Decentralized Renewable Energies in South Africa

Market Conditions and Application Potentials

Berlin, Germany

March 2019

GreenCape

GreenCape – Sector Development

Who is GreenCape and why are we here?

Who is GreenCape and what do we do?

Vision

GreenCape's vision is a thriving prosperous Africa mobilised by the **green economy**.

- Lower carbon
- More resource efficient
- Increase local production

- Economic growth
- Increased investment
- Job creation

Our Work

"We work at the interface between business, government and academia in order to identify and remove barriers to economically viable green economy infrastructure solutions in developing countries"

The range of work crosses a wide variety of outputs

PASSIVE / INTERNAL

ACTIVE / CLIENT-FACING

Research:

- Field data through key relationships, site visits and networking
- Market Intelligence Reports
- Knowledge pieces
- Industry updates

Tools:

- Green-Agri Portal
- Decision-making tools e.g. waste, non-revenue water
- Regulatory and legislative advice e.g. tariff work
- Green Finance Database

Stakeholder engagement:

- Networking events
- Thought leadership presentations
- Setting up cross-sectoral and triple helix meetings
- Support for industry gatherings

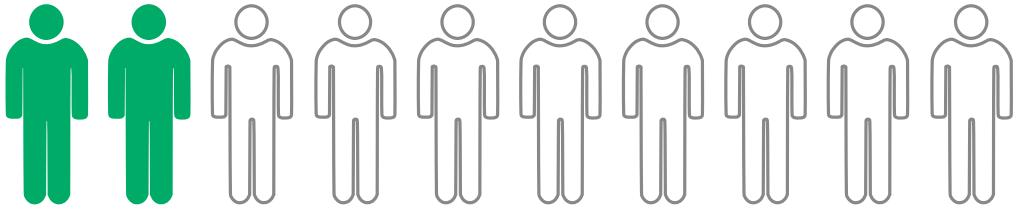
Front-line activity:

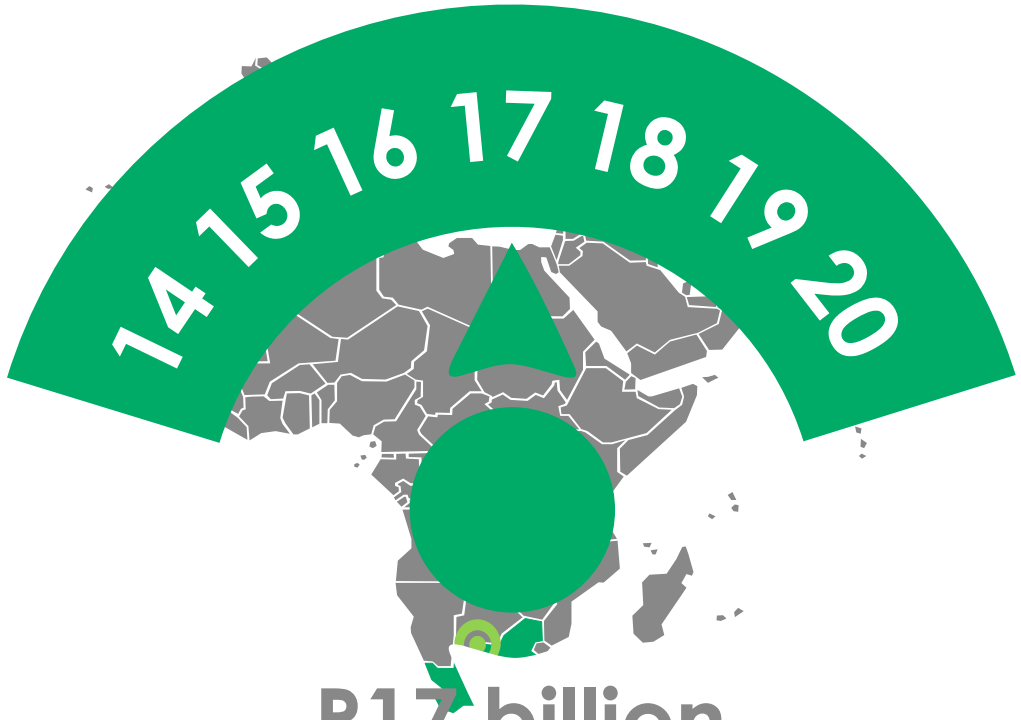
- Proposed Special Economic Zone for Greentech manufacturing
- Western Cape Industrial Symbiosis Programme (WISP)
- Market Connect and Finance Lab

