

Project overview

why you should support the TUCG project



AFRICARY
African Carbon Energy
Theunissen UCG Project

Elmar Roberg
Programme Manager
elmar.roberg@africary.com
+27 82 651 5138

Agenda

- ★ The context
- ★ The opportunity
- ★ The need
- ★ The projects
- ★ The technology
- ★ The company

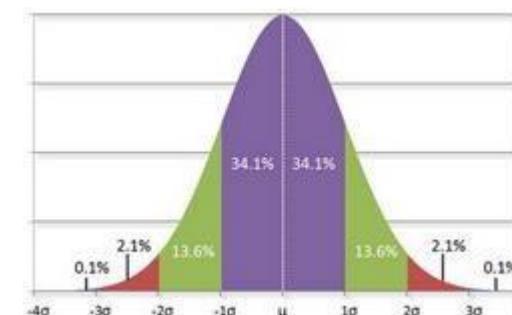
Quick summary

- ★ **South Africa has**
 - ★ Unacceptably high level of unemployment, due to
 - ★ Unacceptably low rate of economic growth, due in part to
 - ★ Diverse but related social issues
- ★ **Further, we are likely to run out of water, energy and food unless there is urgent action**
- ★ **Africary can be a positive role player in**
 - ★ Preventing foreign debt from crippling attempts to solve our urgent problems
 - ★ Using our own most abundant energy source
 - ★ Whilst improving adherence to vital environmental, health and safety goals
 - ★ Using a technology known as *underground coal gasification* (UCG)
- ★ **Best of all, this can all take place within Lejweleputswa**
 - ★ And from there, be rolled out to seven of the nine provinces
 - ★ Within less than 10 to 15 years (i.e. well within the IRP2018)
 - ★ With an investment which is likely to far exceed R20billion

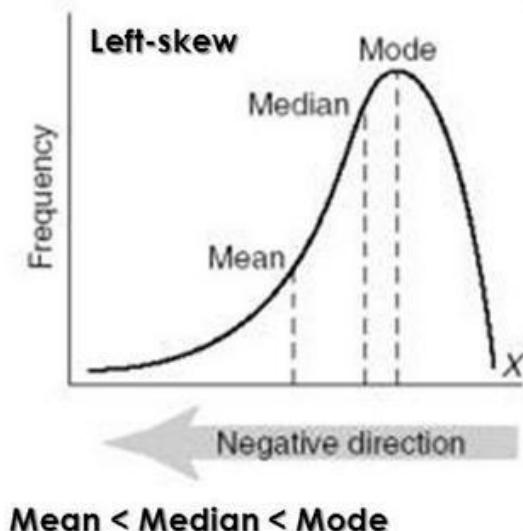
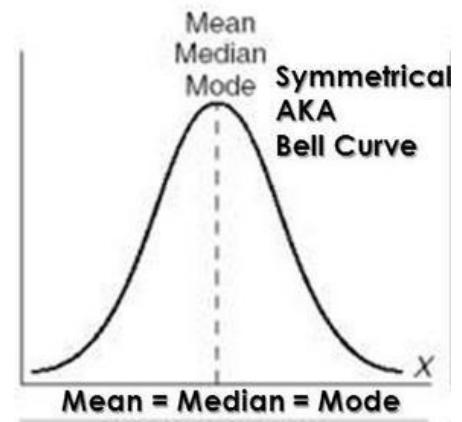
Urgent action is required

Our most pressing needs

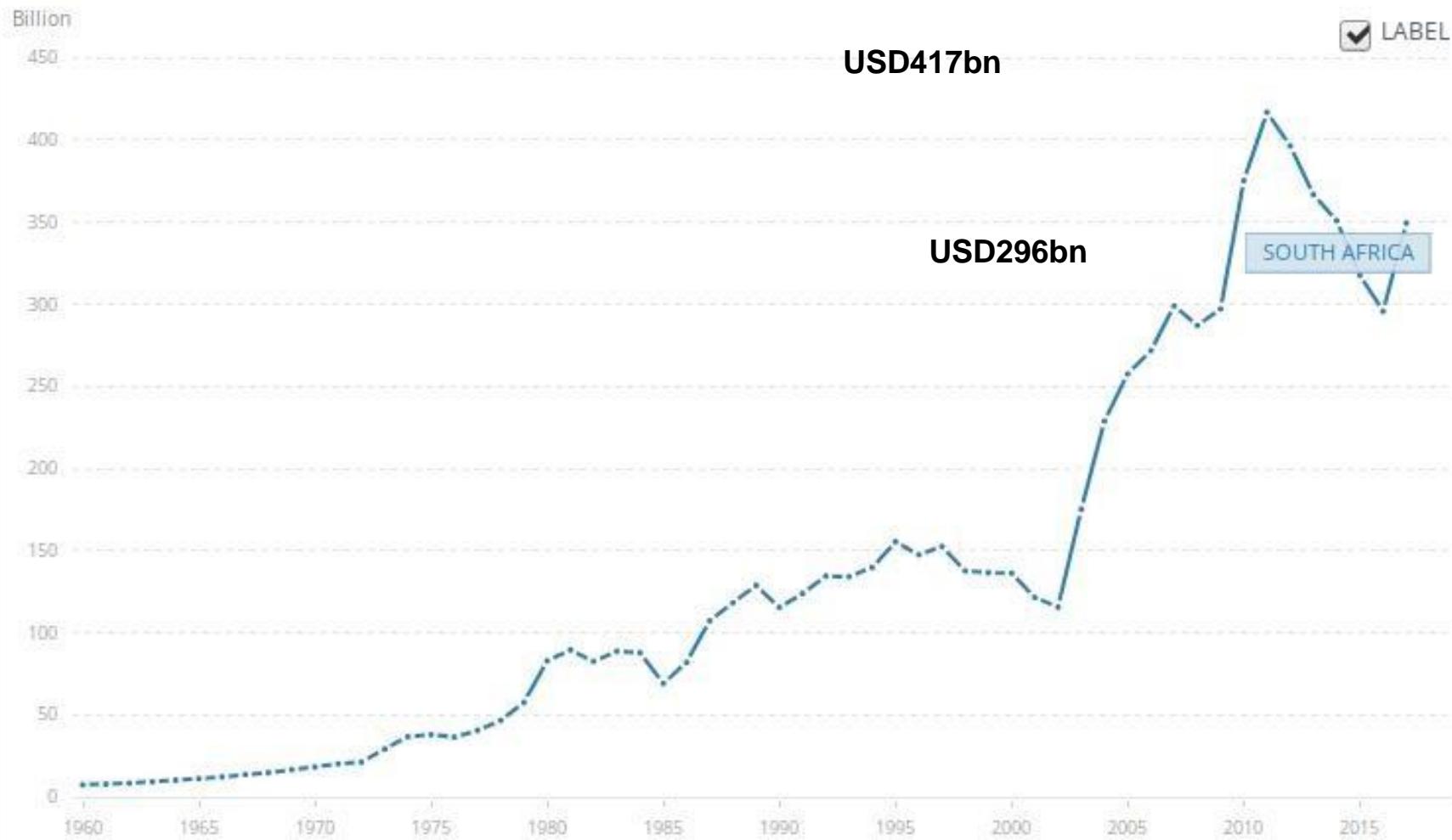
- ★ The eradication of involuntary poverty
- ★ The establishment of a fair society
 - ★ Creation of a “normal” middle class
 - ★ Access to services for all
 - ★ Access to “crown jewels” for all
 - ★ ...
- ★ Water security
- ★ Food security
- ★ Energy security*
- ★ Containment of foreign debt (avoid “fiscal cliff”)
- ★ A sustainable growth economy



* note: cheap / abundant energy is able to reduce the risks of food / water security



Our economy



What the DOE tells us

- ★ Portfolio Committee on Energy
- Presentation on Fuel Pricing 21
- August 2018
- ★ What is the cost?

Overview of the Liquid Fuel Sector

- The SA petroleum industry accounts for:
 - 8.1% contribution to the national GDP
 - >100 000 jobs (direct and indirect)
 - R365 billion p.a. in turnover
 - R72 billion p.a. in duties and levies
 - R9.6 billion p.a. in capital expenditure

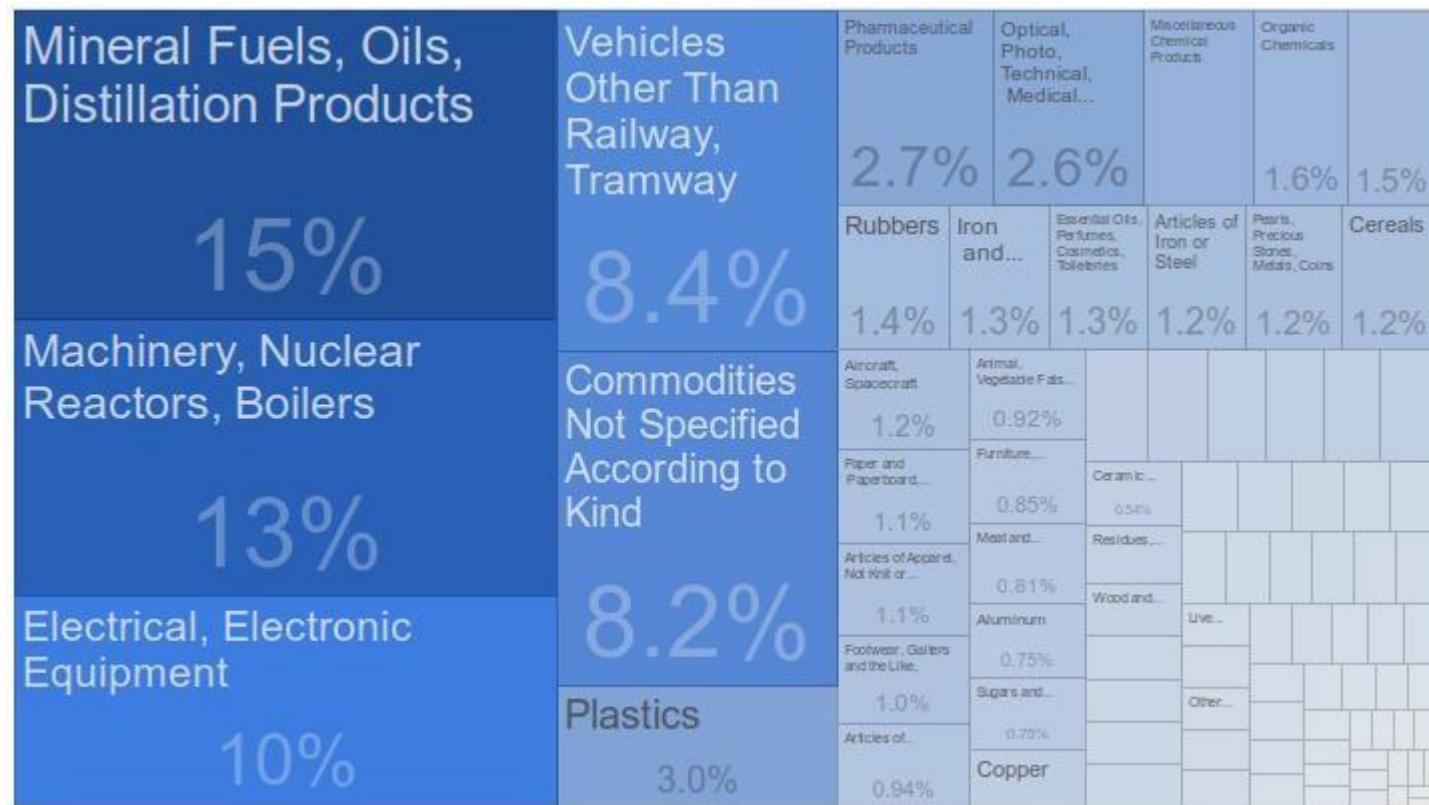


5

where's the problem?

