



Potential of Southern Africa inland gas as a primary energy source

Oil & Gas Focus Group

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Growing Business Value Through Successful Projects

A team of experienced consultants with complementary competencies working within a broad and diverse range of public and private projects and operations



Koos Taljaard

Director

koos@ownerteamconsult.com

+27 83 308 4327

Koos is a Professional Engineer and holds a degree in mechanical engineering, diplomas in GDE (minerals economy), MDP, Project Management (Oxford University), Mechanical Engineers Certificate of Competency Mines, experience in multidisciplinary mining and mineral beneficiation areas and cement industry in various executive, project, operational, engineering, business development, and consulting roles.



Freek van Heerden

Managing Director

Freek@ownerteamconsult.com

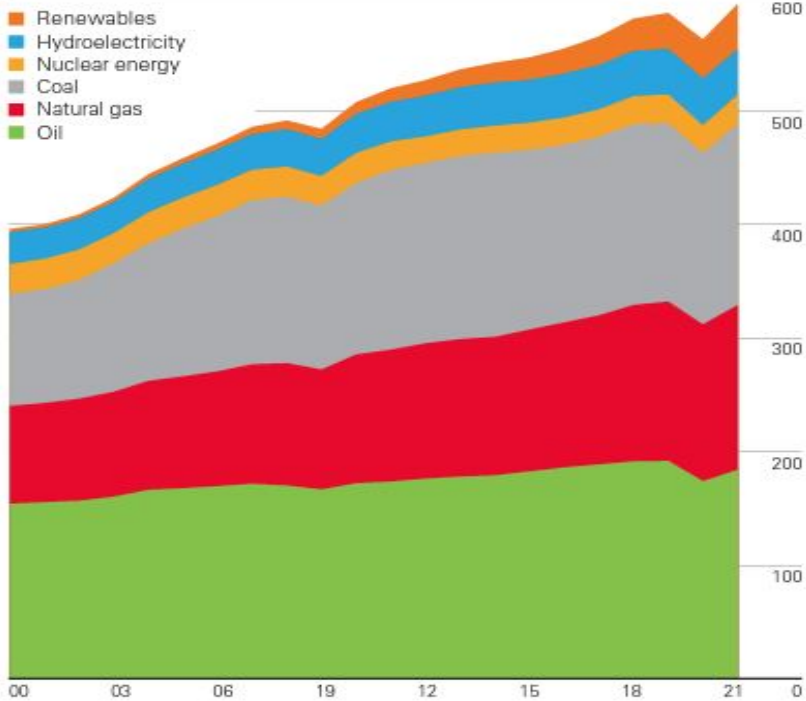
+27 82 610 7426

Freek holds a master's degree in chemical engineering as well as Executive Management Diplomas from Columbia University in general management and the Institute of Management Development (IMD) in managing a technical enterprise. Freek's experience includes roles covering technical support, plant operations, business management and especially project development.