GreenCape's impact in 8 years

> 10,000 local jobs

> 1,600 members





R17 billion

investment in the Western Cape since 2011

1st African Cleantech cluster member of the international clean tech network

South Africa’s electricity sector

The growth of a decentralised electricity market

Single state owned utility

Traditionally

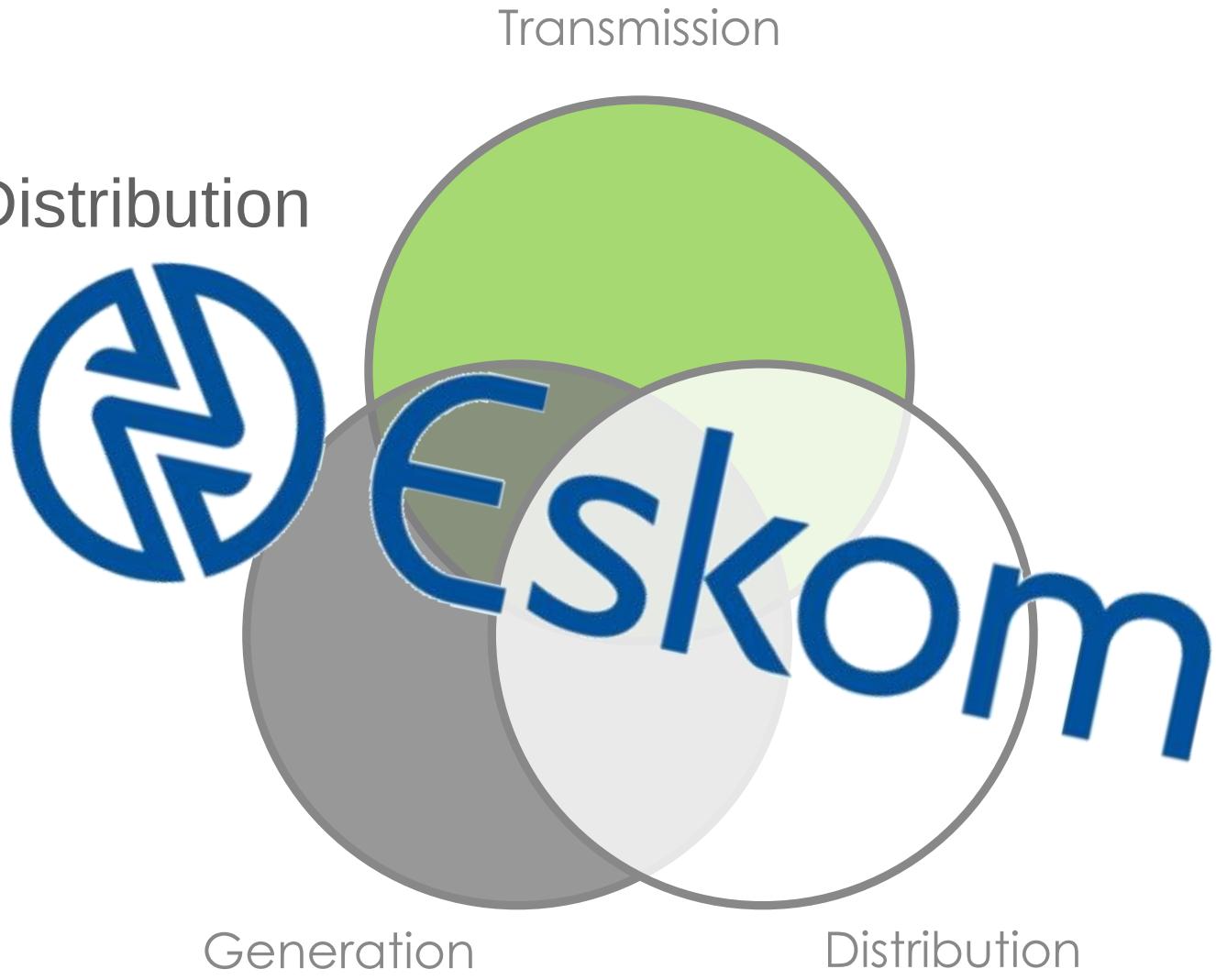
Power generation |

Generation → Transmission → Distribution

Policy structure |

Department of Energy (DoE)
Department of Public Enterprises (DPE)
National Treasury (IPP office)

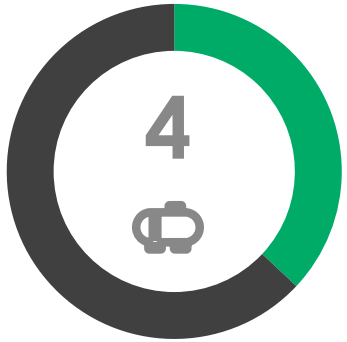
The South African National Energy Regulator



