, and greener power solutions to Botswana and the wider Southern Africa region. The company is developing gas-to-power, solar photovoltaic (PV) and green hydrogen projects at its Lesedi site in Central Botswana to meet the energy shortfall in southern Africa, by exploiting its ~430 bcf of 3P gas reserves and the country's solar potential. Botswana enjoys some of the highest levels of solar irradiation in the world.

The company has already secured a gas production licence and a power generation licence for gas and solar PV and a 10MW power purchase agreement (PPA) with the Botswana Power Corporation (BPC).

Construction of overhead transmission lines to connect the company's Lesedi power project to the BPC grid is ongoing with an initial project finance package secured.

We value Tlou at US$0.052/sh (AU$0.083/share) and expect upside potential from further de-risking of its gas-to-power, solar and hydrogen projects, and likely future expansion. It is important to highlight that our valuation at this stage does not consider the prospects of supplying natural gas to the 90MW Orapa Power Plant which supplies electricity to the Orapa Diamond Mine. We note that winning the Orapa gas supply tender can significantly increase the upside in the valuation of Tlou Energy.

Key points

Tlou investment thesis
Tlou is well positioned to exploit opportunities within the energy sector in Botswana and Southern Africa. The company has 427 bcf 3P (equivalent to 76 billion oil barrels) and 214 bcf of 2C (38 billion oil barrels) contingent gas resources at its Lesedi and Mamba projects in central Botswana, with a further 8 tcf (equivalent to 1,425 billion oil barrels) of prospective resources. The company's 3P reserves and 2C resources can supply up to 300+ MW of power generation capacity for 20 years.
Tlou's hybrid gas and solar PV project together with the hydrogen production project have the potential to supply power with net zero carbon emissions. Tlou can solve Botswana's power deficit by supplying electricity at a competitive price to BPC to displace dirtier coal and diesel fired generation as well as imports. This will have a positive impact on the country's balance of payments and assist with decarbonizing the electricity industry in Botswana.

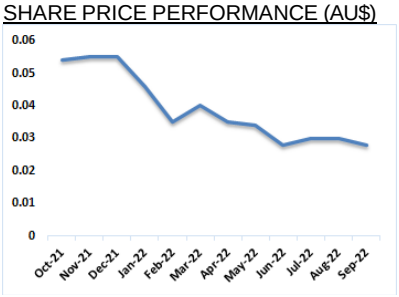
Existing approval and PPA
Tlou's has already secured a long-term gas production licence and a power generation licence for gas and solar power. A long-term 10MW PPA has been signed with Botswana Power Corporation Limited (BPC) together with a 66kV transmission line grid connection agreement. Contractors for the 66kV overhead transmission line have already been appointed by Tlou and work is underway. Its initial 10MW PPA has potential to expand to ~100 MW of new generation, and gas supply to the existing 90 MW Orapa power station provides further options for expansion.

Hybrid gas/solar generation
The hybrid gas and solar solution offers several advantages compared to stand alone solar which can be volatile. Tlou will be able to provide 24 hours of dependable electricity output, with solar meeting daytime demand and gas covering shoulder and night-time requirements.
This will also enable the company to significantly increase the expansion potential for the power project. The inclusion of battery storage is a possible future enhancement.

Potential for hydrogen production
Through its partnership with Synergen Met, Tlou is developing a prototype process to convert methane to hydrogen and solid carbon products via plasma pyrolysis. Synergen Met has in the past developed a successful hydrogen production process for commercial applications. The first prototype is expected to commence field trials at Lesedi in 1H 2023, producing hydrogen and solid carbon.
Hydrogen provides an additional path to revenue generation for the company. Hydrogen can be used for power generation and transport fuels. Solid carbon which is produced as a by-product can potentially be supplied in the carbon black market, for tyre manufacture and coating applications among other uses. The solid carbon product may be able to be upgraded for other uses including batteries.

Significant progress achieved in project financing
Tlou has secured project financing for its power project at Lesedi. In December 2021, the company announced that it agreed the terms with Botswana Public Officers Pension Fund (BPOPF) in Botswana to raise funding for the Lesedi project through the issue of a convertible debenture. The funds raised allow the company to proceed with construction of its 66kV transmission line, a critical item of infrastructure for the delivery of the power project.

SHARE PRICE PERFORMANCE (AU$)



Source: ASX

CAPITALIZATION (AU$)	
Last price	$0.0280
52-week range	0.0250-0.055
Capitalization	$16.8m
Cash: June 2022	$7.9m
Debt: June 2022	$7.5m
EV	$16.26
Shares	600.2m
Options/rights	57.5m
Conv Notes	7.2m
Balance date	30 Jun 2022

Source: ASX, Tlou Quarterly reports

RESERVES AND PRODUCTION	
1P	0.3 bcf
2P	41 bcf
3P	427 bcf
2C/3C	214/3,043 bcf
2U	8,596 bcf
FY21a	0 bcf
FY22e	0 bcf

Source: Tlou Energy Limited

SHAREHOLDERS (%)	
Board/mgt	7.9
Substantial	24.9
Other	67.1
LEADERSHIP	
Chair	Martin McIver
MD/CEO	Tony Gilby
FD/CFO	Colm Cloonan
ED	Gabaake Gabaake
NED	Hugh Swire

Source: Tlou Energy Limited

Disclosure:

This is an independent research report commissioned by Tlou Energy Limited as per letter of engagement dated 2 November 2021. The fee received by Grant Thornton Capital Advisors (Pty) Ltd will not be contingent upon a successful capital raise by the company and is fixed.

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Proven leadership track record
Tlou's key management have a credible track record in establishing and developing mining and energy projects. This includes establishing a CBM company in Australia which was later sold for AU$ 1 billion. This is a critical aspect given the shortage of relevant skills in Botswana.

Share price catalysts
We believe there is further scope for price re-rating of the company's shares in the near term driven by the following:

- Conclusion of the project to construct 100 km 66 kV transmission line to connect to BPC rid and initial 2 MW gas fired power generation (2H23).
- Demonstration of increased CBM well flowrates (1H23).
- Hydrogen prototype trials (1H23).
- Solar PV project (2H23).
- First power sales (2H23).
- Expansion of gas-to-power project to 10 MW.
- Capture of other growth opportunities beyond the current 10MW power project. These include supplying gas to the 90MW Orapa which is currently being run on diesel and as per a recently completed RFP from BPC.

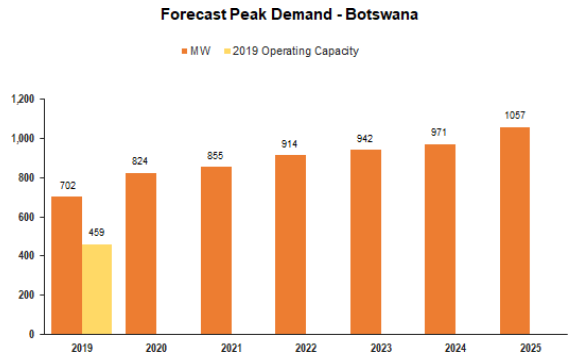
Risks
Investors should be aware of the following risks relating to the company's shares:

- Significant project finance/new equity is required to fund company's projects. Failure to raise the required funding may affect the share price performance of Tlou. We estimate Tlou will require an additional $20-22m of debt and equity to expand its power generation capacity from 2 MW to 10MW by 2025.
- Successful implementation of the initial 2MW pilot power project will be critical in unlocking value in the company's shares and attracting investors for future financing rounds by the company.
- The demonstration of CBM well performance and drilling cost reduction to achieve commercial outcomes will also be key for Tlou.
- The company's hydrogen production process is still in development stage. The outcome of the results of the development process may have an impact on the company's share price performance.

Botswana faces an energy supply gap

Electricity Demand

Botswana's peak electricity demand is 702 MW with average maximum demand being 613 MW. The country is currently able to produce 70 – 80% of its power requirements with the remaining balance being imported largely from South Africa through the Southern Africa Power Pool (SAPP). Peak electricity demand is forecast to increase at a compound annual growth rate of 7% per annum to 1,057MW by 2025 as shown below.



Source: SAPP

Supply of Electricity

Botswana relies on thermal power stations for generation of electricity. The bulk of domestic electricity production is generated by the two Morupule coal-fired power stations which are owned by the state-owned power utility, BPC. The two power stations are the 600 MW Morupule B and the 132 MW Morupule A. Other power sources include the 90MW Orapa and the 70MW Matshelagabedi diesel fired power plants. The table below summarises the state of the power plants in Botswana:

Power Station	Capacity (MW)	Age (Years)	Comments
Morupule A	132	35	Currently operating at 70% availability rate Long-term reliability and carbon emissions concerns
Morupule B	600	9	Currently operating at only 31% availability rate Long-term reliability and carbon emissions concerns
Orapa	90	10	The Orapa power plant can operate on both liquid fuel (diesel) and natural gas. Orapa offers a potential off-taker for Tlou's natural gas and possible upside for accelerating the development of the Lesedi Project in the short-to-medium term. BPC floated a tender calling for the supply and delivery of natural to the Orapa power plant in May 2021.
Matshelagabedi	70	11	Electricity generation is comparatively more expensive Carbon emissions concerns
Total	892		

Source: BPC, GT analysis

The Morupule plants are operating under capacity. The Morupule B project which was completed in November 2012 did not meet its intended objective of providing 600MW (gross) firm generation capacity over a period of 30 years due to construction and equipment defects. Morupule A's availability rate is estimated at 70 percent while Morupule B's availability rate is 31 percent.