Natural gas as a growing primary energy source

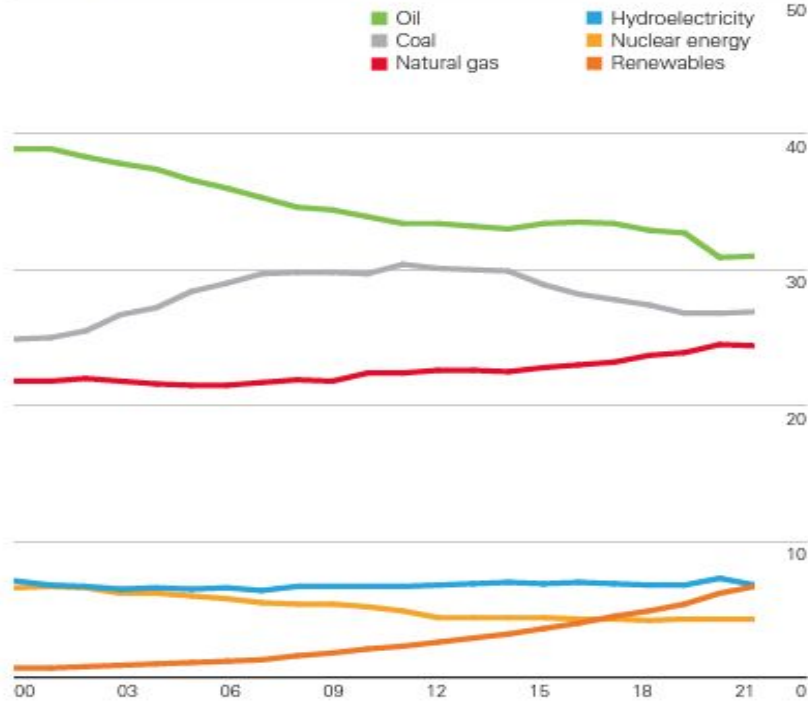
World consumption

Exajoules









Shares of global primary energy

Percentage

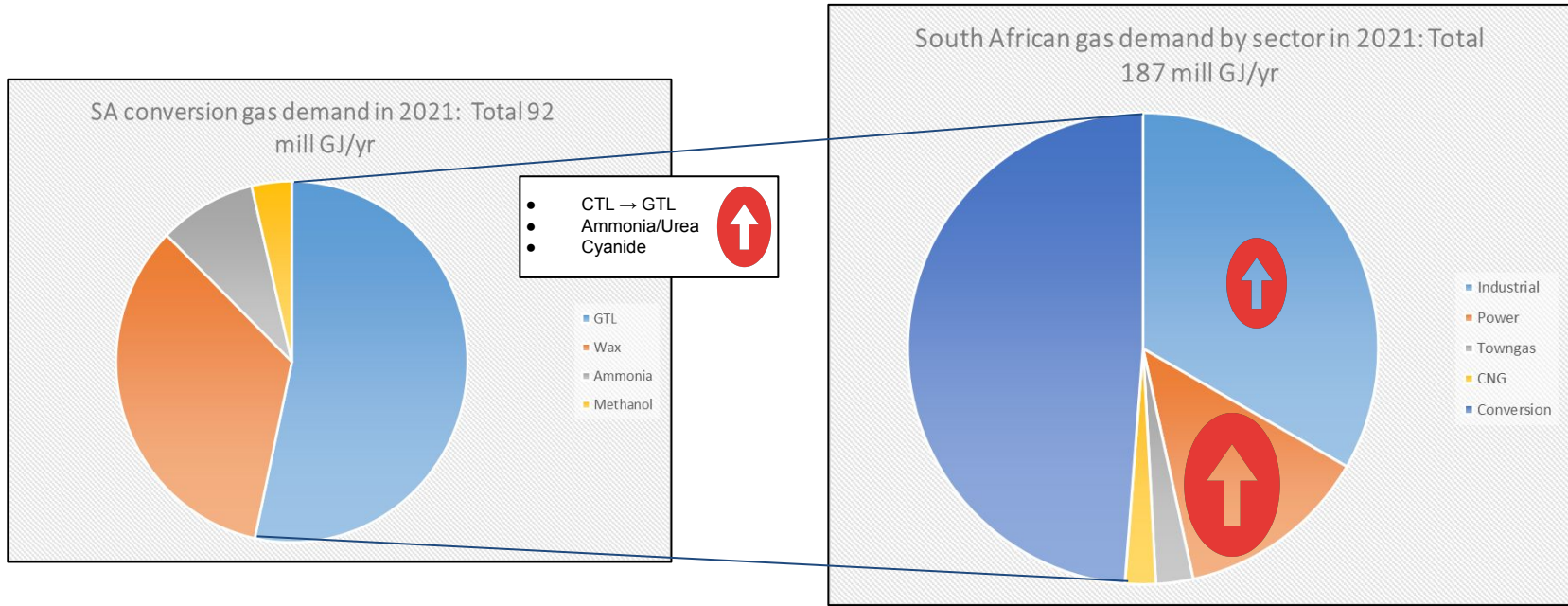


Natural gas consumption and opportunity for growth

Country	Oil	Natural Gas	Coal	Renewables	Total energy
Japan	37%	21%	27%	7%	17740 PJ/a
Germany	33%	12%	17%	13%	12640 PJ/a
USA	38%	32%	11%	8%	92970 PJ/a
Egypt	34%	59%	1%	3%	3790 PJ/a
Morocco	52%	3.1%	32%	7%	960 PJ/a
South Africa	20% 	3% 	71% 	3%  	4980 PJ/a 

- South Africa heavily dependant on Coal - historical as well as shortage of gas
- Growth severely limited by lack of “cheap” energy
- Per unit energy 30% - 35% higher GHG emission compared to gas
- Can substantially reduce GHG by switching to gas.
- Substantial inland gas resources close to markets available
- Renewable still at very low percentage - will take time to gain a substantial foothold