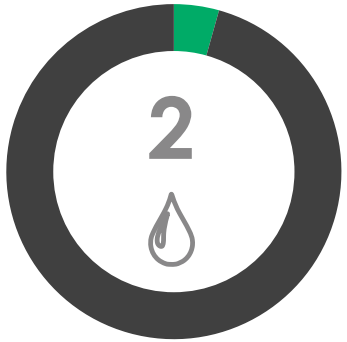
Generation mix

Currently Over 44 GW in use but less than 40 GW operational

Coal stations

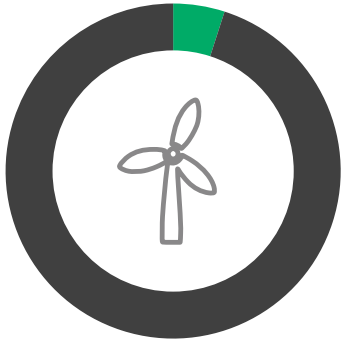


Gas turbines

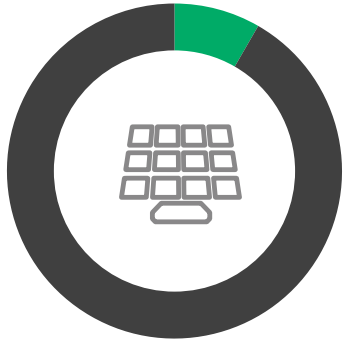


Pumped storage

Nuclear station



Wind power



Solar Power

6.3GW

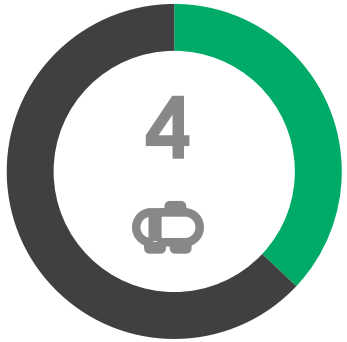
South Africa’s electricity crisis

The future of the state owned monopoly & the market

South Africa’s electricity crisis

The challenges in the South African electricity market

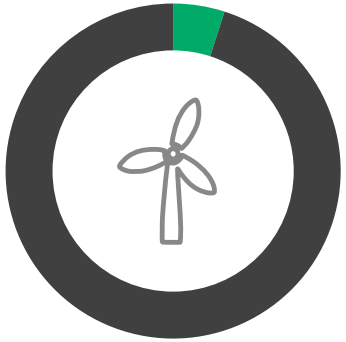
Average age 37 years
30% near end of life (12GW)