South Africa Imports By Category

This page displays a table with South Africa Imports By Category in U.S. dollars, according to the United Nations COMTRADE database on international trade.

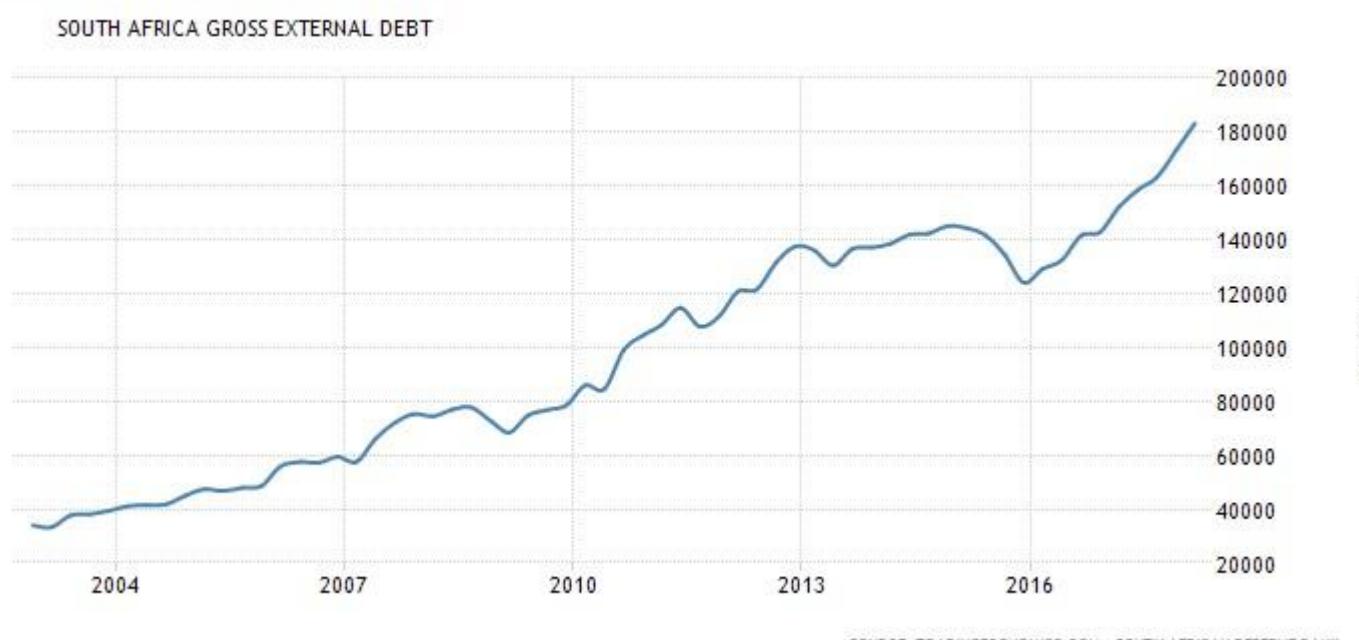


<https://tradingeconomics.com/south-africa/imports-by-category>

You tell me ... should we be concerned?

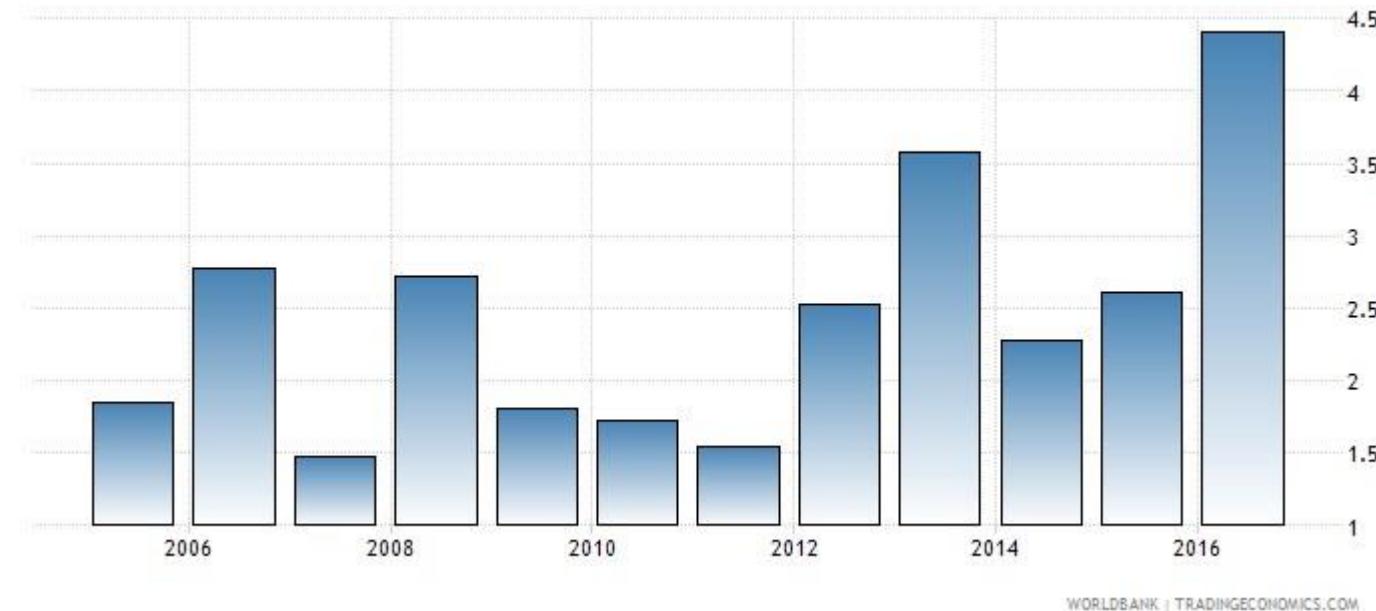
South Africa Gross External Debt 2002-2018 | Data | Chart | Calendar

External Debt in South Africa increased to 183,239 USD Million in the first quarter of 2018 from 173,319 USD Million in the fourth quarter of 2017. External Debt in South Africa averaged 96787.02 USD Million from 2002 until 2018, reaching an all time high of 183,239 USD Million in the first quarter of 2018 and a record low of 33,262 USD Million in the first quarter of 2003.



South Africa - Total debt service (% of GNI)

Total debt service (% of GNI) in South Africa was reported at 4.4006 % in 2016, according to the World Bank collection of development indicators, compiled from officially recognized sources.



Debt-service costs are expected to rise from R183-billion in 2018 to R223-billion by 2021, making government loan repayments the fastest-growing expenditure item, at 11% of the Budget.

<https://www.timeslive.co.za/politics/2017-10-26-paying-off-debt-is-crippling-sa/>

What it *is* telling us is bad enough

★ Portfolio Committee on Energy
 Presentation on Fuel Pricing
 21 August 2018 (16082018) ★
 What is the cost?

Overview of the Liquid Fuel Sector

- ❑ The SA petroleum industry accounts for:
- ❑ 8.1% contribution to the national GDP
- ❑ >100 000 jobs (direct and indirect)
- ❑ R365 billion p.a. in turnover
- ❑ R72 billion p.a. in duties and levies
- ❑ R9.6 billion p.a. in capital expenditure



5

Industry Context

- ❑ South African economy relies heavily on Petroleum
- ❑ RSA is dependent on imported Crude Oil and increasingly imported Petrol and Diesel imports
- ❑ No proven oil resources in the country yet except the Shale Gas potential
- ❑ Dominated by Private Sector
- ❑ Petroleum Import dependence is increasing



6

cont'd

Crude Oil Imports (January to December 2017)

- Saudi Arabia 49%
- Nigeria 24%
- Angola 20%
- Togo 2%
- Equatorial Guinea 1%
- United States of America 1%
- Cameroon 1%
- Ghana 1%



Main Causes of High Fuel Prices (1)

1. OPEC + Decision

- Prices were \$115 in 2014
- January 2016 Crude Oil was below 30 USD per Barrel
- In November 2016 OPEC + key Non OPEC Producer (especially Russian Federation) removed 2% of Global Oil Production to support higher oil Prices
- In 2018 prices are around \$80
- Result – Oil Prices have more than doubled in 24 months
- To a large degree OPEC + have achieved their objective to the detriment of Petroleum consumers globally



8

cont'd

Main Causes of High Fuel Prices (3)

2. Geo-Political Instability (cont...)

Recent US Policy Towards Iran

- In May 2018 US decided to withdraw from the Joint comprehensive Programme of Action (JCPOA) signed with Iran
- Immediate imposition of US sanctions enforceable by November 2018
- Iran is a major producer of Oil and Sanctions include Embargo on Iranian Oil Exports
- Market has to factor this into Crude Oil Price



10

Main Causes of High Fuel Prices (4)

3. Global economic recovery

Global economic recovery in 2017 and impact on the demand of oil resulted in approximately 1.5 million b/d increase in demand



11

What about this

Table 6: Births and deaths for the period 2002–2016

Year	Number of Births	Number of deaths	Number of AIDS related deaths	Percentage of AIDS deaths
2002	1 065 149	587 001	232 581	39.6
2003	1 089 307	623 061	268 496	43.1
2004	1 112 009	654 512	299 504	45.8
2005	1 133 578	675 642	320 473	47.4
2006	1 157 720	681 434	325 241	47.7
2007	1 186 149	675 287	315 059	46.7
2008	1 213 007	649 556	284 312	43.8
2009	1 221 737	636 926	266 591	41.9
2010	1 216 150	628 915	256 625	40.8
2011	1 207 511	600 085	225 901	37.6
2012	1 210 987	562 184	185 558	33.0
2013	1 212 947	541 413	161 986	29.9
2014	1 213 213	537 579	155 063	28.8
2015	1 212 055	537 313	151 748	28.2
2016	1 198 861	539 714	150 759	27.9

Excluding legitimate immigration, South Africa has to feed an additional .5m every year!

Is foreign debt good or bad?