The two diesel power plants were conceived to support peak load but are being used for regular electricity supply (BPC, 2017a). The diesel power plants are costly to run due to the need for imported fuel. It is frequently cheaper to import electricity than to generate from diesel-fuelled facilities.

Supply gap and value of imports

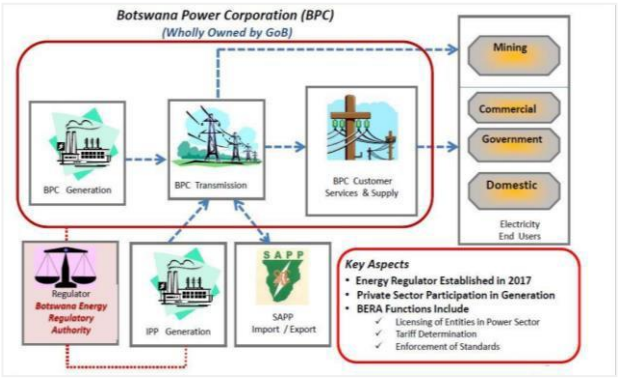
To meet its electricity peak demand, Botswana imports power from the Southern Africa Power Pool ("SAPP")– mainly from South Africa. Botswana imported 70 GWh, 127 GWh and 200 GWh of electricity from the Southern African Power Pool in 2017, 2018 and 2019, respectively. Imports of electrical energy were estimated US$157.7 Million during 2020.

Through its current economic plan, the National Development Plan (NDP 11), the Botswana Government has pursued a policy of developing diversified sources of economic growth. Development of the trade and manufacturing sectors is a key target for the Government. These sectors are vulnerable to electricity shortages and require investment in power generation and distribution infrastructure.

Botswana was ranked sixth within the SADC region for electricity access on the back of Government efforts to improve access in rural areas through several rural electrification initiatives. According to the World Bank, the country's electricity access rate is 64.9%. Electrification in urban areas stands at 75% and 57% in rural areas. Regionally, South Africa, Mauritius and Seychelles have access rates in excess of 90%. The Government of Botswana has set a national electricity access target of 87% by 2040.

The resolutions of the recent United Nations COP26 summit are likely to make it difficult to access funding for new coal mines and coal fired power stations. This casts doubt on Botswana's ability to fully exploit its abundant coal reserves to alleviate its power supply gap.

Market Structure



Source: SAPP

Botswana Energy Regulatory Authority (BERA)

BERA is the independent regulator set up by the Government of Botswana to provide an efficient energy regulatory framework for electricity, gas, coal, petroleum products, solar and all other forms of renewable energy. The primary mandate of BERA is to provide the economic regulation of the energy sector and facilitate private sector participation.

Botswana Power Corporation (BPC)

BPC was formed in 1970 by an Act of Parliament and is responsible for the generation, transmission, and distribution of electricity within Botswana. The company currently enjoys a monopoly on electricity transmission and distribution in Botswana. IPPs seeking to participate in the electricity sector in Botswana can access the market through Power Purchase Agreements (PPAs) with BPC.

Independent Power Producers (IPPs)

The government, through BERA, has implemented policies to encourage the participation of IPPs in the electricity generation sector in Botswana. Already, two electricity generation licences have been issued to BSE listed companies, Tlou Energy Limited and Shumba Energy.

Current domestic supply is dominated carbon dioxide-intensive and polluting coal supported by expensive and polluting imported diesel. The primary power stations are unreliable and operating below capacity.

Botswana's clean energy potential

Government policy is supportive of clean energy

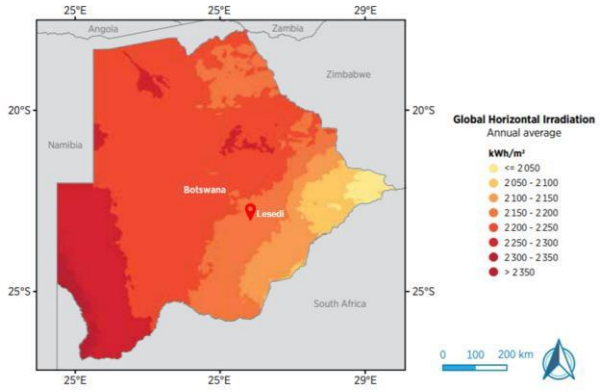
The Botswana Energy Regulatory Authority, through its Integrated Resource Plan (IRP), has set a target to increase the contribution of renewable energy sources in the country's energy mix. Some of the key strategic objectives of the IRP are diversifying the sources of electricity generation, achieving electricity self-sufficiency and becoming a net exporter of electricity by 2024, and reducing the environmental impact of power generation by using low carbon technologies. The IRP sets a target to reduce coal's contribution from the current 99% to 61% by 2040. Renewable energy sources are expected to contribute 20% of demand by 2030 and 35% by 2040.

In line with these objectives, Government is targeting additional capacity of 435 MW of solar, 100MW from CBM and 50MW from wind energy by 2030. The strategy is to implement these projects through the least cost option with a number of projects being offered to IPPs for tendering.

Solar Energy

Botswana has some of the highest levels of direct normal (solar) irradiation (DNI) in the world, making solar energy a promising renewable energy source. The country experiences approximately 280-330 days of sun per year. The daily average sunshine ranges from 9.9 hours during the summer to 8.2 hours in winter. Average total solar radiation is 21MJ/m^2/day (approximately 2,100 kWh/m^2/yr)[1]. The graphic below shows a solar Atlas of Botswana derived from satellite observations and simulations with the HelioCLim 2 methodology.

Global horizontal irradiation for Botswana



Source: IRENA global atlas for renewable energy

Global horizontal irradiation (GHI) ranges from 2,050 to 2,920 kWh/m²/yr. These irradiation levels are similar to those in California, which is amongst the most competitive solar markets today. The highest values of insolation appear in the southwestern parts of the country, in the Kgalagadi and Ghanzi districts, where values reach 6.2 kWh/m²/day.

Declining capex costs make solar attractive

The capital cost of installing solar projects has been declining, driven by technological innovation and declining prices of key raw materials for solar panels such as silicon. Capex costs in Germany (which has the most developed solar PV markets and highest installed base of ~38GW in the world) are estimated to have dropped ~70% since 2009. In India, the capital cost per MW is estimated to have plunged from INR 180m/MW (USD 3m) in 2009 to nearly ~INR 65m/MW (USD 1m) in 2020. An ~30-40% reduction in solar capex costs is expected over the next 4-5 years due to solar module costs decline and increasing panel efficiencies[2].

Reasonable return on equity (ROE) on solar projects

Solar fetches reasonable ROEs which can support investor appetite for renewable energy. The average ROE for the lifetime of solar projects has been estimated at 19%, though ROEs tend to be low in the initial years following project implementation[3].

Hydrogen – The clean energy fuel of the future

Hydrogen has increasingly gained prominence as an energy source driven by the increasing urgency to tackle climate change concerns. The urgency to reduce the world's emission of greenhouse gases has grown considerably in recent years, as political pressure to act increases. This is evidenced by global agreements such as the Paris Agreement and the Glasgow Climate Pact that was agreed at the recent united Nations COP26 climate summit. The cost of hydrogen supply from renewable energy has come down and continues to fall making hydrogen an attractive solution as countries and businesses have begun to take action to decarbonize their energy supply systems.

Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water. The production of clean hydrogen has therefore enjoyed political and business momentum, with the number of policies and projects around the world expanding rapidly. Hydrogen has been termed the fuel of the future and is likely to gain an increasingly significant share of the world's energy markets in the coming decades.

Hydrogen as an energy source and industrial chemical

Hydrogen has wide industrial uses and is one of the key starting materials used in the chemical industry. It is used in the manufacture of two of the most important chemical compounds made industrially, ammonia and methanol. It is also used in the refining of oil, for example in reforming, one of the processes for obtaining high grade petrol and in removing sulfur compounds from petroleum which would otherwise poison the catalytic converters fitted to cars.

The debate on hydrogen has increasingly shifted from its industrial uses to energy applications. Hydrogen has potential to reduce carbon emissions in hard-to-decarbonize sectors. Applications include low carbon mobility solutions for the automotive and trucking sector through Fuel cell electric vehicles (FCEVs). Hydrogen can also be used in aviation, shipping, heating applications and other energy-intensive industries.