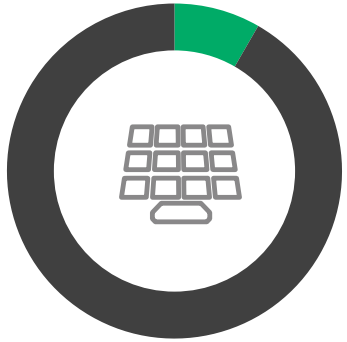


All run on diesel as baseload

Steenbras down for 4 years maintenance

Koeberg down for 1 years maintenance



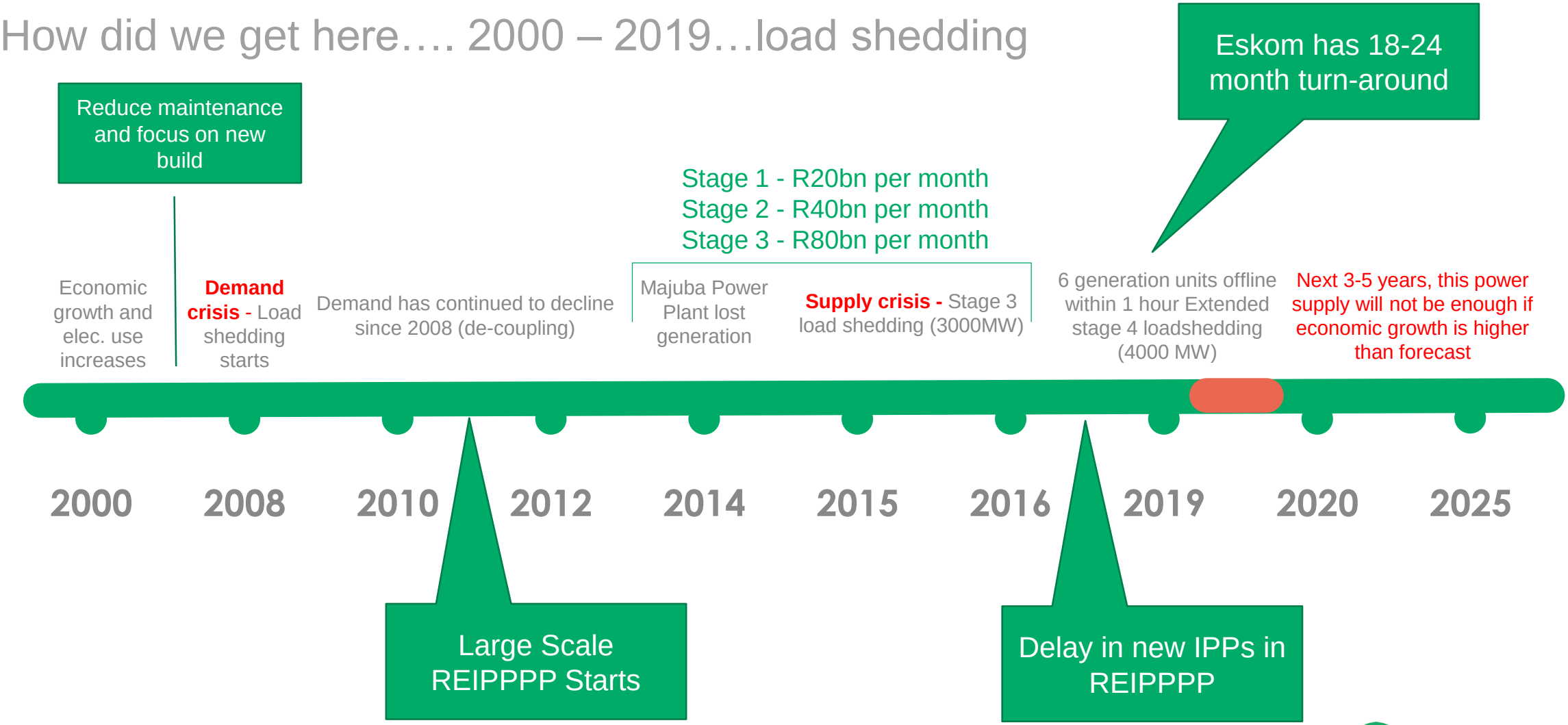


3 year delay in signing new utility Scale Projects

Eskom

South Africa’s electricity crisis

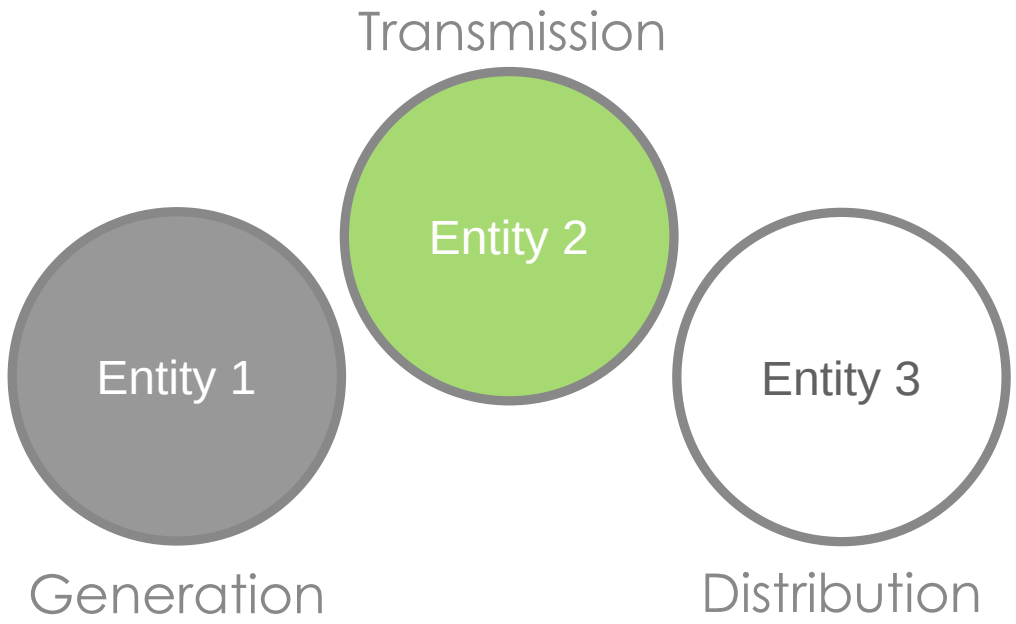
How did we get here…. 2000 – 2019…load shedding



South Africa’s electricity crisis

What is next for the South African electricity industry?

Splitting the national utility (Eskom)



Updated Integrated Resource Plan

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)
Embedded Generation Capacity (Generation for own use allocation)

Table 7: Proposed Updated Plan for the Period Ending 2030

Integrated Resources Plan for 2018

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
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Table 7: Proposed Updated Plan for the Period Ending 2030

Emerging Energy Opportunities

Never waste a good energy crisis

Emerging Opportunities - REIPPPP

Utility Scale Renewable Energy Opportunity

- 4 bid windows executed:
  - close to R200b investments attracted (25% international sources)
- Projects coming online almost monthly
- Round 4 projects
  - PPAs were signed early April 2018
  - Unlocked R56b across 27 projects
- 6.3GW procured to date
  - 3GW of which is connected/operational
- Bid window 5 expected in April 2019
- Target - 17.8 GW by 2030
- Over 40% of new generation capacity
- 21% of the total generation mix
- Large scale RE manufacturing reignited
  - Atlantis Special Economic Zone
    - Tax, land, import, export, skills

Emerging Opportunities – Small Scale Embedded Generation

Last 12 months 210MW$_p$ roof top PV installed in South Africa

Delay in Utility scale (2014/15 onwards) and load shedding ignited a new market (SSEG)

Market is currently dominated by rooftop solar PV (Industrial, commercial and agricultural)