- ★ It depends
- ★ Production related debt:
 - ★ The interest / settlement is paid from exports (if possible)
- ★ Consumption related debt:
 - ★ It is like you don't have a job
 - ★ And all your meals are paid using your credit card
 - ★ When you reach the limit, you increase the limit
 - ★ What will eventually happen?
- ★ BUT, some will say, it doesn't work that way for countries
- ★ Really?
- ★ Check this out:

25,460 views | May 13, 2015, 08:48pm

**17 Nobel Laureates and 1200+
Economists Agree with Ben
Carson re U.S. Fiscal Gap**



Laurence Kotlikoff Contributor ⓘ
Retirement

<https://www.forbes.com/sites/kotlikoff/2015/05/13/17-nobel-laureates-and-1200-economists-agree-with-ben-carson-re-u-s-fiscal-gap/#4c8c307c4d17>



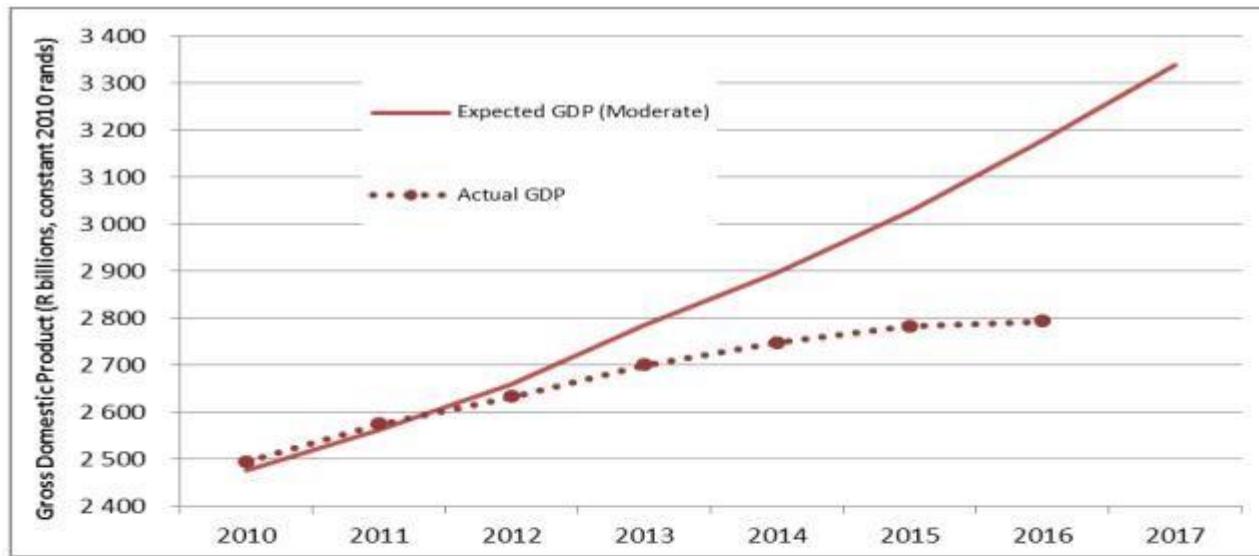


Figure 2: Expected GDP Growth from IRP 2010 vs Actual (Sources: Statistics SA & Promulgated IRP 2010–2030)

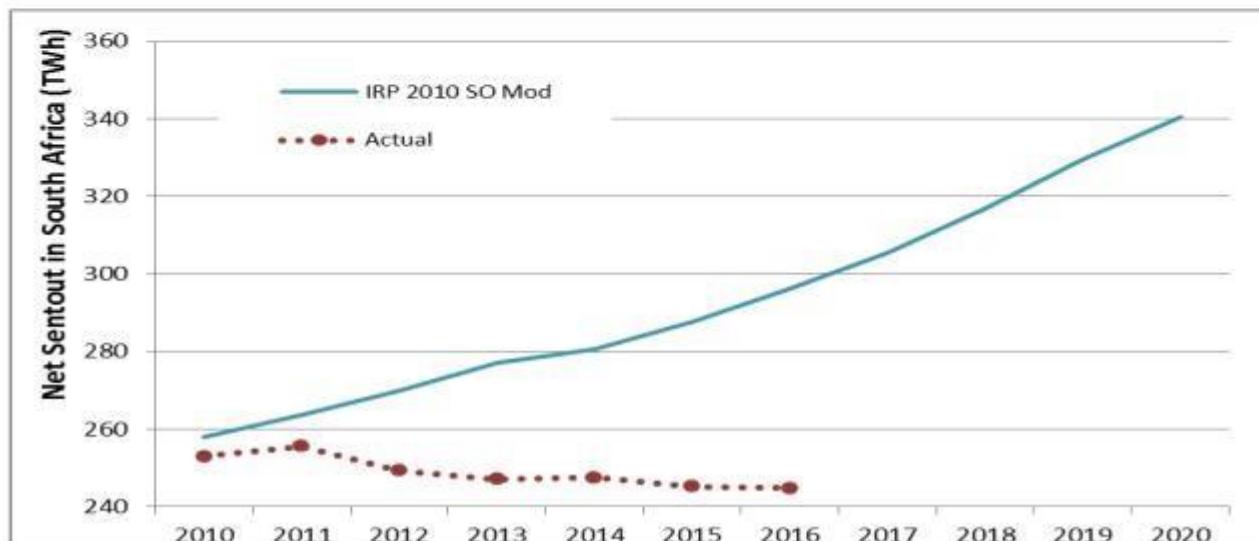


Figure 3: Expected Electricity Sent-out from IRP 2010–2030 vs Actual (Sources: Statistics SA & Promulgated IRP 2010–2030)

IRP 2018

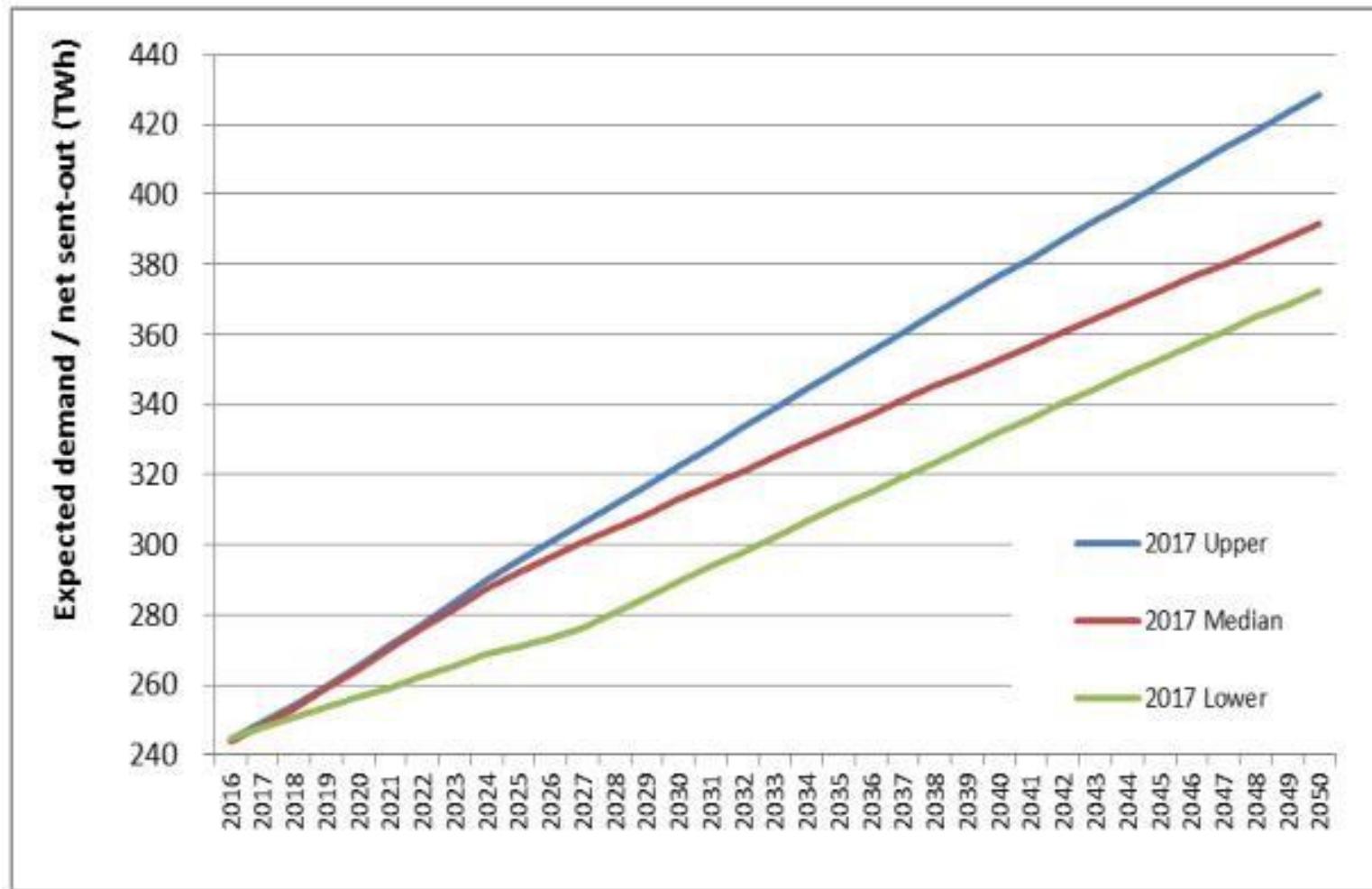


Figure 5: Expected Electricity Demand Forecast to 2050

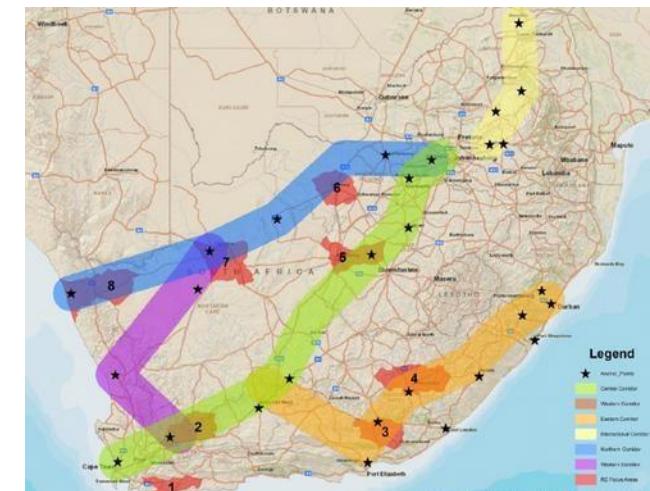
UCG can make a difference

- ★ SA has massive coal reserves
- ★ Estimated that 80% are uneconomical
- ★ Fossil fuels will continue for some time (decades) to dominate We have been in a 10y slowdown
- ★ Needs have continued to grow
- ★ Eskom's grid
 - ★ Can it handle massive renewables?
 - ★ What about the new corridors?
 - ★ How long to get ready?
- ★ High road / low road High road: 3
 - ★ - 6%+ growth required Low road:
 - ★ we miss the boat because of a lack of energy
 - ★ Our national debt cancels out growth

UCG★ is the cleanest, most environmentally friendly, lowest



- impact, safest fossil fuel technology
- Utilises stranded coal
- Normal coal available for export
- ★ Coal deposits are spread across country (7/9 provinces)
- ★ Modular and scalable
- Concurrent, fast development time
- No need for FDI
- ★ Price stability and predictability
- ★ No need for increased consumption
- ★ debt



IJC can make a difference

SA has massive coal reserves



Estimated that 80% are uneconomical Fossil fuels will continue for some time (decades) to dominate We have been in a 10y

★ slowdown

★ Needs have continued to grow

★ Eskom's grid

★ Can it handle massive renewables?

★ What about the new corridors?