Hydrogen is also being advanced as an alternative to electricity for storing and transporting renewable energy produced elsewhere. Hydrogen can be compressed and stored. It can be used to store surplus renewable energy produced during the day and time shift daytime solar to night-time power supply.

[1] [1] World Energy Council

[2] Deutsche Bank - India 2020: Utilities & Renewables

[3] Deutsche Bank - India 2020: Utilities & Renewables

Hydrogen Production
Natural gas, oil, coal, and electrolysis are the four main sources of commercial production of hydrogen and account for 48%, 30%, 18% and 4% of the world's hydrogen production respectively (A comparative overview of hydrogen production processes: Pavlos Nikolaidis & Andreas Poullikkas). The main processes for producing hydrogen are summarised below:

Steam methane reforming
This is currently the cheapest and most dominant source of industrial hydrogen accounting for nearly 50% of the world's current hydrogen production. In steam-methane reforming, high-temperature steam (700°C to 1,100°C) reacts with methane in the presence of a catalyst to produce hydrogen, carbon monoxide, and carbon dioxide. The downside to the process is that its by-products are major atmospheric release of carbon monoxide, and carbon dioxide and other greenhouse gases.

Electrolysis
Electrolysis splits hydrogen from water using an electric current. The process does not produce any byproducts or emissions other than hydrogen and oxygen. The electricity for electrolysis can come from renewable sources such as hydro, solar, or wind energy. If the electricity for electrolysis is produced from fossil fuels (coal, natural gas, and petroleum) or biomass combustion, then the related environmental effects and carbon dioxide emissions are indirectly associated with the electrolysis. The downside to the 'renewable powered electrolysis of water' is that it is several times more expensive than production via methane pyrolysis using a renewable energy source.

Methane Pyrolysis
Pyrolysis produces hydrogen and solid carbon products by heating methane using a high temperature plasma torch that is powered by electricity. The process can produce low-cost hydrogen and has the added benefit of producing industrial quality solid carbon that can be sold as manufacturing feedstock or be landfilled thus avoiding atmospheric release of greenhouse gases and ground water pollution.

Coal Gasification
The process uses steam and oxygen to break molecular bonds in coal and form a gaseous mixture of hydrogen and carbon monoxide.

Types of Hydrogen
Hydrogen is labelled as black, grey, blue, turquoise, green and even pink and orange according to its production process.

Classification	Description
Green	Considered to be produced by carbon dioxide-free processes powered by renewable energy. Examples include electrolysis and Pyrolysis using a renewable energy source.
Turquoise	Pyrolysis of natural gas to form Hydrogen and solid Carbon products using energy that is produced from fossil fuels. The process does not release greenhouse gases but still has an impact from the energy source.
Blue	Hydrogen production by the benchmark 'Steam Reforming' process, with Carbon Capture and Storage (CCS) of the resulting CO2 by-product.
Grey	Currently, this is the most common form of hydrogen production. Grey hydrogen is created from natural gas, or methane, using steam methane reformation but without capturing the greenhouse gases made in the process.
Black	Using coal in the hydrogen-making process. This is the most environmentally damaging hydrogen spectrum.
Pink	Pink hydrogen is generated through electrolysis powered by nuclear energy. Nuclear-produced hydrogen can also be referred to as purple hydrogen or red hydrogen.

Source: https://www.nationalgrid.com

While hydrogen continues to gain increasing attention as an energy source, the focus is on green hydrogen production techniques as the world increasingly becomes concerned with climate change and environmental issues.

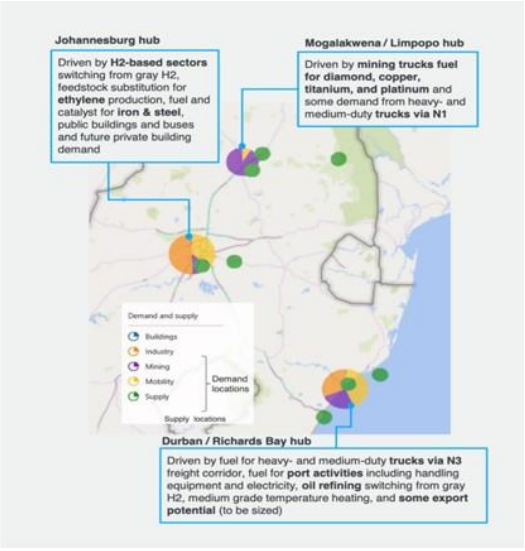
Regional market for hydrogen and solid carbon products

South African Hydrogen Valley

South Africa has taken a lead from several countries that recognized the immense potential of hydrogen and developed specific policies to foster their domestic hydrogen industries and markets. The country has created a 'corridor' that connects 3 hydrogen hubs: the port of Durban/Richards Bay, Johannesburg and surrounds, and The Mogalakwena/Limpopo mining complex. This has been termed the Hydrogen Valley ("HV").

The Government, in partnership with Anglo American, Bambili Energy and ENGIE are looking into opportunities and innovations to transform the hydrogen industry and market in South Africa.

This offers opportunities to other regional pioneers to access a large and developing market. Development of the industry in South Africa is likely to be precursor for the rest of the SADC region.



Source: South Africa Hydrogen Valley Feasibility Study report

Anglo American and De Beers
Diversified mining company, Anglo American, is piloting the world's biggest green hydrogen-powered haulage vehicle fleet. The company plans to replace its global truck fleet of 400 diesel trucks with hydrogen trucks over a ten-year period from about 2024.

Introducing hydrogen mobility on its mines will be material to its ambition of achieving carbon neutrality by 2040 as diesel represents 17% to 18% of the London and Johannesburg stock exchanges listed company's carbon emissions. This change is expected to reduce group carbon emissions by 15%[4].

Anglo American controls the largest diamond mines in Botswana through a joint venture with the Government of Botswana, Debswana. The intended shift to hydrogen is likely to impact Debswana in the medium to long-term.

Steel and Cement Industries
Anglo American, in South Africa, and other steel producers (Arcellor Mittal et al.) are actively researching CO2 abatement in steel manufacture via hydrogen power and carbon additions. The companies are conducting research into feed materials, including iron ore pellets and lump iron ores, suitable for use in direct reduction (DR) steelmaking based on natural gas and hydrogen, a significantly less carbon intensive production method than the conventionally used blast furnace (BF) process. The collaboration may also explore developing broader hydrogen technologies[5].

Carbon and carbon black market
South Africa offers a market for carbon products given its highly developed industries. The Tyre manufacturing industry in South Africa can benefit from synthetic carbon products which allow the industry to reduce its dependence on carbon black from fossil fuels and vulnerability to fluctuations in fossil fuel prices. Graphite is the single largest input to lithium (and many other) batteries. Battery manufacturing is progressively shifting towards use of synthetic graphite, mainly due to contamination of natural graphite with 95% of battery production now estimated to be using synthetic graphite. Carbon can also be processed into briquets of synthetic charcoal for use by households. This is a more environmentally friendly source of charcoal that can replace and reduce deforestation for purposes of firewood.

The carbon black, graphite and hydrogen markets are growing and the potential for value growth in graphite is high due to the increasing need for high purity graphite in battery production.

Hydrogen production in Botswana
There is no current production of hydrogen within Botswana. The country however has vast potential to become a leading producer given its massive and largely unexplored gas reserves.

Hydro and Wind energy
Botswana is largely an arid to semi-arid country and regularly suffers from severe droughts and floods which make continuous use of large water resources difficult. The country does not have large perennial rivers and dams which limits its potential for hydropower. There are no hydropower resources that are currently being used in Botswana. Small hydropower potential (SHP) is currently estimated at 1 MW (UNIDO, 2016) in the north of the country[6]. Hydropower has therefore not been prioritized due to the country's limited potential.

The country also has wind power potential which has not been fully explored. Reasonable wind speeds exist in the country with the highest wind resources potential located in the Kgalagadi district near Tsabong and the Southern district, with a technical potential of up to 1.5 GW per year[7].

Substantial thermal power capacity but Government has committed to phase down coal

Botswana is endowed with large unexploited reserves of coal. The country's coal reserves are estimated at approximately 212 billion tonnes. The only two coal reserves that have been fully explored and measured are the Morupule and Mmamabula basins, with a capacity of 7.2 billion tonnes (MMEWR, 2017b). There are currently two operational coal mines in Botswana, the Morupule Colliery which is 100% owned by the state mining company Debswana and Masama mine which is 100% owned by the Botswana Stock Exchange (BSE) listed Minergy Coal. India's Jindal Steel & Power Limited (is expected to start building a third coal mine in 2022 within the Mmamabula coalfields.