- Current installed capacity of +-700MW$_p$
- Exceed 1GWp of rooftop installed in South Africa by the end of 2019
- Market could reach as much as 7.5GW of installed capacity by 2035 (+-500MW$_p$ per year)
- Total available market of €315 000 p.a. and a total available market of €4.7billion by 2035

Emerging Opportunities – Small Scale Embedded Generation

The market is price competitive and promotes local partnerships and skills

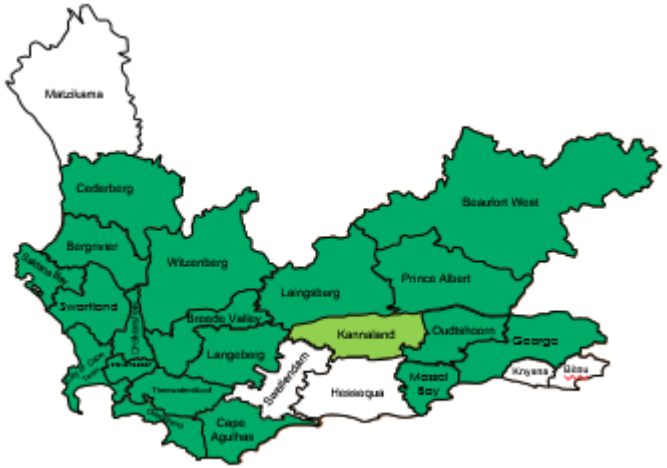
System Size	Capital cost of system (kWp)	PPA tariff (LCOE)
< 100 kWp	R 13,500 – R 16,000 (€835 – €990)	R 1.20 – R 1.45 (7c – 9c)
< 500 kWp	R 11,500 – R 14,000 (€712 – €866)	R 1.05 – R 1.25 (6c – 7c)
> 500 kWp	R 9,900 – R 13,000 (€613 – €804)	0.85c – R 1.15 (5c – 6c)

PVGreenCard

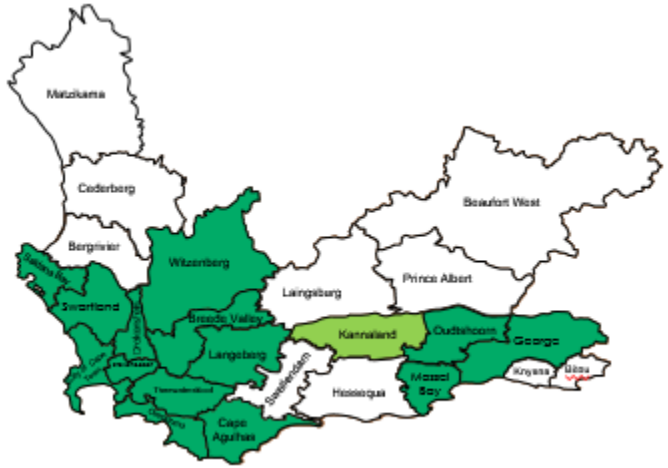
SARETEC
SOUTH AFRICAN RENEWABLE ENERGY TECHNOLOGY CENTRE

Emerging Opportunities – Small Scale Embedded Generation

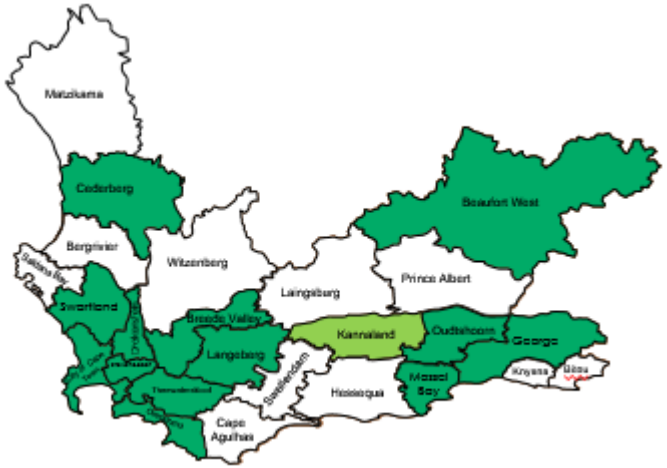
The growth of feed-in tariffs and stream-lined regulations