Natural gas usage and opportunities by sector



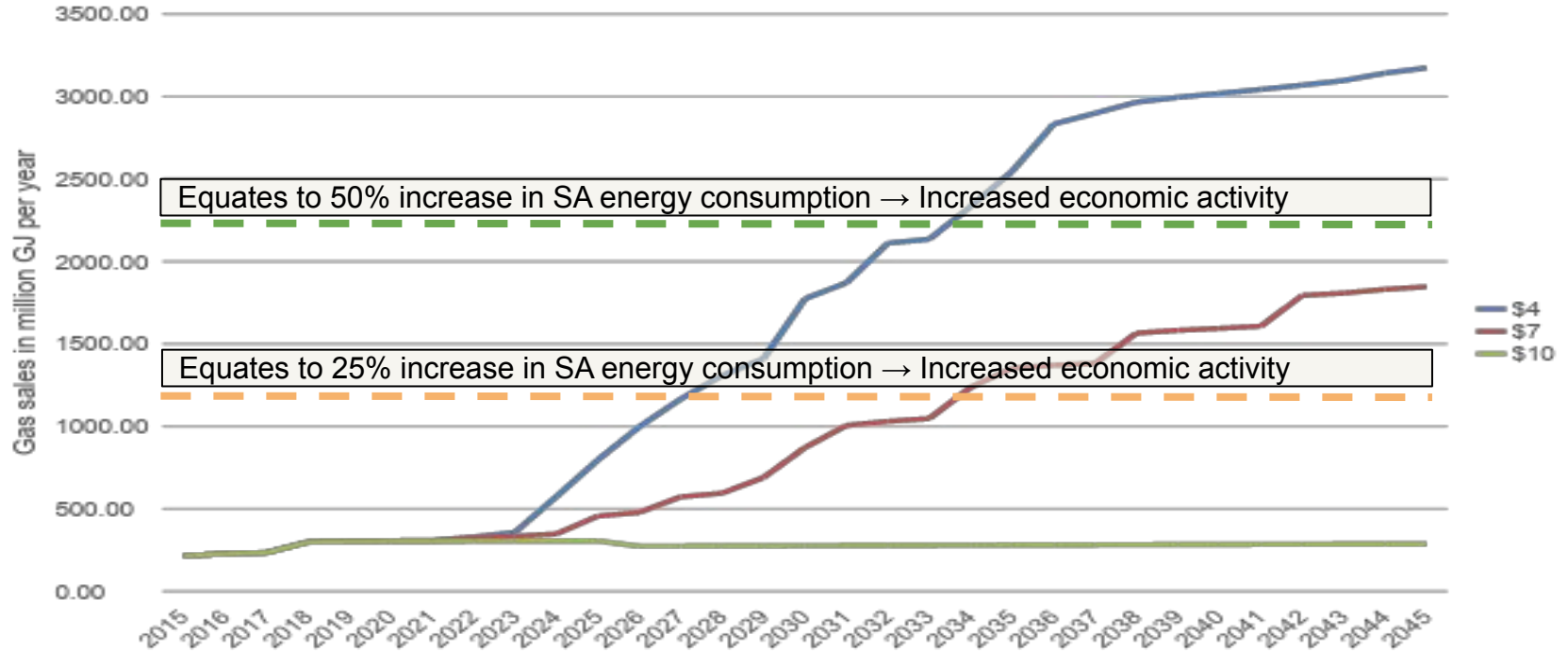
Gas is used both as an energy source as well as a raw material for conversion to other products