The resolutions of the recent United Nations COP26 summit are expected to drive the global climate change and sustainability agenda in the coming years. The resolutions included commitments from member countries to target net zero carbon emissions and phasing down the use of coal which is responsible for 40% of global carbon dioxide emissions. Botswana signed up to a global commitment to reduce the use of coal but opted out of a pledge to stop issuing new coal mining licences. Member countries are expected to meet again in 2022 to pledge further cuts for carbon dioxide emissions as current pledges are deemed inadequate to meet the target of limiting annual global temperature growth to 1.5 degrees Celsius. Funding for future coal thermal power generation projects is likely to become increasingly difficult to obtain. The summit however agreed to significantly increase funding for poor countries to cope with climate change and switch to clean energy with financial organisations controlling more than USD 130 trillion agreeing to back clean energy.

[4] miningweekly.com – Anglo to transition to green hydrogen mine fleet over decade

[5] www.angloamerican.com -press releases

[6] Renewable energy resource assessment study (MMEWR, 2016a) and IRENA

[77] Renewable energy resource assessment study (MMEWR, 2016a) and IRENA

Power crisis in Southern Africa

The Southern Africa region is facing electricity supply challenges with production dominated by old coal thermal power plants with reliability issues. Integration through SAPP offers producers access to the entire region and markets beyond their country's own borders.

SADC electricity supply gap

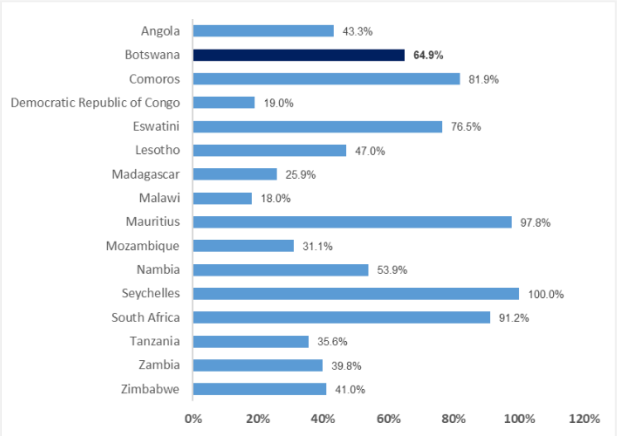
The electricity supply security in Southern Africa, although diverse, is generally difficult. While SADC countries have abundant energy resources, they sometimes lack the technical and financial capacity to put them to use. Botswana, Namibia, South Africa, Tanzania, Zambia, and Zimbabwe have all had to resort to load shedding in the last ten years or so. The table below shows the power supply gap for the region for the year 2020.

SADC electricity supply and demand

Description	MW
Installed Generation capacity	64,438
Current Operating capacity	51,979
Peak Demand including reserves	53,883
Deficit Generation Capacity	**1,904**

Source: Southern Africa Power Pool 2020 annual report

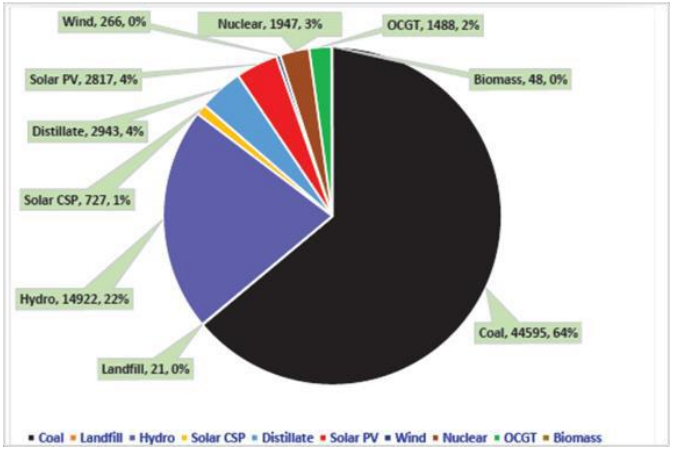
The region had an electricity supply deficit of 1,904 MW as shown above. The World Bank anticipates the demand for electricity to increase by 40% over the next 10 years as the region's economies continue to grow and industrial capacity increases. A substantial proportion of the population in many of the countries in Southern Africa still have no access to electricity. The chart below shows the average electricity access rates in SADC countries.



Source: adapted from the World Bank

SAPP generation mix

The region's generation mix is currently dominated by the use of thermal (coal) with 64% and hydropower at 22%. The usage of other renewable energy sources such as solar and wind is still very minimal. The largest regional supplier, Eskom, has been forced to terminate power export agreements to other countries as it struggles to meet demand in its home market in South Africa. Eskom and most of the other SADC countries continue to rely on aging coal fired power stations and thus face supply reliability challenges and environmental concerns.



Source: SAPP

Regional integration among power utilities in SADC region

Southern Africa Power Pool

The Southern African Power Pool (SAPP) is a regional cooperation of national electricity utilities in the SADC region. SAPP provides a forum to coordinate the planning and operation of the electric power systems of member utilities and find solutions to the region's energy problems. Members of SAPP have created a common power grid between their countries and a common market for electricity in the SADC region. SAPP first established the Short-Term Energy Market in 2001. From 2004, SAPP started the development of a competitive electricity market for the SADC region. The day-ahead market (DAM) was established in December 2009. In 2015 the SAPP trading Platform was upgraded with Forward Physical Markets and the Intra Day Market.

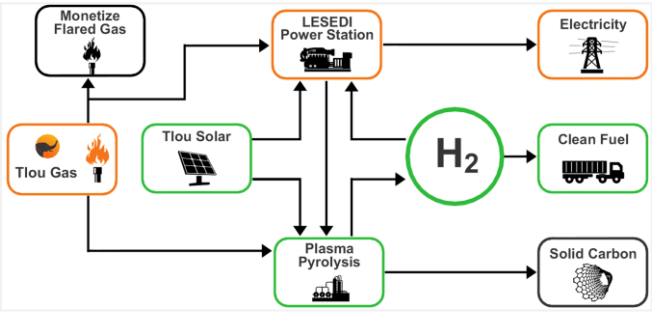
Botswana is interconnected with other Southern African countries through SAPP. Several projects are ongoing to reinforce these integrations including the Botswana–South Africa interconnector (BOSA) and the Zimbabwe–Zambia–Botswana–Namibia Interconnector (ZIZABONA). These projects are aligned with Botswana's IRP, which aims for Botswana to become an energy surplus nation. The SAPP will allow Botswana and Tlou Energy access to the regional energy market.

Tlou's potential contribution to Botswana's clean energy targets

Tlou is well positioned to take advantage of the power supply deficit in Botswana and Southern Africa through its gas, solar and hydrogen projects.

Overview

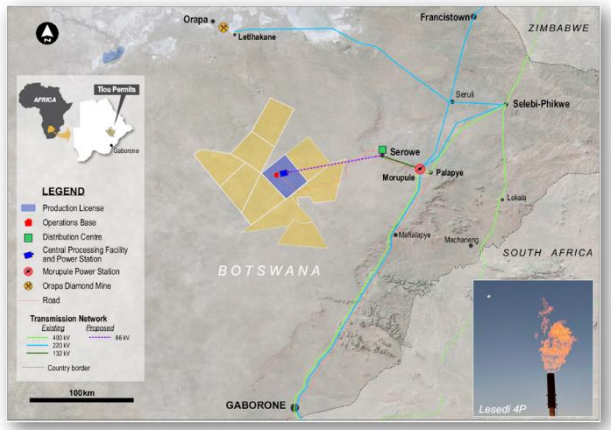
Tlou Energy Limited is a power company with a focus on generating and transmitting electrical power from coal bed methane (CBM) gas extracted from its CBM Projects that are in Central Botswana, solar power, and hydrogen production. The electricity will be supplied to Botswana and the southern African region via the Southern African Power Pool (SAPP).



Source: Tlou Energy Limited presentation – Clean energy for Botswana and Beyond

CBM Projects

The company has CBM projects spanning approximately 8,500 Km^2 within the Permian Southeast-Central Kalahari Sub-Basin of the Karoo Kalahari Basin. These projects organized into three project areas as shown below.



Source: Tlou Energy Limited

Lesedi Project

This is Tlou's most developed CBM project and the location of the proposed gas to power plant, central processing facility and solar farm. The project consists of a three CBM Prospecting Licences and a Mining Licence covering a total area of approximately 3,000 km^2. Gas reserves at the Lesedi site have been independently verified through SRK Consulting Australasia. The company's mining licence is valid up to 2042 while the prospecting licences are renewed every two years.

Mamba Project

The Mamba project is a CBM exploration and evaluation project which consists of five CBM Prospecting Licences covering a land area of approximately 4,500 km^2. The project has independently certified gas reserves. The company has plans to carry out additional exploration drilling at the Mamba project.

Boomslang Project

This project consists of one Prospecting Licence covering a land area of approximately 1,000 km^2. Environmental Impact Statement (EIS) Approval for the Boomslang project was received in March 2021 paving way for the company to commence exploration work for the project.