Allow SSEG



Regulations/By-laws

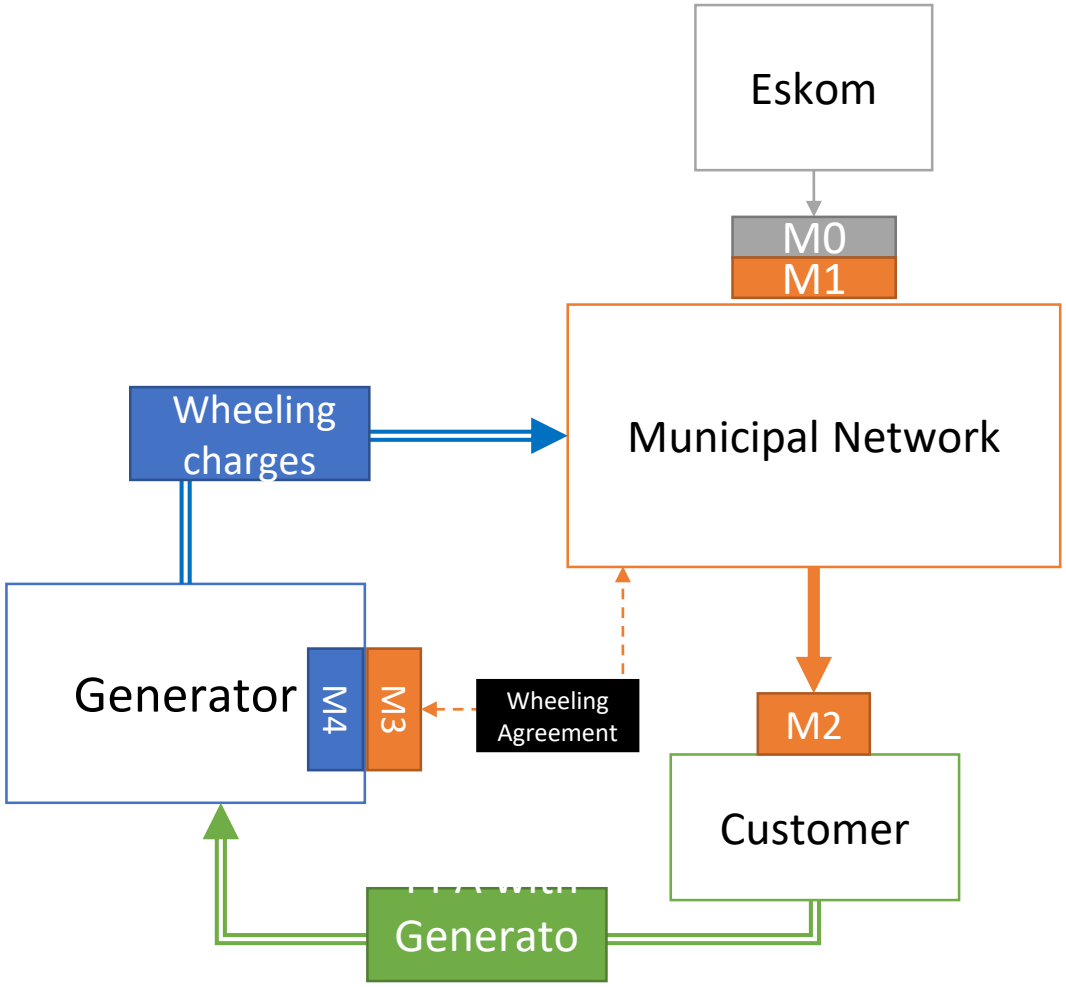


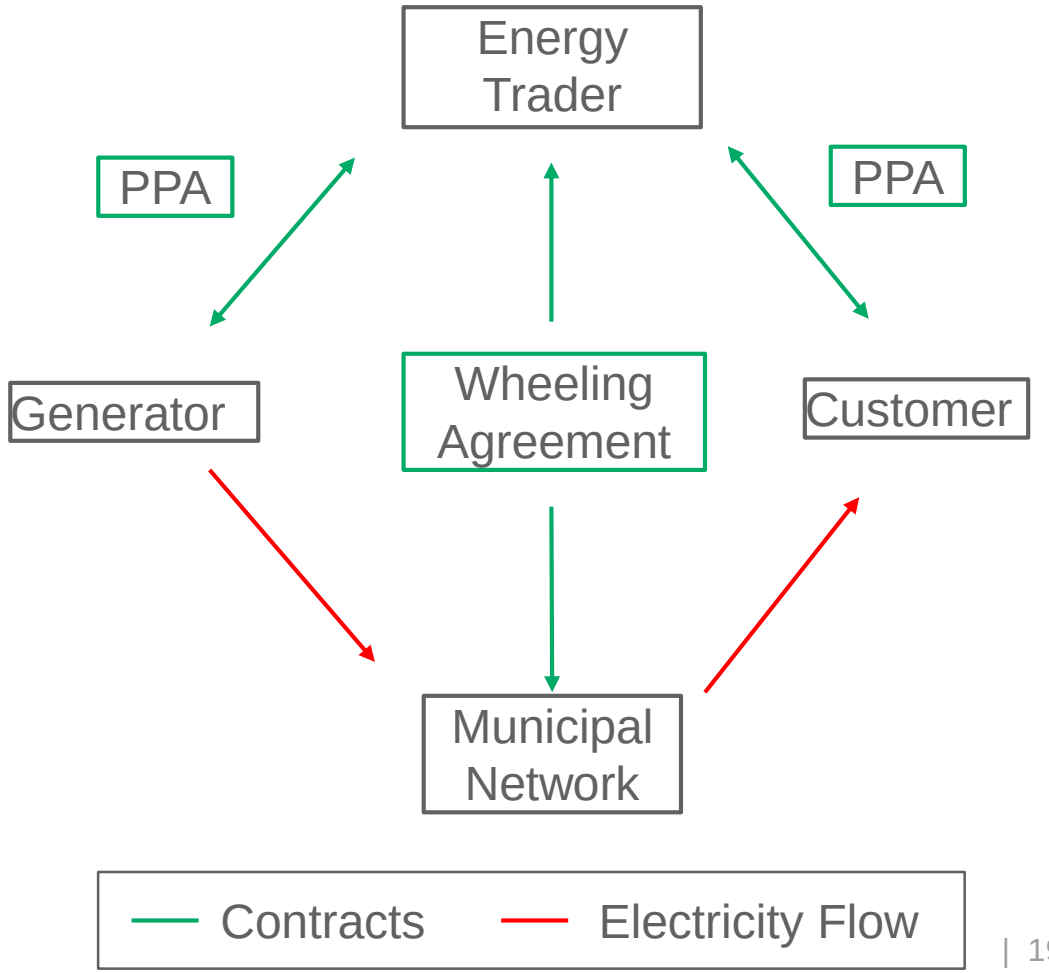
Tariffs

50 municipalities across South Africa having already introduced rules and regulations including 5 out of the 8 metros. GreenCape