★ How long to get ready?

★ **High road / low road** High road: 3

★ - 6%+ growth required Low road:

★



we miss the boat because of a lack of electricity

Our national debt cancels out growth



UCG is the cleanest, most

environmentally friendly, lowest

impact, safest fossil fuel

technology Utilises stranded coal

Normal coal available for export

Coal deposits are spread across country (7/9 provinces)



Modular and scalable
Concurrent, fast development time
No need for FDI
Price stability and predictability
No need for increased consumption debt



Our energy problem

(one of ...)

Operational coal-fired capacity in GW

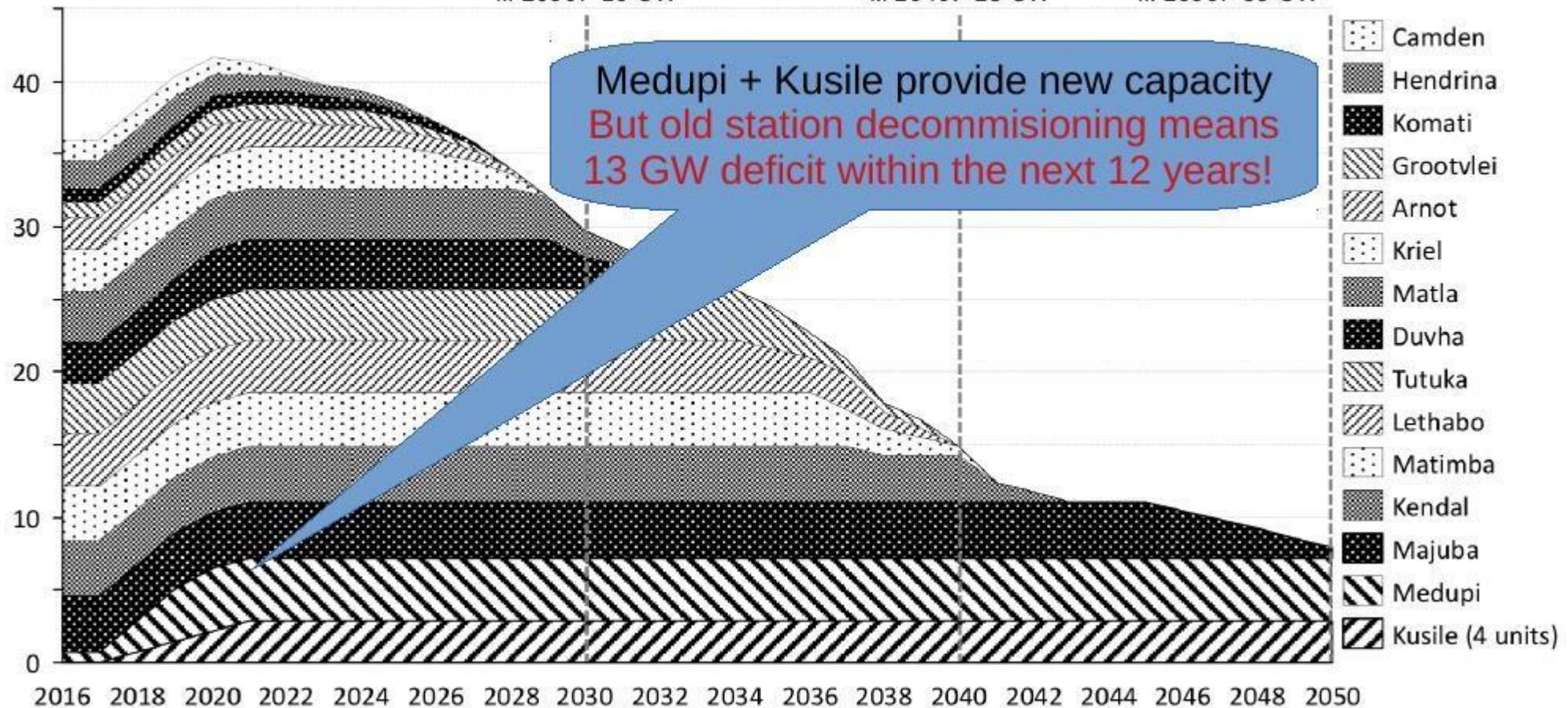
Scheduled decommissioning until...

... 2030: -13 GW

... 2040: -28 GW

... 2050: -35 GW

Medupi + Kusile provide new capacity
But old station decommissioning means
13 GW deficit within the next 12 years!



Mining right



Matjhabeng needs this project

★ Matjhabeng Local Municipality (part of Lejweleputswa District Municipality)

- ★ Population has declined 10% in last 10 years
- ★ ...due to economic stagnation
 - ★ Mine closures
 - ★ Associated industries closed down or shrunk
 - ★ **#3 on the President's priority list of stressed municipalities**
- ★ Failed and failing infrastructure (especially water)
- ★ Africary identified as **the anchor project** for economic revitalisation

★ Business Chamber proposed economic revitalisation projects

- ★ Creation of Special Economic Zone (SEZ)
- ★ Infrastructure stabilisation: energy, sewage, water, roads
- ★ Africary and diversified mining
- ★ Welkom airport
- ★ Phakisa
- ★ Safe City / Smart City
- ★ Industrial Incubator / Business Park
- ★ Training & education
- ★ Open Sky Film Studios
- ★

Agri training for emerging farmers

Projects evaluation

PJ	Projects
PJ.1	Creation of Special Economic Zone (SEZ)
PJ.2	Infrastructure stabilisation: energy, sewage, water, roads
PJ.3	Africary and diversified mining
PJ.4	Welkom airport
PJ.5	Phakisa
PJ.6	Safe City / Smart City
PJ.7	Industrial Incubator / Business Park
PJ.8	Training & education
PJ.9	Open Sky Film Studios
PJ.10	Agri training for emerging farmers

Legend	Rating
0	Has no impact / influence
1	Has some impact / influence
2	Significant impact / influence

3

Major impact / influence / essential to success (direct)

Key performance areas

Key Performance Areas (KPA)			Projects									
KPA1	KPA 1: Service Delivery and Infrastructure		Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KPA1.1	Water services		3	3	0	0	0	2	0	1	0	2
KPA1.2	Electricity		3	3	3 / 1	0	0	2	0	1	0	0
KPA1.3	Solid waste management		3	3	1	0	0	2	0	1	0	1
KPA1.4	Environmental management		3	3	3	1	1	2	0	1	0	3
KPA1.5	Roads		3	3	0	1	1	2	0	1	0	0
KPA1.6	Housing (metros only)		3	2	1 / 3	0	0	2	0	1	0	0
KPA1.7	Urban efficiency and Spatial planning (metros only)		3	2	0	0	0	3	2	2	0	0
KPA1.8	Community facilities		3	3	2	1	2	3	2	2	0	0

KPA2	KPA 2: Local Economic Development		Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KPA2.1	Economic growth		3	3	3	2	2	3	3	3	2	1
KPA2.2	Poverty alleviation		3	2	2	1	1	2	2	2	1	2
KPA2.3	Job creation		3	2	1 / 3	2	2	2	3	3	1	2

PJ	Projects
PJ.1	Creation of Special Economic Zone (SEZ)
PJ.2	Infrastructure stabilisation: energy, sewage, water, roads
PJ.3	Africary and diversified mining
PJ.4	Welkom airport
PJ.5	Phakisa
PJ.6	Safe City / Smart City
PJ.7	Industrial Incubator / Business Park
PJ.8	Training & education
PJ.9	Open Sky Film Studios
PJ.10	Agri training for emerging farmers

Legend	Rating
0	Has no impact / influence
1	Has some impact / influence
2	Significant impact / influence
3	Major impact / influence / essential to success (direct)

Key performance areas

KPA3	KPA 3: Municipal Financial Viability	Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KPA3.1	Financial viability	3	3	2	2	2	3	3	3	2	1
KPA3.2	Grant expenditure and management	3	1	0	0	0	3	1	1	3	3

KPA4	PA 4: Municipal Transformation and Institutional Development	Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KPA4.1	Organizational design	3	1	0	0	0	3	1	0	1	0
KPA4.2	Employment equity	3	0	0	0	0	3	2	3	0	3
KPA4.3	Skills development	3	2	1	2	2	3	3	3	1	3
KPA4.4	Integrated development planning	3	2	1	2	2	3	2	1	0	2
KPA4.5	Performance management system	3	0	1	1	1	3	1	1	0	0

KPA5	KPA 5: Good Governance	Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KPA5.1	Public participation, accountability and transparency	3	1	2	2	2	3	1	1	0	1
KPA5.2	District governance (For district only)	3	0	0	0	0	3	0	0	0	0
KPA5.3	Ward system	3	0	0	0	0	3	0	0	0	0
KPA5.4	Corporate governance	3	0	0	0	0	3	0	0	0	0

PJ	Projects
PJ.1	Creation of Special Economic Zone (SEZ)
PJ.2	Infrastructure stabilisation: energy, sewage, water, roads
PJ.3	Africary and diversified mining
PJ.4	Welkom airport
PJ.5	Phakisa
PJ.6	Safe City / Smart City
PJ.7	Industrial Incubator / Business Park
PJ.8	Training & education
PJ.9	Open Sky Film Studios
PJ.10	Agri training for emerging farmers

Legend	Rating
0	Has no impact / influence
1	Has some impact / influence
2	Significant impact / influence
3	Major impact / influence / essential to success (direct)

Key economic drivers / outcomes

KED	Key Economic Drivers	Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
KED.1	Mining	3	2	3	0	0	1	1	3	0	0
KED.2	Wholesale & Retail	3	3	0	2	2	3	2	2	1	1
KED.3	Financial & other services	3	3	0	1	1	2	2	1	2	1
KED.4	General government	3	3	0	0	0	3	3	1	1	1
KED.5	Tourism	3	3	0	3	3	3	3	3	3	0
KED.6	Manufacturing	3	3	2	1	1	3	3	3	1	0

OUT	Expected Outcomes:	Pj1	Pj2	Pj3	Pj4	Pj5	Pj6	Pj7	Pj8	Pj9	Pj10
OUT.1	Improved capability to deliver: province / muni	3	3	3 / 1	1	1	3	3	2	1	0
OUT.2	Accelerated delivery / quality services	3	3	3 / 1	0	0	3	2	2	0	0
OUT.3	Empowered communities	3	3	1	0	0	3	1	3	0	3
OUT.4	Improved sustainability	3	3	3	1	0	3	3	3	1	3
OUT.5	Basis for shared wealth creation	3	3	3	1	1	3	3	3	1	3

Africary: achievable scenario

PJ	Projects
PJ.1	Creation of Special Economic Zone (SEZ)
PJ.2	Infrastructure stabilisation: energy, sewage, water, roads
PJ.3	Africary and diversified mining
PJ.4	Welkom airport
PJ.5	Phakisa
PJ.6	Safe City / Smart City
PJ.7	Industrial Incubator / Business Park
PJ.8	Training & education
PJ.9	Open Sky Film Studios
PJ.10	Agri training for emerging farmers

Legend	Rating
0	Has no impact / influence
1	Has some impact / influence
2	Significant impact / influence
3	Major impact / influence / essential to success (direct)



	1	2	3	4	5	6	7	8	9	10
Africary Coal Achievable Scenario	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Investment (cumulative)			R2bn			R3.5bn	R5bn	R6.5bn	R14bn	R20bn
Electricity output			±50MWe	50MWe	50MWe	100MWe	150MWe	200MWe	350MWe	500MWe
Timeline										
Mining Right Awarded	Jul2019									
Phase 1:										
MS1: Investor / legal requirement		Mar2020								
MS2: Breaking Ground		Apr2020								
MS3: Initial Operational Capability			Dec2021							
MS4: Full Operational Capability				Mar2022						
Phase 2				MS1: Jan		MS4: Dec				
Phase 3					MS1: Jan		MS4: Jul			
Phase 4						MS1: Jan		MS4: Jul		
Phase 5						MS1: Jan		MS3: Dec	MS4: Jul	
Phase 6								MS1: Jan		MS4: Jul
Inhibitors										
DWS delays Water Use Licence										
DMR delays award of Mining Right										

Just how much energy?