Gas Reserves

Between its Lesedi and adjacent Mamba Projects, Tlou has 0.35 BCF 1P (equivalent to 0.06 billion oil barrels), 40.8 BCF 2P (equivalent to 7.1 billion oil barrels) and 426.6 BCF 3P (equivalent to 75 billion oil barrels) Gas Reserves as shown below:

0.35 BCF (1P)			40.8 BCF (2P)			426.6 BCF (3P)		
			Gas Reserves [1]			Gas Contingent Resources [2,4]		
Location	Project	Tlou Interest	1P (BCF)	2P (BCF)	3P (BCF)	1C (BCF)	2C (BCF)	3C (BCF)
Karoo Basin Botswana	Lesedi CBM (Lower Morupule coal) (ML 2018/181, PL001/2004)	100%	0.34	25.2	252	4.6	45.6	331
Karoo Basin Botswana	Lesedi CBM (all coal seams) (ML 2018/181, PL001/2004)[4]	100%	0.34	25.2	252	4.6	214	3,043
Karoo Basin Botswana	Mamba CBM (Lower Morupule coal) (PL238/2014-PL241/2014)	100%	0.01	15.5	175	n/a	n/a	n/a

Source: SRK Consulting

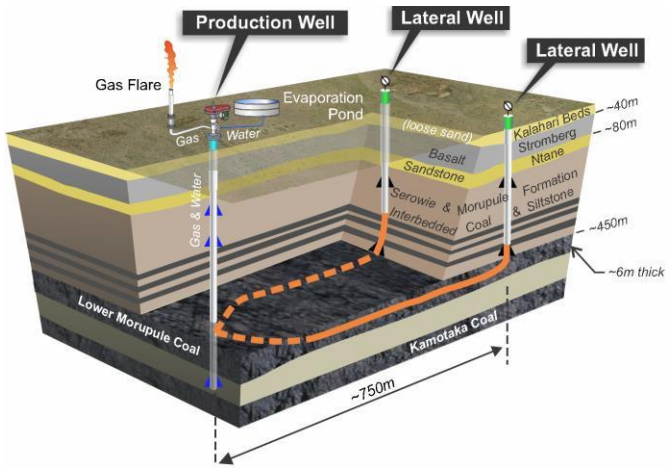
The gas reserves and resources for the Lesedi and Mamba projects were independently certified by leading industry consultants SRK Consulting. There are currently no 1P, 2P or 3P reserves booked for the Boomslang project.

Gas Production

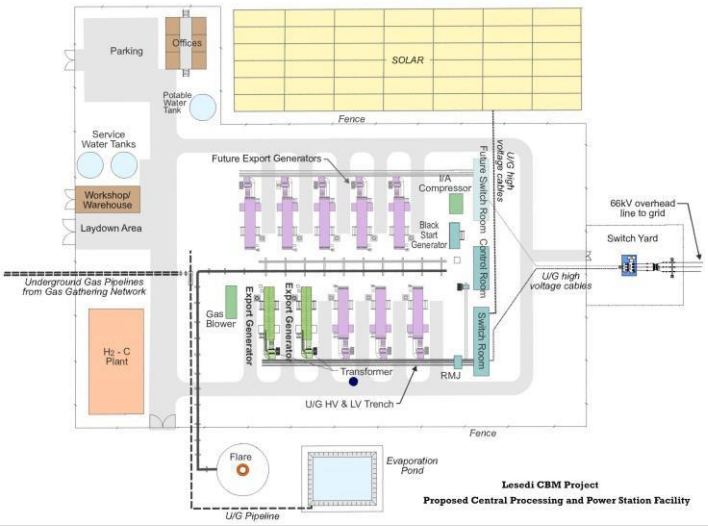
Tlou is already producing gas at the Lesedi project site. This gas is proposed to be used to generate the initial gas fired power for sale into the BPC grid. The electricity generation project will require expansion of the gas production capability. Tlou thus plans to drill additional wells as the project progresses. Tlou uses horizontal (or lateral) drilling techniques which is summarized in diagram below:

CBM mining and proposed power plant layout

Tlou's gas wells, referred to as "Dual Lateral Pod" consist of two lateral wells that intersect with a vertical well to produce gas



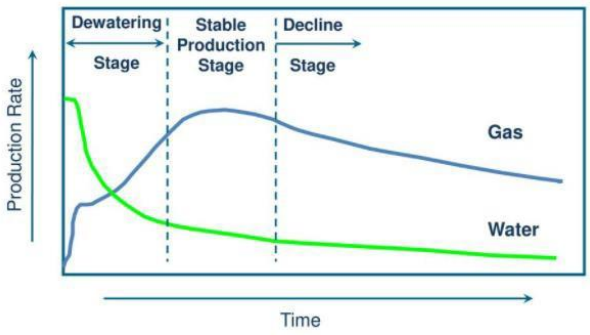
Gas produced from Tlou's Dual Lateral Pods will feed into a Central Processing Facility to be converted into electricity and sold into the grid



Source: Tlou Energy Limited presentation – Clean energy for Botswana and Beyond

The gas is produced from shallow onshore wells drilled to a depth of approximately 400-600m. Gas and water produced from the wells are separated at the surface. Gas is used to generate power whereas the water produced can potentially be used for agriculture or other beneficial purposes.

Production profile of gas wells



Source: Tlou Energy Limited presentation – Clean energy for Botswana and Beyond

A typical gas well can have a production life of up to 15 years. A gas well goes through three stages in its production life cycle namely dewatering, stable production and decline. Dewatering can last for several years. The water production rate gradually falls as water is removed from the coal cleats (orthogonal joints in the coal). At the same time more and more gas is produced at increasing rates and the relative permeability to gas in the cleats increases leading to lower pressures and more gas production. During the stable production stage, most of the water in the cleats has been removed allowing the cleat fluid pressure to bottom out and the relative permeability to gas to level off. Over this period the gas rate slowly peaks. During the decline stage, there is no more increase in drawdown available to sustain gas production and gas production declines[8].

Tlou is in the early stages of the production life cycle at Lesedi. The company aims drill more production wells into the producing coal and expects this will quicken the dewatering process and enable the company to reach peak gas flows.

Gas to power project

The proposed gas to electricity power plant will be located at the Lesedi site and is approximately 100 km away from the nearby town of Serowe. Tlou has previously produced power to run its gas field pumps and metering operations at Lesedi via a 60kVA Cummins G8.3 generator. The project involves constructing a 2MW pilot power project to act as proof of concept before expanding power generation capacity to 10MW in the medium term. In the long-term, power generation capacity may be expanded to 100MW. The company is also seeking to construct a 66kV overhead transmission line and two substations to enable connection to the BPC substation at Serowe for the purpose of selling the electricity.

Tlou and BPC initially entered into a 2MW Power Purchase Agreement (PPA) and a grid connection agreement to pave the way for the design and development of the transmission line. The 2MW PPA was subsequently upgraded to a 10MW PPA as announced by the company on 19 October 2021. Tlou has already secured a long-term power generation license from the Botswana Energy Regulatory Authority (BERA) covering both gas and solar production.

Project implementation costs for the 10MW power project are estimated at USD 30 million. Contractors for the project have already been appointed following a tendering and evaluation process that was undertaken by the company with assistance from a specialized engineering consultancy firm operating in Southern Africa. The company announced in October 2021 that it agreed terms with the Botswana Public Officers Pensions Fund (BPOPF) for a funding package to develop the project. The funding from BPOPF is split into ~ US$5 million convertible debenture in FY2022 with further potential for ~US$5 million equity funding in FY2023.

[8] The Role of Natural Fractures in Shale Gas Production - Ian Walton and John McLennan

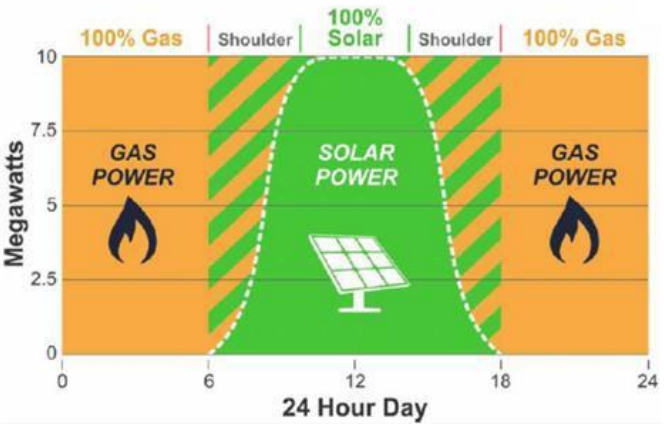
Solar PV Project

Tlou intends to implement a hybrid gas and solar model at the Lesedi site to take advantage of the high levels of solar irradiance in Botswana. The company already has environmental approvals for the project in place while the initial power generation license issued by BERA covers the production of power from both gas and solar.

Combining gas and solar offers several advantages including potential for 24-hour base load and peaking power as compared to stand alone solar which can be volatile. The company believes this will also enable it to significantly increase the expansion potential for the power project. The inclusion of battery storage is a possible future enhancement.

The solar project will be located at the Lesedi project site. Average irradiation for the area is estimated at 21.7 MJ/m^2/day.