can offer tariff and design support as can SALGA, GIZ, DoLG

Emerging Opportunities – Distributed Generation

1-10MW wind, solar and biogas – wheeling and trading





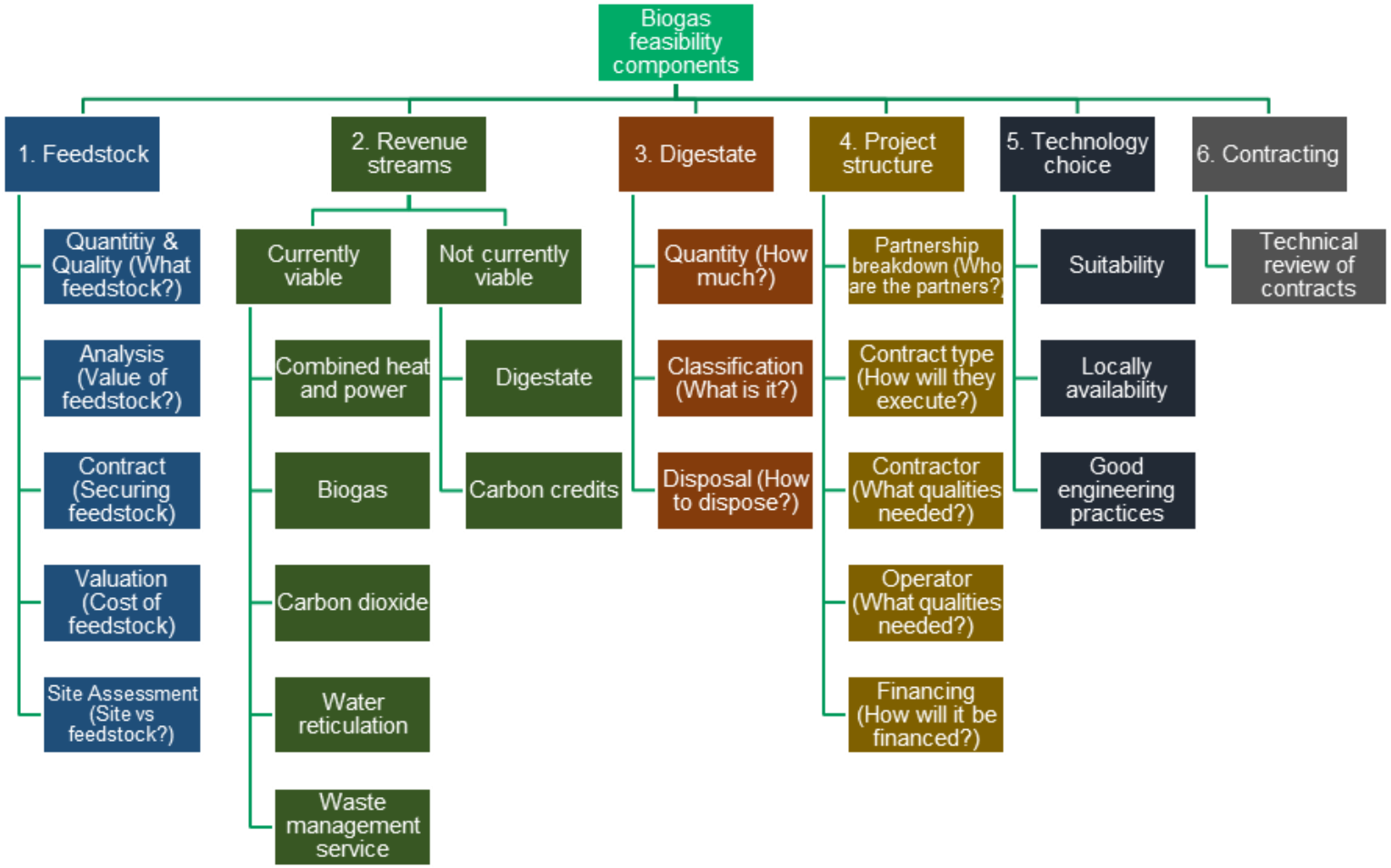
Emerging Opportunities – Distributed Generation