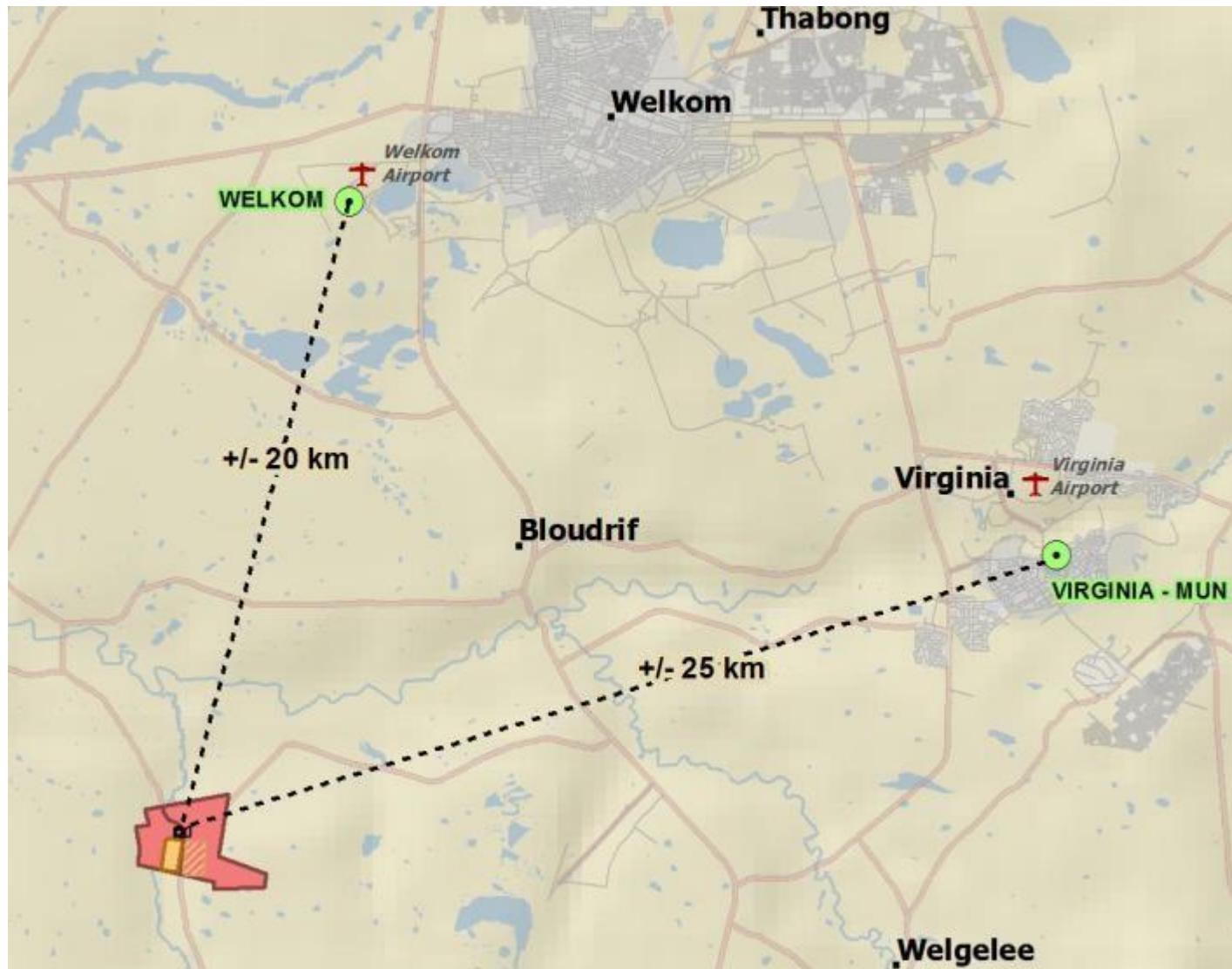
Area	SAMREC * Classification	Gross Coal Volumes (million tons)	Gross Syngas Volumes (PJ)	SPE Category**	Gross Gas Volumes (tcf)
UCG Project	Measured	3.7	72	1P Reserve (Proven) 15 years	72 bcf
Palmietkuil Farms	Indicated + Inferred	5.0 + 21	447	2P Reserve (Proven + Probable) 120 years	0.5 tcf
Theunissen Resource	Inferred	1,000	16,560	3P Reserve (Proven + Probable + Possible)	16.6 tcf



* SAMREC classification as signed off by a Competent person.

**SPE = Society of Petroleum Engineers category, but the values in the table are indicative only

First project location



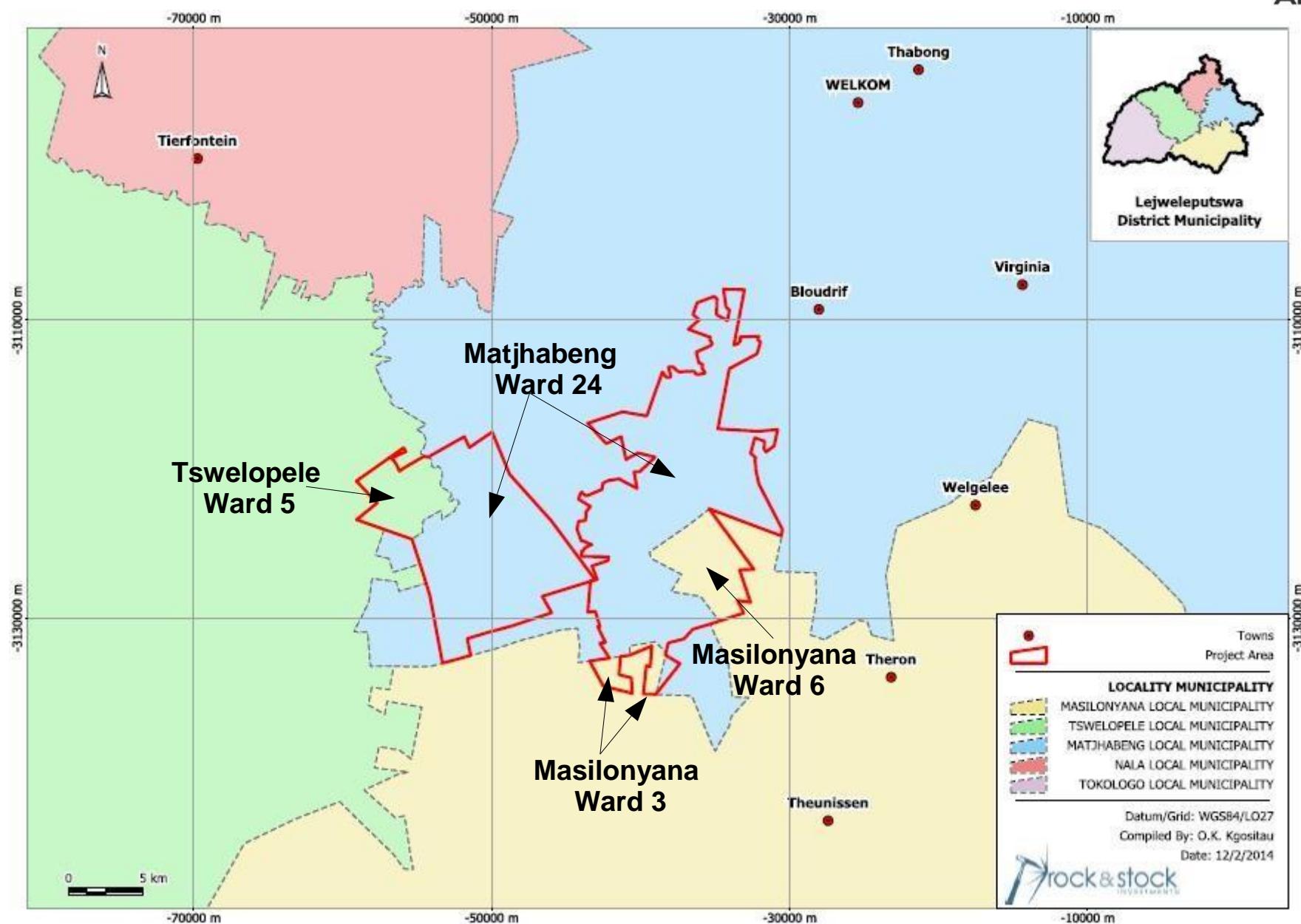
What's in it for Lejweleputswa?

			Threshold	Target	Wght
T1	Economic Development				
T1	E1	Job Creation			
E1	Person months performed by citizens of the RSA as of total person months		50.0%	80.0%	2.0%
E1	Person months performed by RSA based black employees as of total person months performed by citizens of the RSA		30.0%	50.0%	1.7%
E1	Person months performed by skilled black employees as of total person months performed by skilled employees		18.0%	30.0%	2.0%
E1	Person months performed by citizens from Local Communities as of total person months performed by citizens of the Local Communities		12.0%	20.0%	2.7%
E1	Person months performed by citizens of the RSA per MW of Contracted Capacity divided by 12		NA	NA	16.7%
T1	E2	Local Content			
E2	Value of local content spend as of total project value		40.0%	65.0%	25.0%
T1	E3	Ownership			
E3	Shareholding by black people in the electricity selling company		12.0%	30.0%	3.5%
E3	Shareholding by Local Communities in the electricity selling company		3.0%	5.0%	4.0%
E3	Shareholding by black people in the construction contractor		8.0%	20.0%	4.0%
E3	Shareholding by black people in the operations contractor		8.0%	20.0%	3.5%
T1	E4	Management Control			
E4	Gender adjusted black people in the top management as of total people in top management		-	40.0%	5.0%
T1	E5	Preferential Procurement			
E5	Amount of procurement spend on BBBEE contributors as of total procurement spend		-	60.0%	5.0%
E5	Amount of procurement spend on QSEs and EMEs as of total procurement spend		-	10.0%	2.5%
E5	Amount of procurement spend on women owned vendors as of total procurement spend		-	5.0%	2.5%
T1	E6	Enterprise Development			
E6	Enterprise Development Contributions as a percentage of revenue		-	0.6%	2.5%
E6	Enterprise Development Contributions adjusted for localness as a percentage of revenue		-	0.6%	2.5%
T1	E7	Socio-economic Development (SED)			
E7	Socio-Economic Development Contributions as a percentage of revenue		1.0%	1.5%	10.0%
E7	Adjusted Socio-Economic Development Contributions adjusted for localness as a percentage of revenue		1.0%	1.5%	5.0%