Hybrid gas/solar power generation



Source: Tlou Energy Limited presentation – Clean energy for Botswana and Beyond

Solar PV project assumptions
We present below our assumptions for the company's solar project.

Solar irradiation
We estimate average solar irradiation for the Lesedi site at 21.7 MJ/m^2/day in line with solar atlas for Botswana presented earlier. In according with the solar atlas, we estimate that the Lesedi site lies within a region where total solar radiation ranges between approximately 2,100 kWh/m^2/yr and 2,150 kWh/m^2/yr. We have adopted the lower range of 2,100 kWh/m^2/yr.

Production capacity
Tlou have approval for gas and solar power production up to 20MW. Based on the company's hybrid gas and solar power production approach, we estimate that the solar project will be developed in line with expansion of the gas to power project. Tlou will initially start with a 2MW pilot gas to power project which is only expected to start power sales in early FY2024. This is expected to be expanded by further 4MW in both FY2025 and 2026 to bring total capacity to 10MW.

Project life
We have assumed a project life of 20 years. According to most estimates, the average life of solar projects ranges from 20 to 30 years. We have taken the lower end estimate of 20 years.

Capital cost
Capital costs for solar projects were estimated at US$1 million per MW in 2015 with an expectation that average costs were likely to fall by ~30 - 40% in the next 4 to 5 years[9]. We have therefore assumed capex costs of US$0.7 million per MW.

Opex
A study on renewable power generation costs in 2019 estimated that operation and maintenance costs for solar PV projects ranged from US$10/kWh/yr to US$18/kWh/yr[10]. We have assumed operation and maintenance costs of US$10/kWh/yr in line with our view that costs have been falling due to improvements in technology within the solar energy sector.

Power price

Power prices are based on estimates of approximately US$0.80 per kWh for the 2MW pilot project and US$90c per kWh for the 10MW.

Hydrogen Project

Tlou entered into a binding Heads of Agreement (HOA) with Synergen Met Pty Ltd (Synergen Met) for the construction of prototype hydrogen and solid carbon capture project to be installed at the Lesedi Project. The HOA was announced by the company on 30 July 2021. Synergen Met uses Plasma technology to convert methane into hydrogen and solid carbon through pyrolysis. Key highlights from the announcement are:

- Synergen Met utilizes plasma technology to convert methane to hydrogen and solid carbon. The process is carbon neutral. Synergen Met has a working prototype developed in conjunction with the University of Queensland that has produced hydrogen and NaCN (Sodium Cyanide) for commercial applications.
- Design work has commenced to modify this prototype to produce hydrogen and solid carbon using Tlou's existing gas flows and approvals.
- The prototype hydrogen production unit is being designed, built, and tested in Brisbane, Australia prior to transportation to Lesedi 1H23 and commencement of production trials.
- Post the successful development and deployment of the prototype, Tlou's objective is to grow the hydrogen segment of its clean energy business via a Joint Venture with Synergen Met throughout the Southern African Development Community (SADC) region.
- Plasma pyrolysis can deliver near-zero greenhouse gas emissions compared to Steam Reforming which is currently used for most of the world's hydrogen production. The process has lower net production costs than electrolysis of water due to lower capex, production of highly valuable solid carbon products and potential carbon credits for the company.

[9] Deutsche Bank - India 2020: Utilities & Renewables

[10] IRENA – Renewable power generation costs in 2019

Potential Benefits to Tlou

The potential benefits to Tlou are summarised below:

- A new market for the Company's gas in conjunction with an experienced hydrogen development partner.
- The prototype project can utilize Tlou's existing gas flow which is currently being flared.
- The ability to diversify Tlou's saleable products and customer base.
- There is expansion potential beyond a successful prototype.
- The project creates an alternative route to market for Tlou's gas while adding potentially high value carbon and carbon products to the company's product range.
- Clean hydrogen production reduces the greenhouse gases emissions of the power generation operations.
- The project broadens geographic markets, reducing reliance on Botswana alone. There is scope for licensing the exclusive technology being developed into South Africa and across the wider SADC region.
- The hydrogen project can enable new business areas and opportunities such as waste-to-gas-to-power, waste disposal via thermal (plasma) destruction of hard-to-abate man-made chemicals, such as Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs).
- Early-stage sales of Hydrogen and Carbon products have the potential to improve cash flow, reduce funding costs and increase funding options.
- Potential to exploit new and yet unforeseen applications of plasma technology.

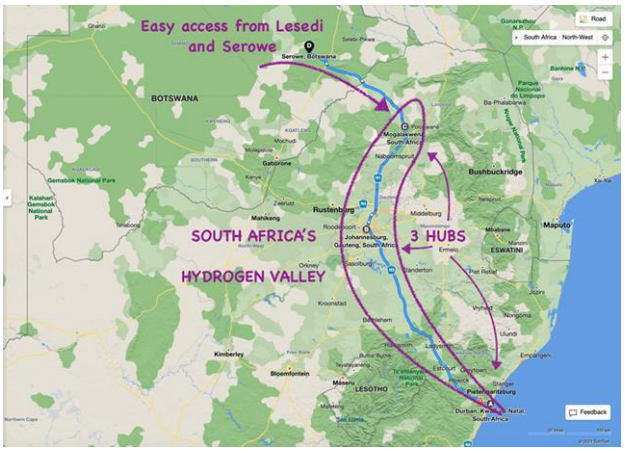
Tlou is strategically located to exploit opportunities in the Hydrogen Valley

South Africa's HV extends from Durban in the south to Mogalakwena in the north. The HV is likely to produce significant demand for hydrogen, alongside technologically developments and advancement of the Hydrogen economy more generally.

The hydrogen Hub at Mogalakwena will be instrumental in the development and rollout of hydrogen-powered mining vehicles as announced by Anglo American and this will likely have an impact on De Beers and Debswana in the long-term.

Tlou is strategically located in proximity of the HV through long-distance transport routes, via Serowe/Francistown as shown below:

Hybrid gas/solar power generation



Source: South Africa Hydrogen Valley Feasibility Study report & GT analysis

Leadership of Tlou

Management has a credible track record in delivering projects in the mining, oil & gas and energy sectors. This experience will be critical in implementing the various projects lined up by Tlou to exploit the opportunities in the Botswana and SADC energy markets.

Management of Tlou Energy Limited

The table below summarises the qualifications and experience of key management at Tlou Energy:

Name	Position	Curriculum Vitae
Anthony Gilby	Chief Executive Officer	**Qualifications** • Bachelor of Science degree in Geology. • Research in sequence stratigraphy at the Exxon Production Research Centre in Houston **Experience** • Over 30 years' experience in the oil and gas industry. • Founding Director of Tlou Energy Limited. • Began his career working as a well-site geologist for Delhi Petroleum in the Australian Cooper Basin. • Subsequently joined ESSO Australia where he was involved in exploration geology, geophysics, Petro-physics, and New Ventures. • Has previously also worked for MIM Petroleum and the Louisiana Land and Exploration Company (LL&E). • He left LL&E to become a pioneer in Queensland's CBM industry and co-founded Sunshine Gas Limited (formerly ASX listed), a company that proved +1,000PJ of CBM gas reserves and was sold to Queensland Gas Limited (which became a subsidiary of BG Group Plc) for approximately A$1.1 billion.
Gabaake Gabaake	Executive Director	**Qualifications** • Bachelor of Science degree in Geology. • Master's degree in groundwater hydrology. **Experience** • Former Botswana Government Permanent Secretary in the Ministry of Minerals, Energy and Water Resources. • Prior to that, he served in the Ministry of Local Government. • He has served on various private company boards including the De Beers Group, Debswana Diamond Company (Pty) Limited and Diamond Trading Company Botswana.
Colm Cloonan	Finance Director	**Qualifications** • Fellow of the Association of Chartered Certified Accountants (FCCA). • Studied accountancy at the Galway-Mayo Institute of Technology in Ireland. **Experience** • He joined Tlou in 2009 at the early stages of the Company's activities and has been with the Company through all phases of its operations and development to date. • He has over 20 years' experience in various finance roles in Europe and Australia including audit and business services, as well as providing financial and management accounting services to clients in various industries including power generation in Australia.
Danny Horne	Chief Operating Officer	**Qualifications and Experience** • Experience in the drilling industry for approximately 30 years and has worked extensively throughout eastern Australia as well as Africa, Pacific Islands and in the USA. • He started out with a family-owned drilling contracting business before branching out into the oil & gas drilling industry, where he worked as senior drilling supervisor through to project manager. • Previously worked for an energy drilling contractor and later became a shareholder of the business. He held the position of Drilling Manager until the company was acquired by a public company. • Has also worked for Silver City Drilling as General Manager.
Solomon Rowland	Company Secretary, General Manager and Legal Counsel	**Qualifications** • Juris Doctor from the University of Queensland. **Experience** • He has over 20 years' experience in the legal profession in Australia. • Joined Tlou in 2013. • Previously worked for Crown Law representing various Queensland Government Departments in a range of legal matters. • He has been involved in advising government departments on commercial, corporate governance and policy matters as well as representing the State in various Courts, Tribunals and Commissions of Inquiry.
Remigiyo Mavata	Chief Geologist	**Qualifications** • Bachelor of Science degree in Geology. **Experience** • Has been with Tlou since inception and was also part of the Saber Energy group which operated in Botswana prior to being acquired by Tlou. • 25 years' experience as a geologist with African based projects covering multidisciplinary exploration in conventional and unconventional reservoirs. • Previously worked for Mmabula Coal Project as a geological consultant, Mimosa Platinum Mine as a senior mine geologist, Geosearch Technical Services as a mine geologist.