Affordable gas prices by sector

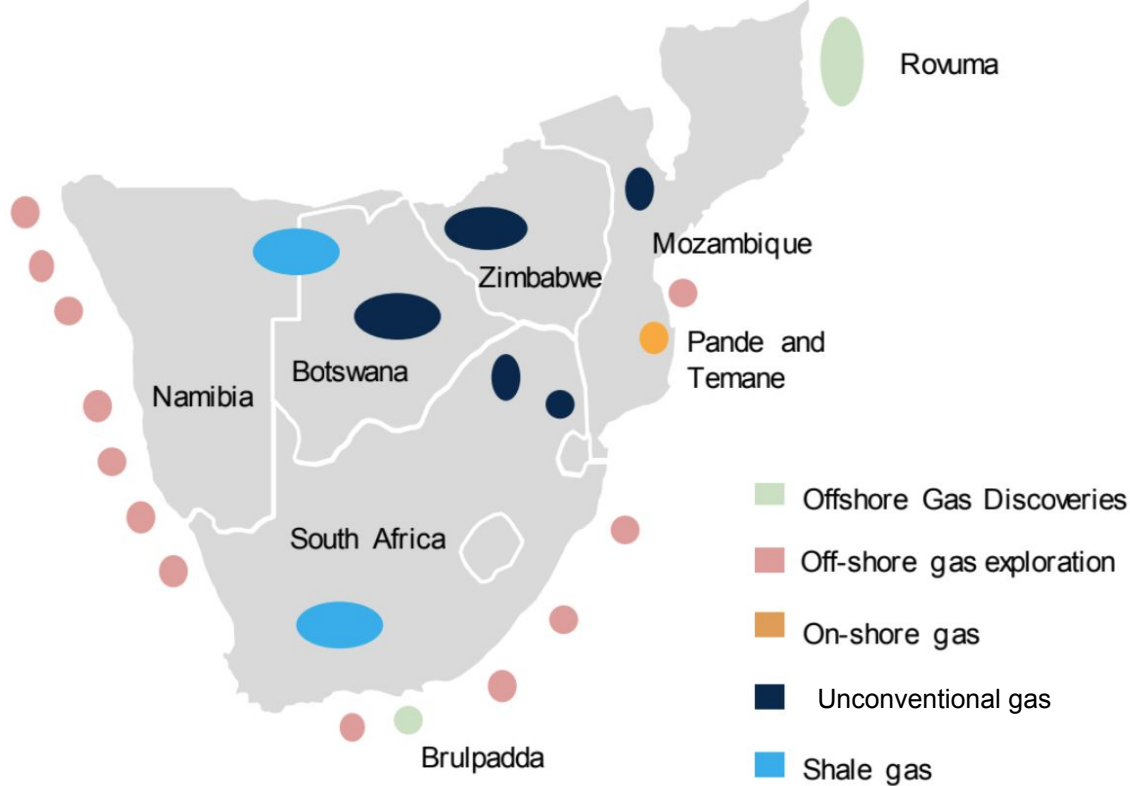
- Towngas - R 270 - R 500/GJ
- Diesel / LPG replacement - R250 - R370/GJ
- Industrial applications - R120 - R260/GJ
- Peak power production - R140 - R200/GJ
- Base power production - R100 - R140/GJ
- Derivatives eg GTL, NH₃ - R50 - R85/GJ*

** Long term average not recent fertiliser and oil prices*

Gas market potential in Southern Africa



Gas resources in Southern Africa



Conventional Gas Resources in South Africa

- Rovuma basin - 150 tcf
- Brulpadda offshore Southern Cape - 5 tcf
- Ibhubesi offshore Northern Cape - 0.5 tcf
- Invictus -Northern Zimbabwe - 9.25 tcf