Requirements for participation in Independent Power Producer (IPP) Programme



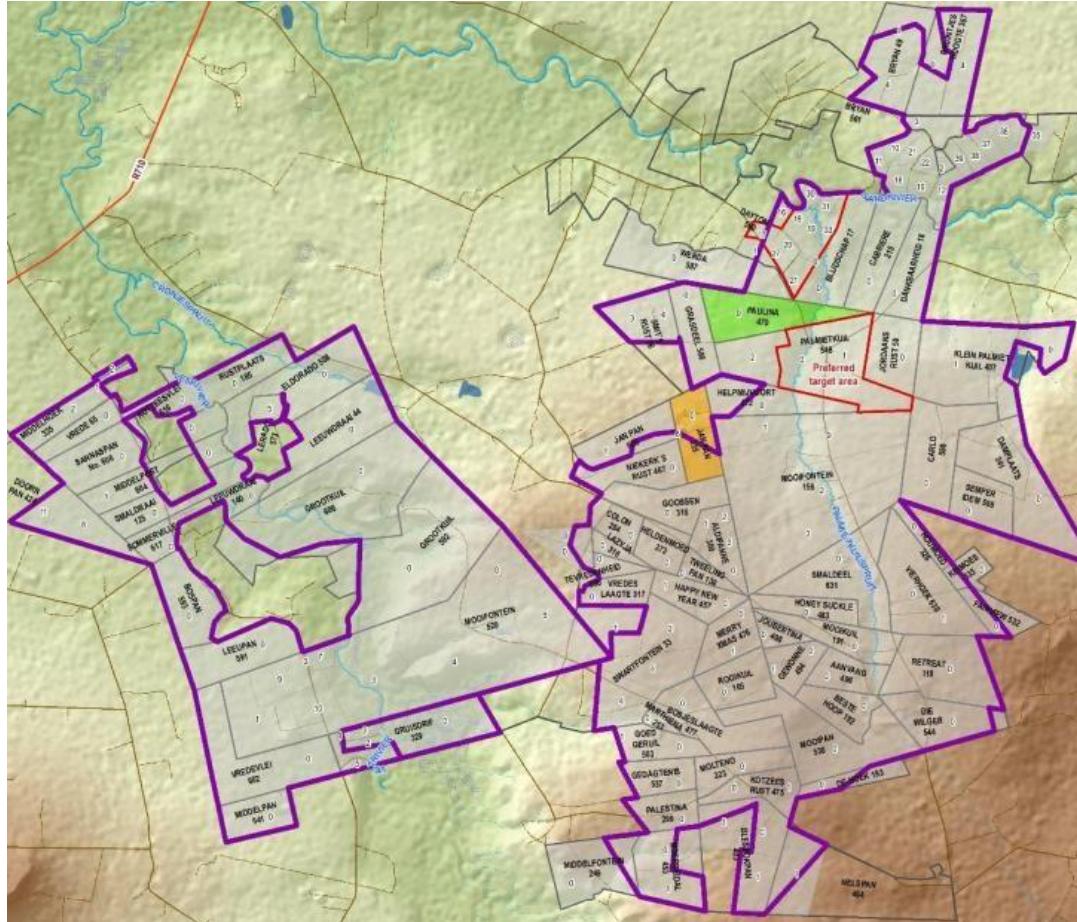
Municipal overlap



Wards (other than Matjhabeng Ward 24)



Tshwelopele Ward 5



Masilonyana Ward 3, 6



The opportunity

- ★ 1 billion ton coal = Sasol Secunda (180,000 bbl/day) for 60 years!!!
- ★ Mining method
 - ★ 50%+ less water use (start up only, then could be as low as 0% use)
 - ★ Almost no environmental issues
- ★ Syngas – polygeneration
 - ★ Electricity
 - ★ Synfuels
 - ★ Gas
 - ★ Hydrogen
 - ★ Naphtha (similar to illuminating paraffin)
- ★ Fast – 24 months breaking ground to production (less for follow-on projects)
- ★ Modular
- ★ Scalable
- ★ Reliable

The economics (polygeneration)

Product	Own Use	Unit	Sellable Production	Unit	Price (ZAR)/unit	Turnover (Rm/year)
Oxygen	local production	kg/hr				
Nitrogen	5 000	kg/hr				
CO2 / (Credits)	10 000	kg/hr				
Coal	67 000	kg/hr				
Water	60	m³/hr				
Electricity	27	MWh	1	MWh	1 030	R 2
Diesel			11 300	litre/hr	6.60	R 620
Naphtha (IP)			1 300	litre/hr	6.60	R 71
LPG			30	kg/hr	17.00	R 5
LNG/CNG			8 000	kg/hr	8.00	R 543
Hydrogen			400	kg/hr	132.00	R 430
Sulphur			200	kg/hr	1.00	R 2

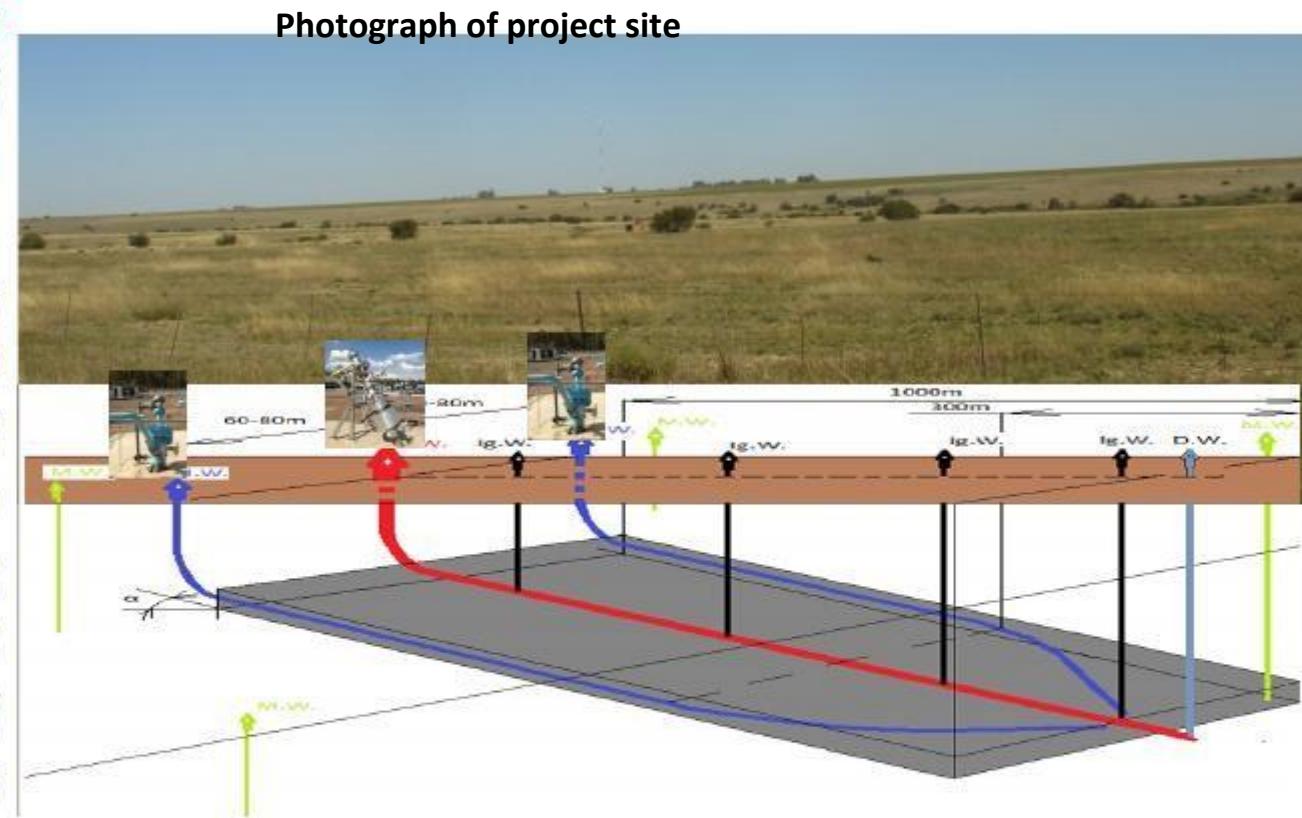
UCG-Poly generation with several products:

- Oxygen requires 10 MWe and is incorporated in the Own Use.
- The main sellable product is Ultra Low Sulphur Diesel (Euro Spec 5b)
- IP and LNG/CNG production has lower fuel taxes
- Production can be scaled between electricity and liquid fuels, but in this case Electricity is minimized and is operated on tail and waste gas streams
- Hydrogen is priced at \$10/kg – high demand market from Platinum fuel cells
- Naphtha production to be sold as alternative back-up fuel.