Source: Tlou Energy Limited corporate website

Financial Forecasts

10 MW gas to power project

We have relied on the financial forecasts for the company's 10MW power project provided by Management and made adjustments where the company's assumptions differed with our own views. Key assumptions relating to the 10MW power project are summarised below.

Revenue

The power project is expected to only start generating revenue in the second half of FY2024. There is no revenue expected in FY2023 to accommodate the implementation of the 2MW pilot power project. We assume the revenue for FY2024 will only be six months.

Installed Capacity

The revenue projections are based on installed capacity of 2MW in FY2024. This is expected to be expanded by a further 4MW in in both FY2025 and FY2026 to bring total installed capacity to 10MW in line with the current PPA signed with BPC. Operating capacity is assumed to be 90% of installed capacity throughout the forecast period.

The forecasts assume that the 1mcf of gas will generate 99kWh of electricity. The figure is prudent given comparable figures from the US Energy Information Administration which indicate that on average 1mcf of CBM will generate 130kWh.

Electricity Price

Power prices are based on estimates of approximately US$0.80 per kWh for the 2MW pilot project and US$90c per kWh for the 10MW. We assume the electricity tariffs will increase in line with inflation at 4% per annum over the forecast period.

Cost of sales

Cost of sales for the project include royalties paid to the Government for CBM mining, direct labour costs, Lesedi camp maintenance and consumables costs, and other related costs. Royalties paid to Government are assumed to be 3% of the selling price of the CBM in line with section 66(2) of the Mines and Minerals Act, 1999. The royalties calculation is based on a national CBM price of US$5/mcf in FY2022. Thereafter, the cost is expected to increase with inflation at 4% per annum. Direct costs relating to power production have been assumed to grow at 4% per annum.

Corporate head office costs

Corporate head office costs are computed based on current head office costs for Tlou Energy and assumed to grow at 4% per annum in line with the inflation assumptions.

Gas production

We assume drilling of 29 additional production wells up to FY2045, with initial production of 250mcfd per well and an 11% decline rate. Drilling costs are estimated at US$837,000 per well and expected to grow at 4% per annum in line with expected inflation.

Capital Requirements

The project's funding requirements are estimated at approximately US$ 30 million. The utilisation of the amount raised is summarised below:

Item	FY 2022	FY 2023	FY 2024	Total
	USD	USD	USD	USD
Gas Gathering & processing	-	-	1,229,000	1,229,000
Power Station Site & Civils	-	4,593,500	4,593,500	9,187,000
Generators	-	-	873,600	873,600
Transmission lines & Substations	5,288,767	-	2,596,256	7,885,023
Drilling of new wells	-	-	3,624,192	3,624,192
Share issue costs	-	-	-	-
Working Capital		-	7,083,452	7,083,452
Balance carried over to next year	111,233	-	-	111,233
Total	**5,400,000**	**4,593,500**	**20,000,000**	**29,993,500**

Source: Tlou Energy Limited financial projections

We have assumed that the US$ 5 million equity capital raised in FY2022 is raised at US$ 0.0455 per share in line with current pricing of the company's shares. The company would thus issue an additional 284 million new shares in FY2022 to bring its issued shares to 885 million. We have included a US$5 million debt issue based on our understanding that part of the funding being raised in FY2023 will be through issuance of a debt instrument. We assume a cost of debt of 7.75% per annum based on announcement from Tlou on the terms of the debt instrument. We have assumed that the interest due on the debt instrument will be capitalised in the first 18 months to enable the project to be implemented before interest payments commence.

Solar project

We summarize our key assumptions for the solar power project below:

Assumption	Description
Resource density	Average daily irradiation (inclined) 21.7 MJ/m^2/day.
Array type	Fixed, 26° tilt. Monocrystalline, efficiency 20.2%. 0.5%pa decline
Capacity	10 MW peak, 2.7 MW average (24 hr day, full year). 2MW implemented by FY2023; a further 4MW to be added in FY2024 and another 4MW added in FY2025.
Project life	~20 years project life
Capital cost	Panels: $US0.7m/MW, all-in, including inverters, etc. Transmission: use existing 66 kV line.
Opex	$US10/kW/yr
Royalties	nil
Tax rate	Botswana corporate tax rate of 22%
Discount rate	WACC of 13.6%
Power price	$US90/MWh for pilot 2MW PPA and $US90/MWh for 10MW PPA

Source: GT analysis

Hydrogen project

We have not made any financial forecasts for the company's hydrogen project. We believe it may be some years before commercial operation is achieved for the company's hydrogen project and related carbon products given that the prototype production process is still being developed and the hydrogen markets in Southern Africa are still underdeveloped. We base our valuation of the hydrogen projects on Management's estimates on expenditure on consultants and other third-party costs.

Valuation

Valuation approach
We have applied a Sum-of-the-Parts (SOTP) valuation methodology in our valuation of Tlou Energy Limited. An SOTP valuation obtains the value for a company by aggregating the standalone values of each of its business units to arrive at a single total enterprise value (EV) for the company. The equity value is then derived by adjusting the EV for the company's net debt and other non-operating assets and expenses.

Our SOTP valuation incorporates valuation for the 10MW gas-to-power project, Tlou's substantial base of 2P and 2C reserves beyond the 10MW power project (Adjusted reserves), the solar project and hydrogen project. We apply risk factors to account for technical and commercial maturity. Our valuation method for each case is summarized below.

10MW gas-to-power project valuation
We have applied the Discounted Cash Flow (DCF) method to value the proposed 10MW gas-to-power project. Our DCF model assumes first power sales in the second half of FY2024. Power generation capacity in FY2024 is assumed to start at 2MW increasing to 6MW in FY2025 and 10MW in FY2026 in line with recently signed 10MW PPA.

We estimated the project funding requirements at US$ 30 million in line with guidance from the company with US$ 25 million being equity and US$ 5 million being raised as debt capital to obtain a weighted average cost of capital (WACC) of 19.51%. This is based on a cost of debt capital of 7.75% as agreed with BPOPF and our estimated cost of equity capital of 22.37%. We expect the company's cost of equity to come down in the future as company specific risk factors such as the lack of a revenue track record, potential impact of dilution from additional capital raises and uncertainty of additional exploration are resolved.

Based on the DCF method and the forecast and valuation assumptions stated in this report, the NPV of the 10MW Power Project is estimated at US$ 8.6 million. We apply a risk adjustment factor of 100% given that the cash flows will be based on actual gas that would have been mined by the company.

Adjusted Gas reserves valuation
We obtain the value of the gas reserves remaining after the 10MW power project by applying the current market price of gas to the adjusted reserves and an adjustment factor to reflect development and production costs that are required to bring the gas above the ground.

Adjusted 2P reserves
Adjusted 2P reserves for Tlou Energy Limited are obtained by subtracting the gas requirements for the 10MW Power Project (23 Bcf) from the company's total 2P gas reserves (40.7 Bcf).

Contingent Reserves
We have used the company's 2C reserves of 214 Bcf as our estimate of the company's contingent gas reserves.

Natural gas price
The natural gas price is based on the current Henry Hub natural gas price (US$5.25 million per BCF). The Henry Hub pipeline is the pricing point for natural gas futures on the New York Mercantile Exchange.

Adjustment factor
The adjustment factor is based on a rule of thumb in the oil and gas industry that reserves in the ground are worth approximately one third of their current market value to consider development and production costs that must be incurred to bring the oil and gas above ground (source: McGowen, Robert M., "Valuing Oil & Gas Properties" (2000). Annual of the Arkansas Natural Resources Law Institute).

Based on the above assumptions, we obtain a valuation of US$92.8 million for the Adjusted 2P reserves and US$ 1,122.43 million for the 2P and 2C reserves respectively. We consider the 2P and 2C reserves to be the best estimates of the company's proven and contingent resources. We have therefore not considered any reserve figures beyond the above in our valuation. We apply risk adjustment factors of 50% and 15% for the 2P and 2C reserves valuation respectively to consider the uncertainty associated with gas reserves.