Long development timeline

South African inland gas resources north-eastern areas

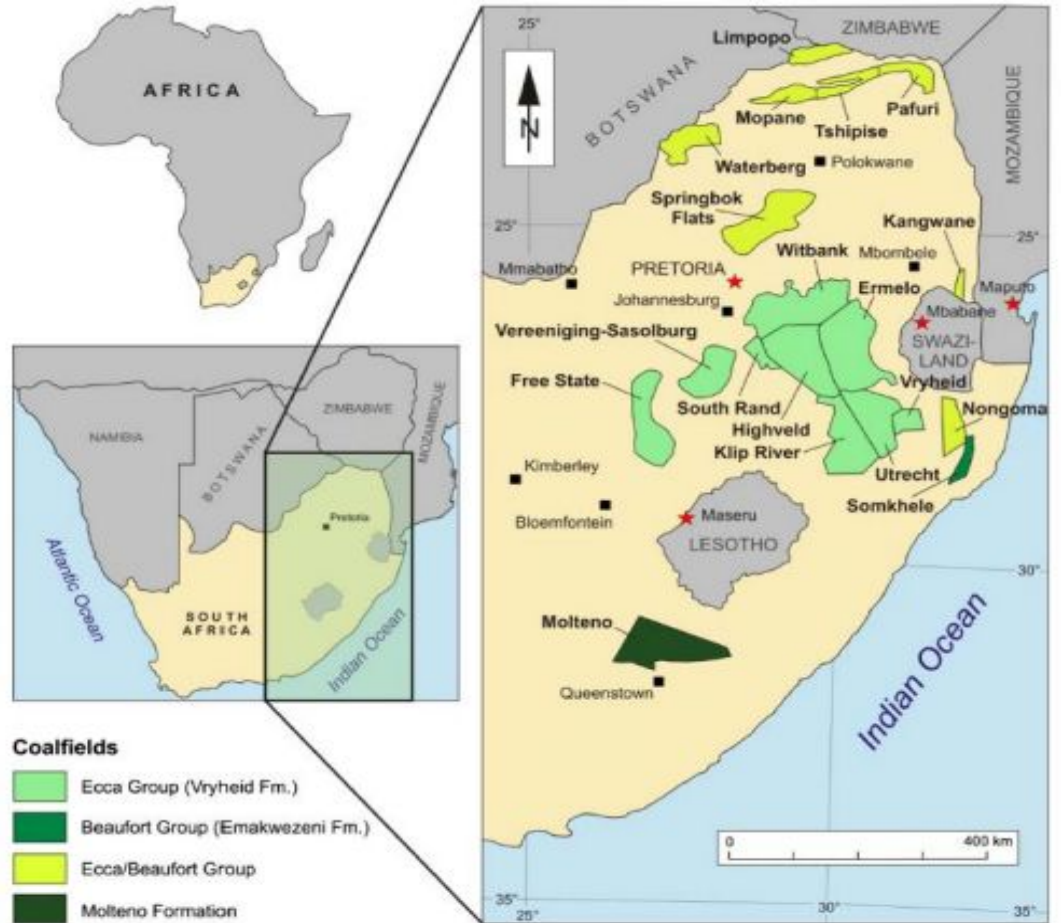


Fig. 1. Coalfields of South Africa. The Mopane, Tshipise and Pafuri coalfields collectively form the Soutpansberg Coalfield. Fm. = Formation. Various modified after Snyman (1998).

Unconventional Gas in Southern Africa



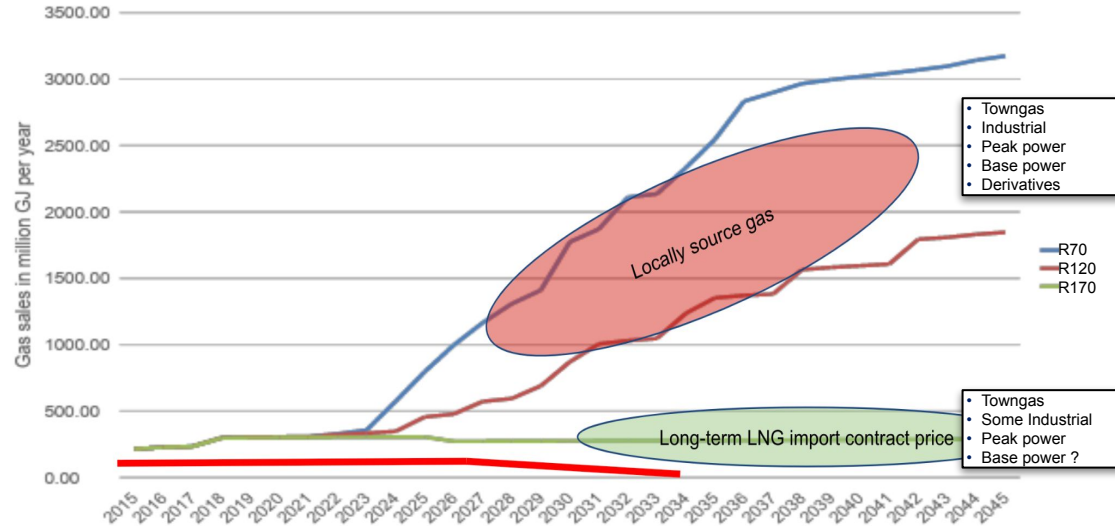
• Karoo shale gas	- 48 ⁺ tcf
• Waterberg	- 2 ⁺ tcf
• Kinetiko (Mpumalanga)	- 5 ⁺ tcf
• Bastion	- ?
• Botswana CBM	
– (KEB, TLOU, Botala)	- 15 ⁺ tcf
• Renergen Virginia	- 0.3 tcf
• Boo brothers	- ?
• Zimbabwe CBM	- ?
• Mozambique Tete	- ?
• <u>Total</u>	<u>+ 20⁺ tcf excl. Karoo</u>

**Various
stages of
development**

**Substantial
gas can be
delivered in
relative short
period**

South Africa potential market for inland gas

- **Electricity generation:**
 - To replace aging Eskom power stations that must come offline
 - New smaller private power stations under 100 MW each
- **Diesel replacement:**
 - Mining vehicles in vicinity of gas resources
 - Road vehicles along highways such as N3 and N4
- Replace future declining Sasol supply from Mozambique, especially the industrial market
- **Derivative manufacture**