The technology - UCG

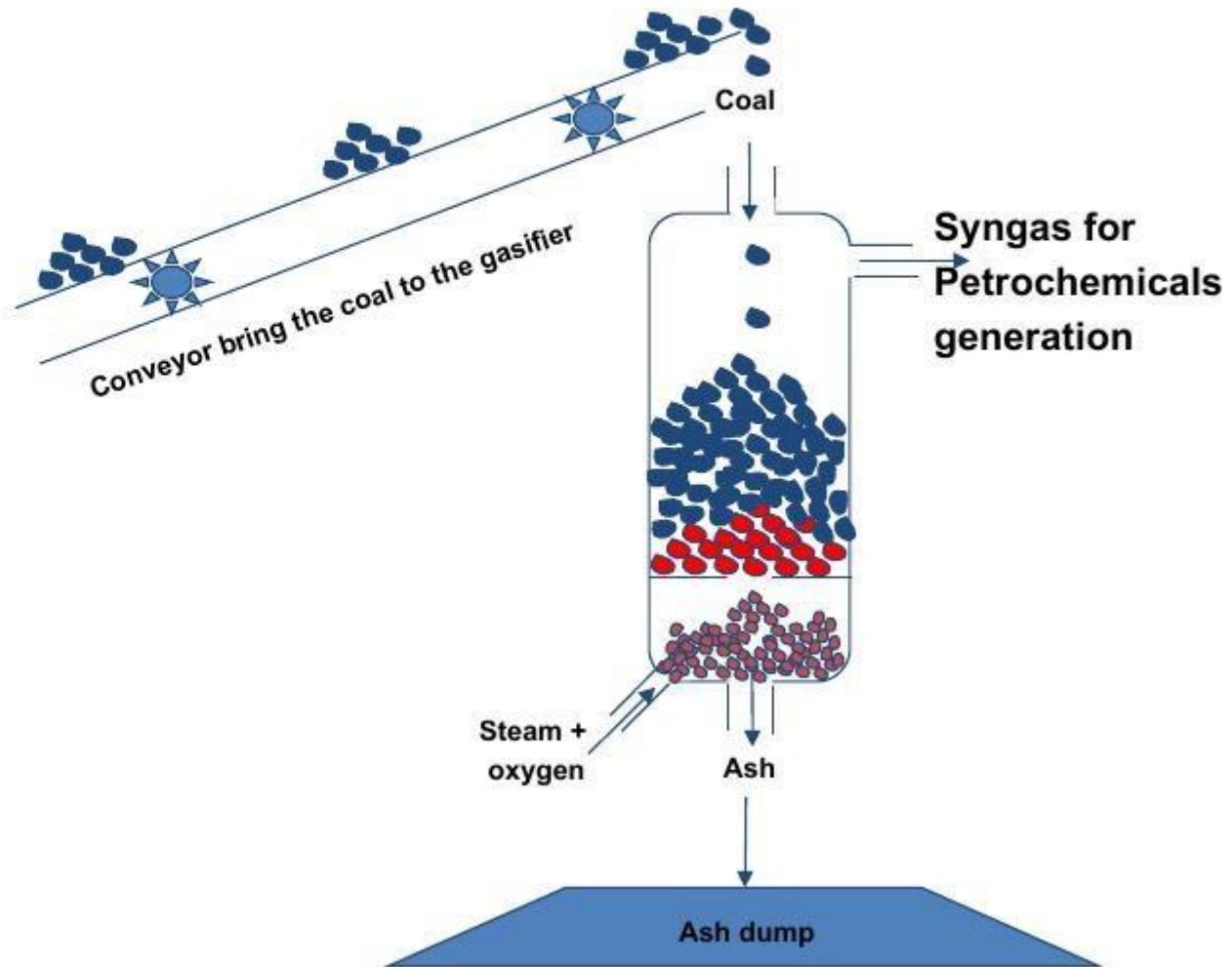
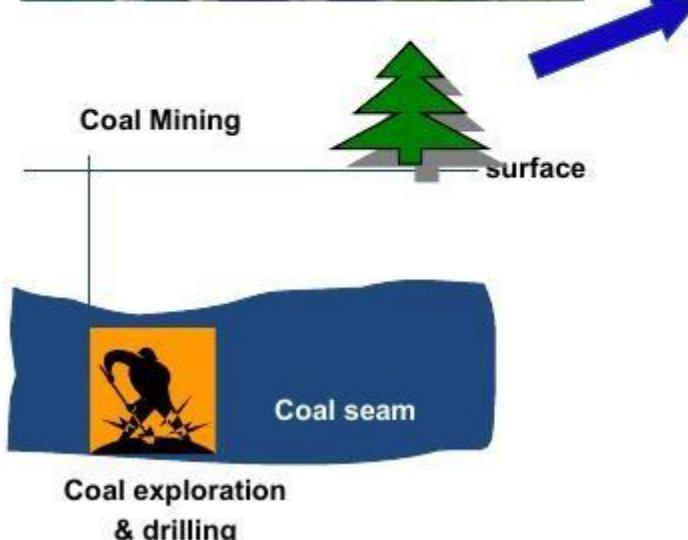
*...is a **mining process** which converts unmined coal into syngas.*

*UCG is an **in-situ gasification** process carried out in deep coal seams by injecting oxygen (and reagents like steam and CO₂) via an **injection well**, into the coal and bringing the resulting syngas to the surface via a **production well**.*



Underground Coal Gasification is a cost-effective, environmental friendly, CLEAN COAL solution for resource recovery in areas beyond the technical and economic confines of conventional mining

vs. surface gasification

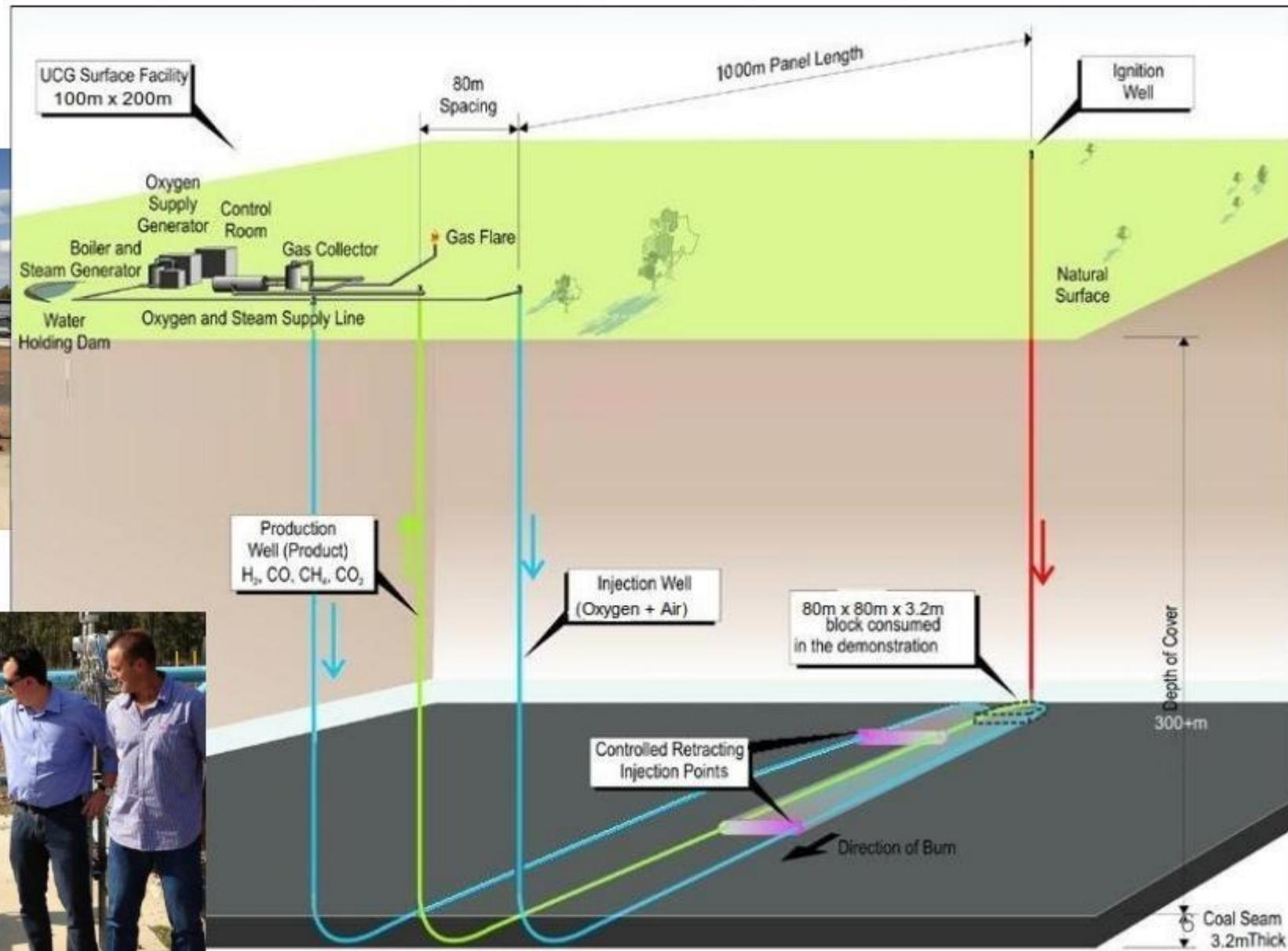


Underground coal gasification (UCG)

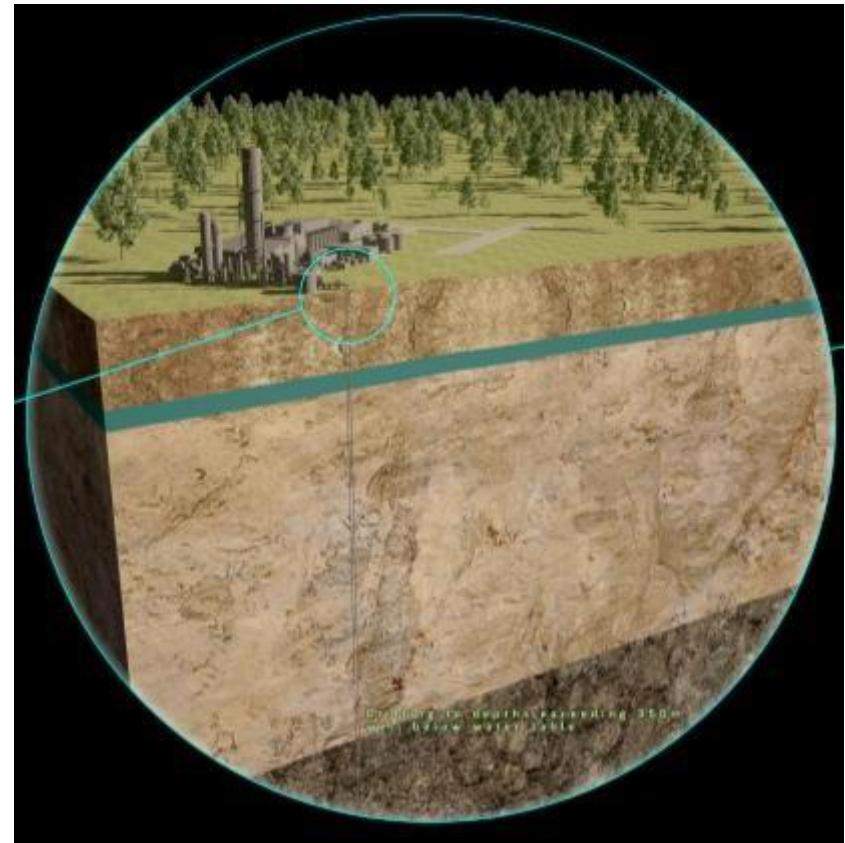
Production well

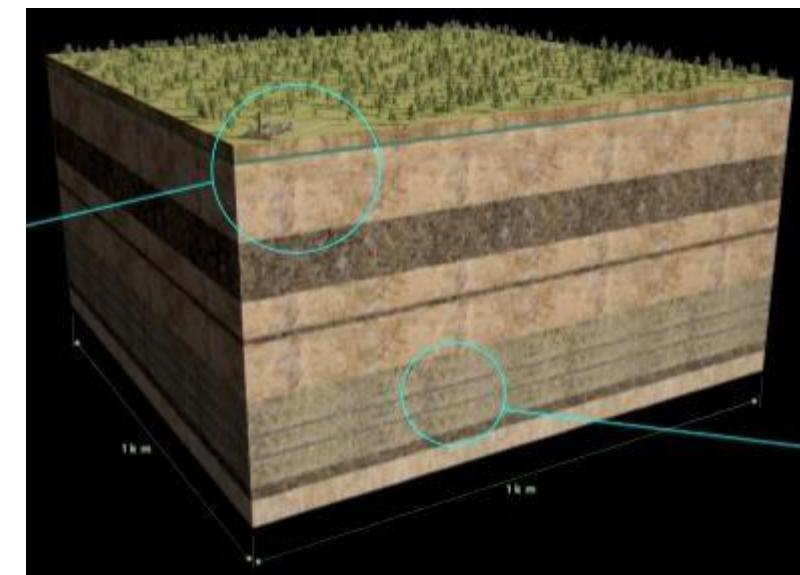


Injection well



Pictorial..