Solar Project valuation
We have applied the Discounted Cash Flow (DCF) method to value the proposed solar project. Our DCF model assumes that the solar project will be developed in line with the timescale for the gas-to-power project given Tlou's hybrid gas and solar approach. The first power sales are therefore expected in the second half of FY2024. Power generation capacity will also follow the capacity expansion plan for the 10MW gas-to-power project and is assumed to start at 2MW in FY2024 increasing to 6MW in FY2025 and 10MW in FY2026 in line with recently signed 10MW PPA.

We estimated the project funding requirements at US$ 7 million, with our estimate of capex per MW being US$0.7 million. This is in line with trends in the solar energy space where capex costs continue to decline with improvements in technology. We have assumed Opex and maintenance costs of US$10/kwh/yr based on estimates from the International Renewable Energy Agency.

Our forecasts assume the project will be funded using 50% debt and 50% equity based on our view that it will be easier to raise debt funding for the solar project given the world's increasing focus on cleaner energy. We assume the additional equity capital will be raised by issuing new shares at the current share price of the company. We estimate a lower cost of equity capital for the solar project of 21.15% given lower specific risks for the project and maintain our cost of debt capital at 7.75% to obtain a weighted average cost of capital (WACC) of 13.6% for the solar project.

Based on the DCF method and the forecast and valuation assumptions stated in this report, the NPV of the Solar Power Project is estimated at US$ 13.2 million.

Hydrogen Project
We have assigned a nominal valuation of US$ 300 thousand based on estimates of expenditure on consultants and other third-party costs for the project. We believe that significant upside is possible following technology validation.

SOTP valuation
Our SOTP valuation is summarised below:

Tlou Energy Sum of the parts valuation summary

	Unrisked USD m	CoS* %	Risk-Adjusted USD m	Risk-Adjusted BWP m	Risk-Adjusted cents/share	Risk-Adjusted thebe/share
10MW Power Project	8.56	100%	8.56	109	0.97	12.31
Adjusted 2P Reserves	30.95	50%	15.47	197	1.75	22.24
Contingent Reserves (2C Reserves)	374.14	15%	56.12	714	6.34	80.67
10MW Solar Project	13.17	70%	9.22	117	1.04	13.25
Hydrogen Project	0.30	100%	0.30	4	0.03	0.43
Net Debt (30 June 2022)	(5.29)	100%	(5.29)	(67)	(0.60)	(7.60)
Head Office costs	(11.07)	100%	(11.07)	(141)	(1.25)	(15.92)
Total NAV	**411**		**73.32**	**932**	**8.29**	**105.38**
Current share price					**4.10**	**50.00**

Source: Tlou Energy Limited; GT valuation

Our valuation at this stage does not consider the prospects of supplying natural gas to the 90MW Orapa Power Plant which supplies electricity to the Orapa Diamond Mine. We note that winning the Orapa gas supply tender can significantly increase the upside in the valuation of Tlou Energy.

Glossary

1H or 2H	1st half or 2nd half of a calendar year or financial year
1Q, 2Q, 3Q or 4Q	1st quarter, 2nd quarter, 3rd quarter or 4th quarter of a calendar year or financial year
A$ or AUD	Australian dollars
AIM	Alternative Investment Market of the London Stock Exchange
ASX	Australian Securities Exchange
Boomslang	The Boomslang CBM project which is 100% owned by Tlou
BSE	Botswana Stock Exchange
BPC	Botswana Power Corporation
BPOPF	Botswana Public Officers Pension Fund
BWP	Botswana Pula
Capex	Capital expenditure
CBM	Coal Bed Methane
CBM Projects	Includes the Lesedi Project and the Mamba and Boomslang project areas
CEO	Chief Executive Officer
CFO	Chief Finance Officer
FY	Financial Year
Lesedi Project	The Lesedi CBM project which is 100% owned by Tlou
LTM	Last Twelve Months
EBIT	Earnings before interest, tax
EBITDA	Earnings before interest, tax, depreciation, and amortization
GT or Grant Thornton	Grant Thornton Capital Advisors (Pty) Ltd
Mamba CBM Project	The Lesedi CBM project which is 100% owned by Tlou
MMGE)	Ministry of Mineral Resources, Green Technology and Energy Security
PPA	Power Purchase Agreement
SADC	Southern African Development Community
SAPP	Southern African Power Pool

Technical terms

1C	low estimate scenario of Contingent Resources in accordance with SPE-PRMS
1P	proved reserves in accordance with SPE-PRMS
2C	best estimate scenario of Contingent Resources in accordance with SPE-PRMS
2P	proved and probable reserves in accordance with SPE-PRMS
3C	high estimate scenario of Contingent Resources in accordance with SPE-PRMS
3P	Proved, probable and possible Reserves in accordance with SPE-PRMS
BCF	Billion cubic feet
cfd	Cubic feet per day
Gas Reserves or Reserves	Those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: They must be discovered, recoverable, commercial, and remaining (as of a given date) based on the development project(s) applied
Gas Resources or Resources	Those quantities of petroleum estimate, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by their economic status
kW or kWh	Kilowatts (one thousand watts) or kilowatt hours
scf	Standard cubic feet
Scfd or scf/d	standard cubic feet per day
MCF/ mcf	Thousand cubic feet
Mcfd or Mscfd	Thousand cubic feet per day or Thousand standard cubic feet per day
Bcf	Billion cubic feet
kW or kWh	Kilowatts (one thousand watts) or Kilowatt hours
MW or MWh	Megawatts (one million watts) or megawatt hours
Pilot	a small development project to validate the petroleum engineering estimates of recovery rates, and spacing before the operator commits to commercial development
SPE-PRMS	Petroleum Resources Management System, the resources and reserves certification standards promulgated by the Society of Petroleum Engineers, the American Association of Petroleum Geologists, the World Petroleum Council and the Society of Petroleum Evaluation Engineers. SPE-PRMS is an internationally recognized standard permitted to be used in the Note for Mining and Oil & Gas Companies pursuant to the AIM Rules for Companies

Caveats

General

The provision of valuation services and considerations of the issues described herein are areas of regular transaction advisory practice by GT. The services do not represent accounting, audit, and financial due diligence review, consulting, transfer pricing or domestic tax-related services that may otherwise be provided by Grant Thornton.

Our analysis and review of the Target company does not constitute an audit in accordance with Auditing Standards. We have assumed that data available in the audited annual financial statements of the Company and other information provided by the management of the Company are consistent and reasonable. We have not independently investigated or otherwise verified the data provided. Nothing has come to our attention to indicate that the information provided had material misstatements or would not afford reasonable grounds upon which to base the report.

Our valuation is primarily from a business perspective and has not taken into account various legal and other corporate structures beyond the limited information made available to us.

The responsibility for assumptions on which the forecasts are based is solely that of the management of Tlou Energy Limited. It must be emphasized that profit forecasts necessarily depend upon subjective judgment. They are to a greater or lesser extent, according to the nature of the business and the period covered by the forecasts, subject to substantial inherent uncertainties. In consequence, they are not capable of being audited or substantiated in the same way as financial statements, which present the results of completed periods. Similarly, we have relied on data from external sources. These sources are considered to be reliable and therefore, we assume no liability for the accuracy of such data. We have assumed that the business continues normally without any disruptions due to statutory or other external/internal occurrences or impact of COVID-19 pandemic.

The scope of our work has been limited both in terms of the areas of the business and operations which we have reviewed and the extent to which we have reviewed them in line with signed Terms of Engagement. There may be matters, other than those noted in this executive summary report, which a wider scope might uncover. It may be noted that valuation is not an exact science and ultimately depends upon what the business is worth to a serious investor or buyer who may be prepared to pay a substantial goodwill.

The valuation contained herein is not intended to represent the value at any time other than the date of valuation that is specifically stated in this document. This report is issued on the understanding that the management of the Company has drawn our attention to all matters of which they are aware concerning the financial position of the Company, which may have an impact on our valuation up to the date of issue. We have no responsibility to update this letter for events and circumstances occurring after the date of this letter.

We have no present or planned future interest in Tlou Energy Limited or any of the group companies and the fee for this letter is not contingent upon the values reported herein.

Sources of information

We have considered the following sources of information in preparing our research report:

- Tlou Energy Limited financial projections for the 20 years up to 30 June 2042.
- Publicly available information on the oil and gas sector such as gas prices, valuation methodologies and risk adjustment factors.
- Tlou Energy Limited certified gas reserves as reported by SRK Consulting (Australasia) Pty Ltd.
- The annual Financial Statements of Tlou Energy limited for the financial years ending 30 June 2018, 2019, 2020, 2021 and half year 2022.
- Publicly available information on bond yields and borrowing rates in Botswana.
- Aswath Damodaran's database.
- Market related data from the Australian Stock Exchange (“ASX”) for comparable oil and gas exploration companies listed on the ASX.
- Botswana Power Corporation (“BPC” 2020 annual report.
- The International Monetary Fund (“IMF”) economic growth forecasts for Botswana.
- The Tlou Energy Limited share price on the ASX and BSE; and
- Discussions with the management of Tlou Energy Limited.