- SA diesel usage 12 million m3 per annum
- Imports 6 million m3 per annum and increasing with refinery closures
- Commercial sector diesel is 9 million m3 per annum = 335 million GJ/a = 6 million tons per annum of LNG

Case study 1 - Develop 5 tcf total in decentralised zones

- Gas supply
 - Supply 360 PJ/a for 20 years (present gas consumption 187 PJ/a)
 - Requires ~ 11 000 well over 400 sq KM (20kmx20km)
 - Gas field development ca R 10 billion
 - Gas sales revenue - R 27 billion per annum
- Potential gas applications

	Power only (7 GW)	Diesel only replace (10 bn liters)	Piped Gas only (360 PJ/a)	Balanced portfolio (40/10/50)
Capital R bn	112	104	30	70
Revenue R bn pa	90	250	42	82

Say 5-6 hubs
1-1.5 TCF each
can supply gas to
the industry

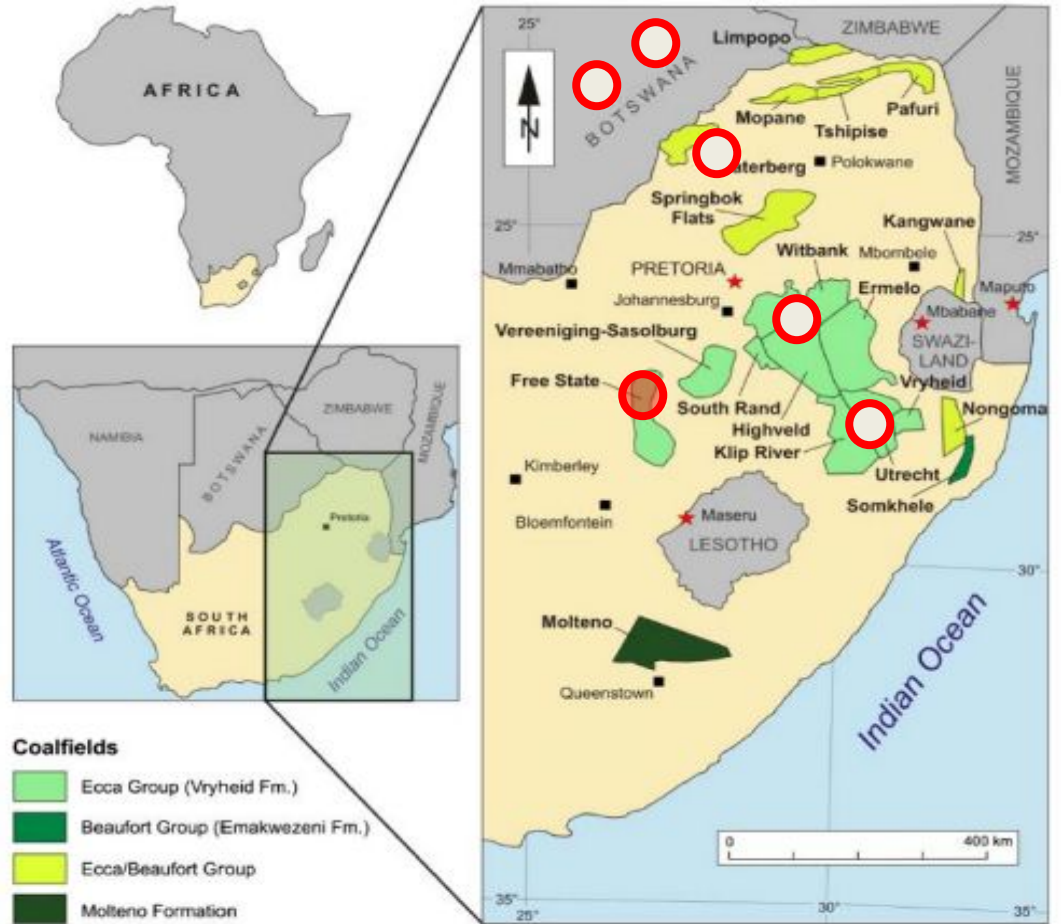
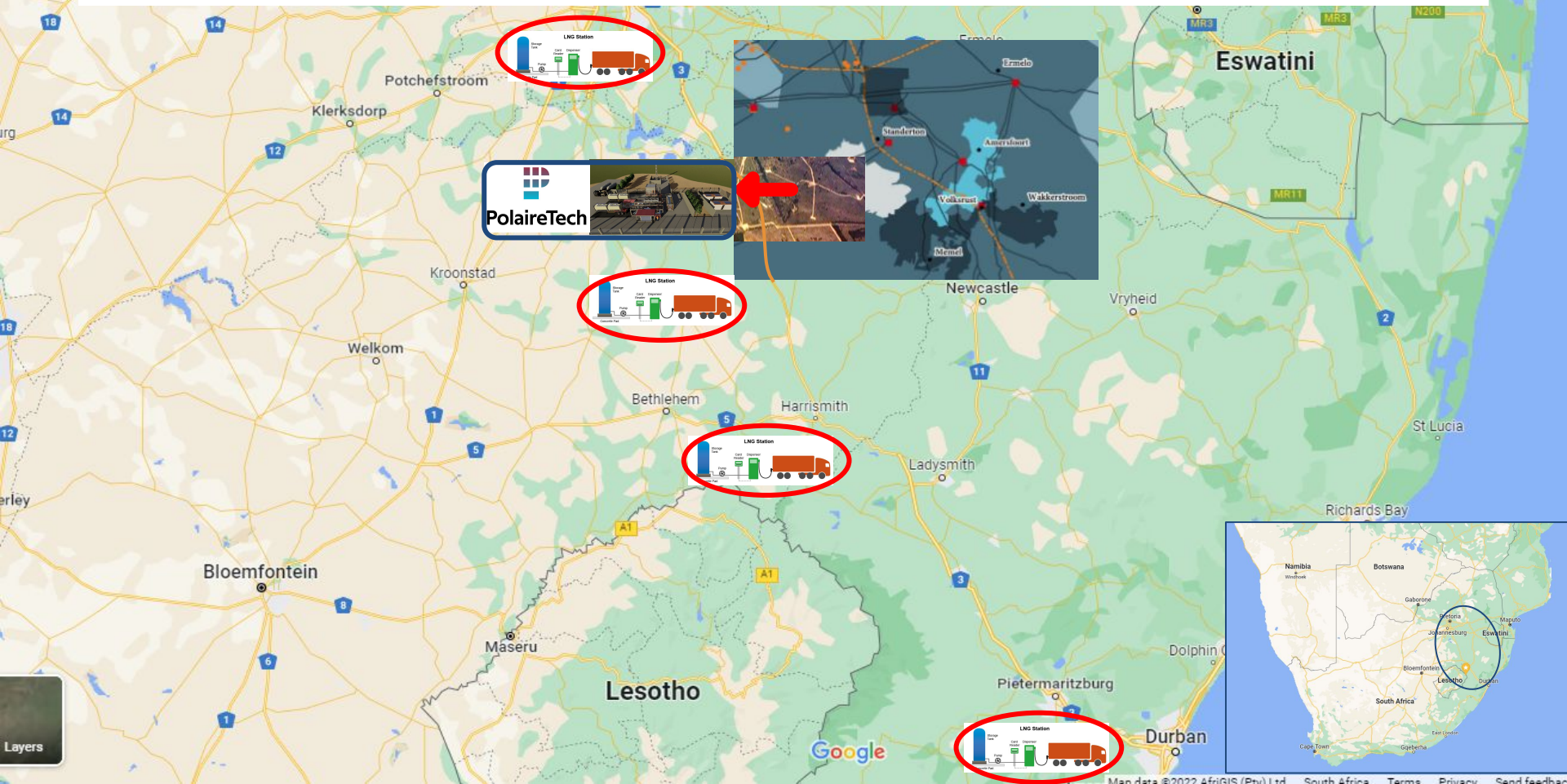


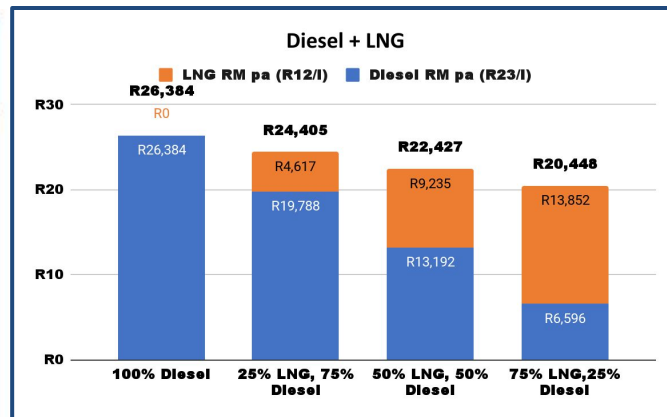
Fig. 1. Coalfields of South Africa. The Mopane, Tshipise and Pafuri coalfields collectively form the Soutpansberg Coalfield. Fm. = Formation. Various modified after Snyman (1998).