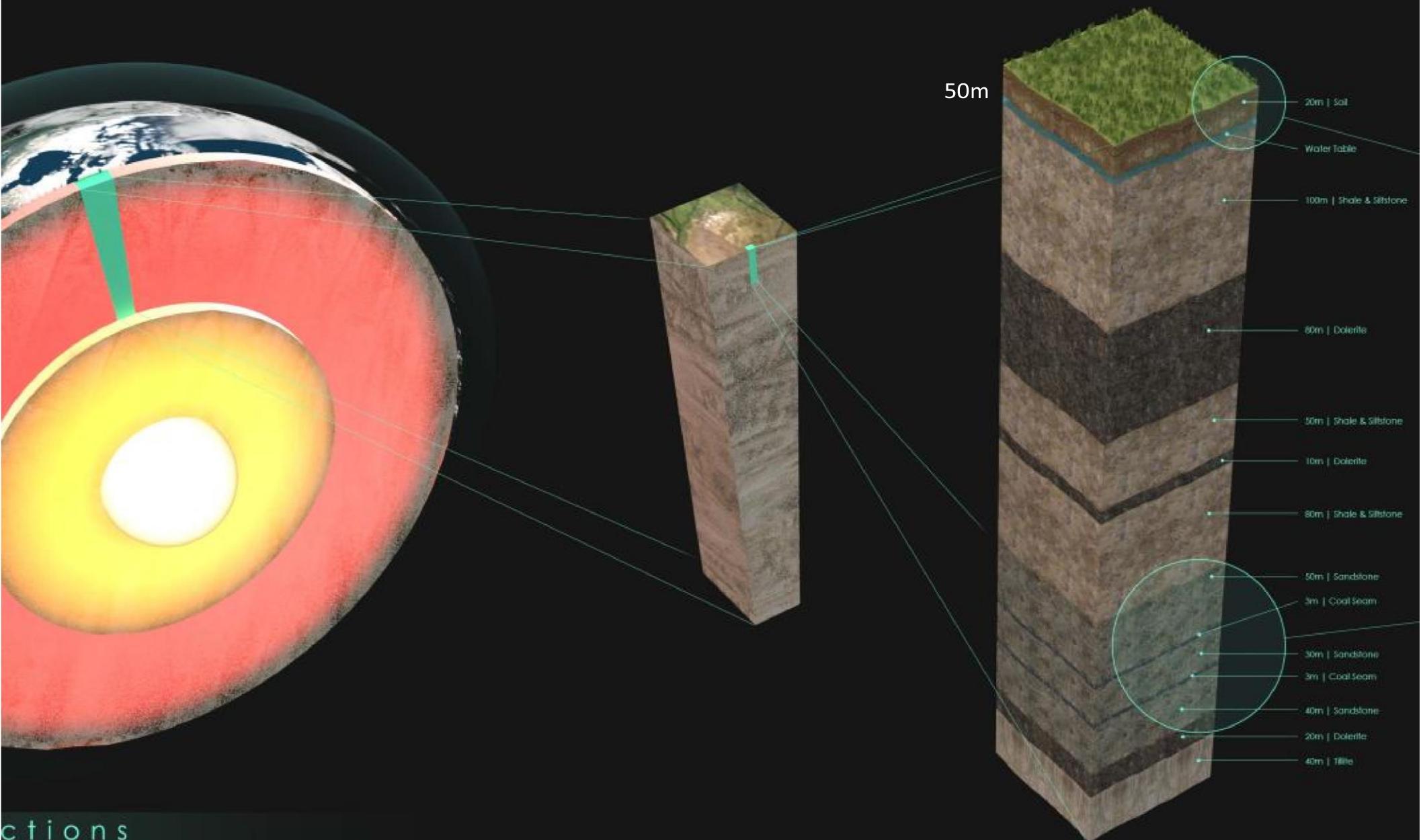




Note: these diagrams are based on actual geology and depths for the Africary coal field



AFRICARY



ctions

Where on earth...?

foote

Typical gas engine plant

(Wärtsilä, Finland)



A typical plant



Eskom Majuba pilot



Eskom's UCG Strategic Drivers



UCG Strategic Drivers	Research Achievements
• Independent, long-term fuel source	Proven at Concept level
• Total Environmental footprint (including Carbon)	In progress
• Low cost energy source	In progress
• Mining efficiency	Proven at Pilot level
• Security of supply – baseload or mid-merit option	In progress
• Technology transfer	In progress
• Mining safety	Proven at Pilot level
• Broader geographic distribution for new generating capacity	Proven at Concept level
• Job creation in rural locations	Proven at Pilot level
• Valuable by-products	Proven at Pilot level
• Ash left underground	Proven at Pilot level

Source: Presentations at SAUCGA Conference Oct2017

UCG technology

- ★ **Environmental & social** very low
 - ★ impacts compared to other coal technologies Carbon tax
 - ★ advantages
- ★ **Economic**
 - ★ can reduce the pressure in the short to medium term ★ as volumes increase, could create new industries, e.g.★ the manufacture of gas engines contingent equipment
 - ★ Low rehabilitation costs
- ★ **Technical**
 - ★ Scalable
 - ★ Modular
 - ★
 - ★

- ★ SA is a leader in directional drilling has a short time-to-production cycle **all the above-ground equipment is**
 - ★ simple,
 - ★ off-the-shelf or has been custom made in thousands of installations across the globe.
- ★ **The underground works** are safe
 - ★ environmentally neutral have been
 - ★ submitted to extensive investigation
 - ★ ★ have been modelled extensively with high predictability

Environmental studies done

Studies

- Climate
- Air quality
- Noise
- Topography
- Geology
- Soils & land types
- Surface water
- Groundwater
- Terrestrial ecology
- Socio-economic environment
- Cultural & heritage
- Visual aspects

Impact findings

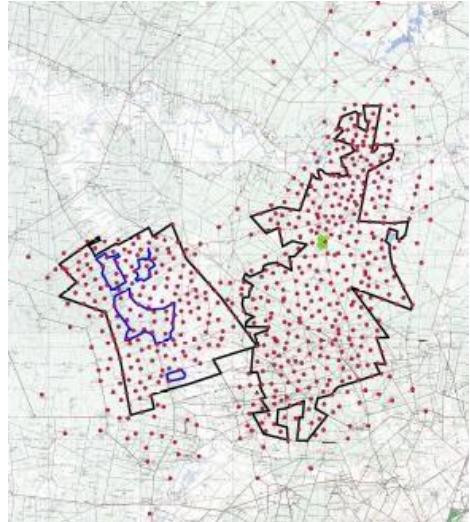
Low to moderate

★ Prospecting

- ★ 9 holes drilled
- ★ SAMRAD
- ★ 3.7mt measured
- ★ 5mt indicated
- ★ 1,000mt inferred

★ Minimal / no in-seam gases found





Historical borehole drilling

Proposed plant



Some economic projections

- ★ **First project: 50-60MWe equivalent**
 - ★ 24 month project
 - ★ Jobs at peak: ±120
- ★ **Projects 2-4**
 - ★ Staggered (18-24 months each)
 - ★ Carbon copies
 - ★ Capacity increased to 200MWe equivalent
- ★ **Projects 5-6**
 - ★ CCGT
 - ★ Capacity increased to 500MWe equivalent
 - ★ Total time 10-12y from first breaking ground
- ★ **Investment**
 - ★ To 2014: ±R260m
 - ★ Project 1: ±R2.5bn
 - ★ By 2030: R20bn+

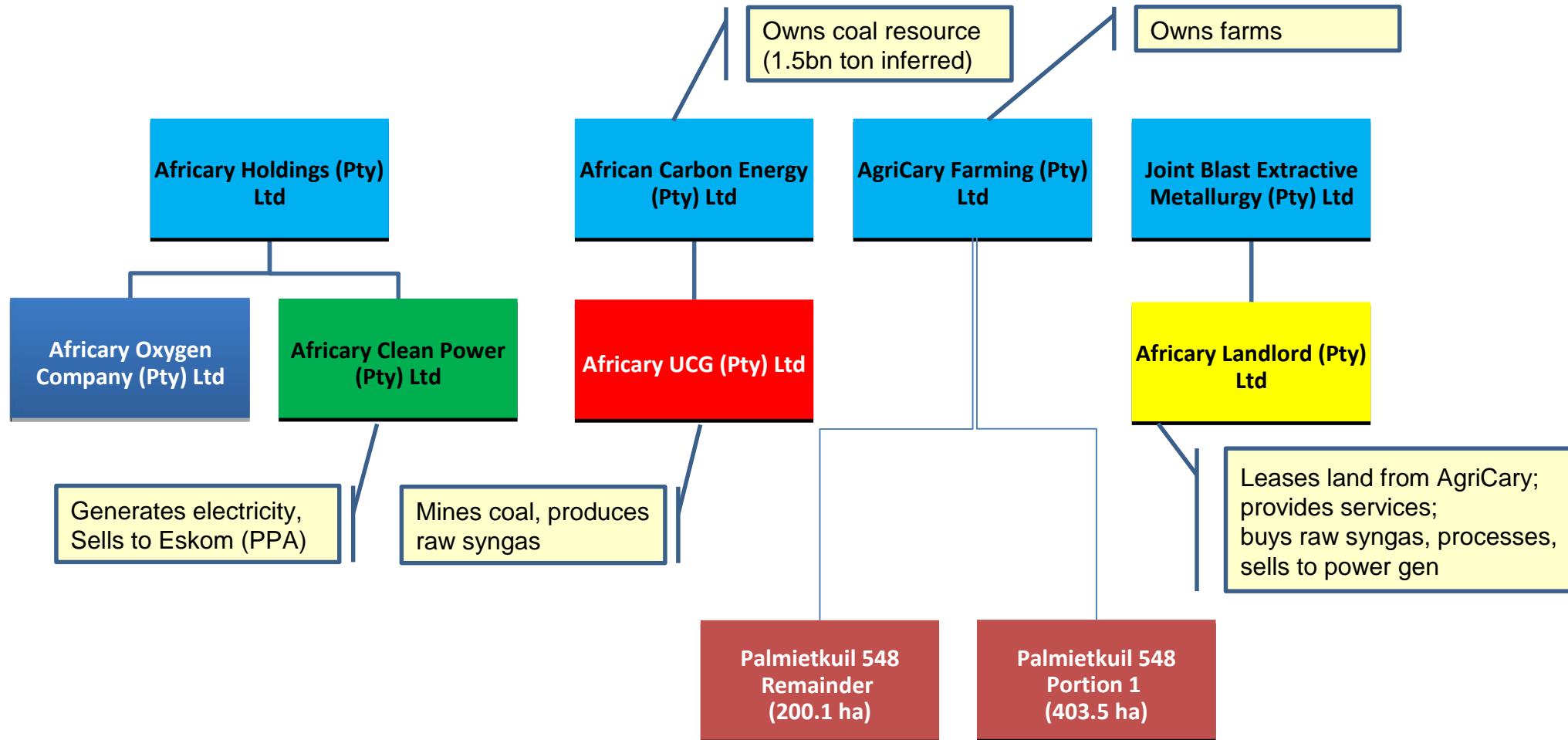


AFRICARY

The partners

COPYRIGHT RESERVED © AFRICAN CAR OWNER'RY

The proposed structure



At present: all wholly owned (**50% black ownership**)

The structure