Case study N3 Gauteng to Durban South Africa



Assumed desktop financials

Description		100% Diesel	25% LNG, 75% Diesel	50% LNG, 50% Diesel	75% LNG, 25% Diesel
Assume	Trucks/day both directions	12000	12000	12000	12000
Diesel	Total ML pa	1147	860	574	287
LNG	ML pa	0	411	821	1232
LNG	60ktpa plants	0	3	7	10
Diesel	Diesel R billion pa	R26	R20	R13	R7
LNG	LNG R billion pa	R0	R5	R9	R14
Combined	R billion pa	R26	R24	R22	R20
Saving	Diesel ML pa	0	-287	-574	-860
Saving	Diesel R billion pa saving	R0	-R7	-R13	-R20
Total	Capex R billion	R0	R8	R17	R24
Saving + Profit	Total R Billion pa	R0	R3	R6	R10
IRR (20 years)	% Savings, +profit	0%	29%	25%	28%

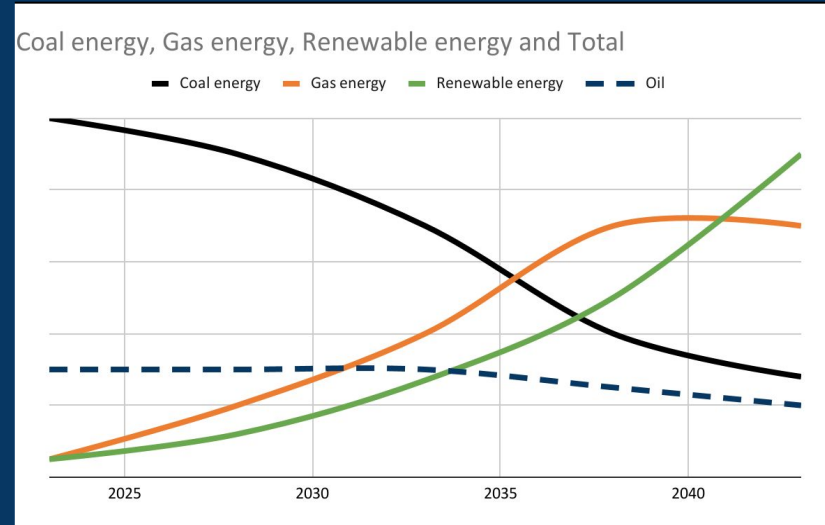


- Development zones
- Local economic development
- Local employment
- Reduction in diesel imports, foreign balance of payment
- Positive impact on GDP
-

1- 1.5 tcf over 20 years

Vision for Southern Africa

- Development of inland gas sources needs more focus
 - Growth in inland gas as a primary energy source
 - Transitional energy source from coal to renewable energy
- Create development zones around inland gas fields
- Large potential market - place for many players
 - Role players to cooperate
- Massive financial and economic development impact
- Gas can relatively quickly help to address present electricity crisis





Thank you



OTC

Growing business value through successful projects

About OTC



Owner Team Consultation (OTC) is a group of experienced consultants on projects in the oil and gas, downstream chemical, mining & beneficiation, energy and related sectors



We work in an integrated team with owner organisations project and business teams to ensure business success



We enable owner organisations and project teams to effectively develop and execute business strategies/plant and supporting projects by providing the necessary oversight, coaching, training and support services

OTC Expertise

Our consultants provide owners with expert and practical guidance to enhance business and project performance in the following areas:

- Project & programme management
- Operations & maintenance
- Environment, health & safety
- Stakeholder management
- Technology and engineering
- Business Strategy development

The OTC Consulting Partners



Anton Putter

*Business Development
& Marketing*



Koos Taljaard

*Mechanical Eng. &
Project Management*



Charl Buys

*Business Development
& Operations*



Freek van Heerden

*Eng. Management
& Integration*



Gavin Halse

*Business Systems
& IT concepts*



Jurie Steyn

*Environmental and safety
Decarbonisation &
New Energy*



Kevin Mattheys

*Project Controls &
Quality*



Cornè Thirion

*Engineering &
Operations*



Christine Render

*Process Engineering &
Concept Development*



Deryck Coetzer

*Process design &
Engineering*

Supported by a strong network of other consultants



Thank you