1-10MW biogas – a growing market

- 26 projects implemented (GreenCape – non exhaustive list)
  - 1 De-commissioned, 1 Not operational, 24 Operational (in some capacity)
  - 11 WC, 8 Gauteng, 1 NC, 1 NWP, 2 KZN, 2 FS, 1 EC
  - Plant capacities range from 17 kW to 5,5 MW energy equivalent
  - Only 2 plants do not use biogas on-site, or for own usage, in form fuel replacement or electricity/heat generation
  - 4 Abattoirs, 3 bovine related, 2 piggeries, 3 poultry farm, 6 food processing, 2 Malls, 3 land rehabilitation (energy crops on non-arable land), 2 WWTW, 1 Integrated waste management facility

Emerging Opportunities – Distributed Generation

1-10MW biogas - Biogas feasibility component decision trees



Emerging Opportunities – Energy Storage

Building energy resilience – Hydrogen and battery storage

The SA **energy storage** market is expected to grow to € 850million by 2035.

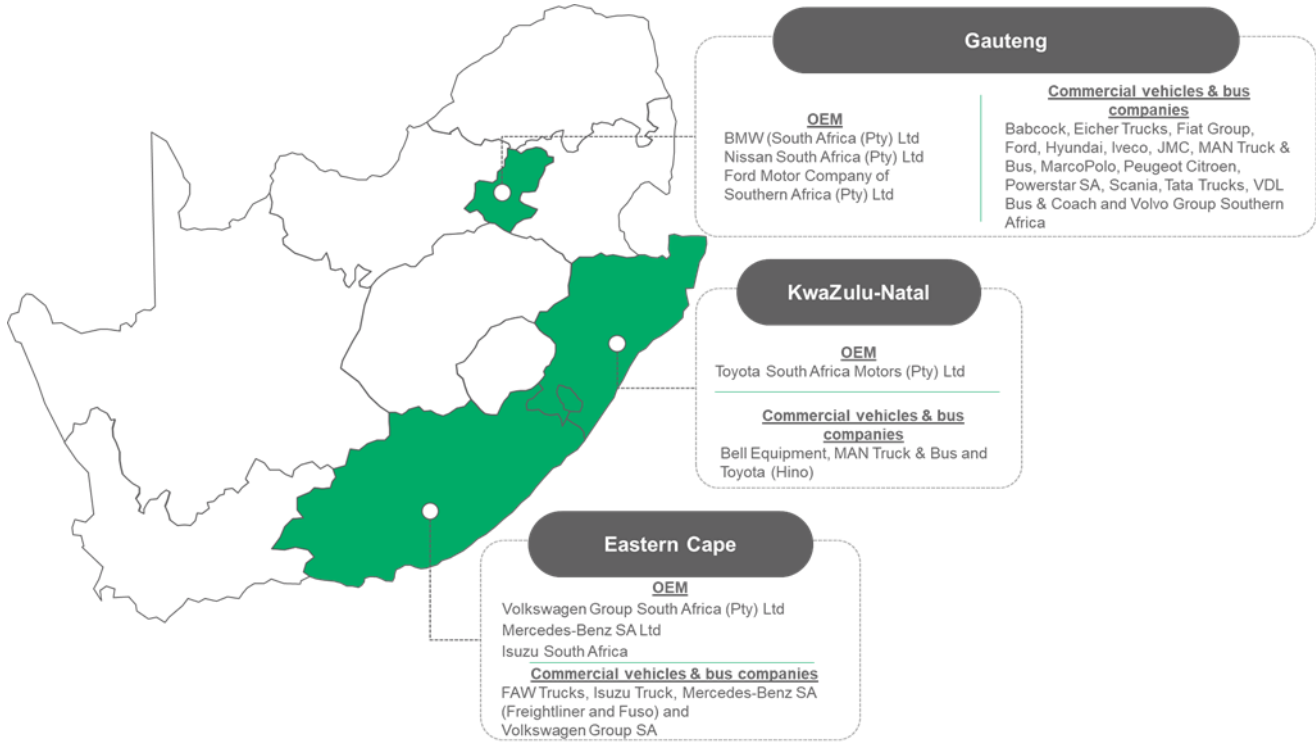
- Interest in hydrogen & lithium iron
- demand charge reduction and backup power for municipalities
- frequency regulation
- deferring upgrades to transmission and distribution (T&D) infrastructure

Additional market growth - Eskom's need for almost 2 GW of additional daily balanced energy storage and private sector/customer side investment in demand side management and backup power.

Emerging Opportunities – Electric Vehicles

Emerging Energy Opportunities

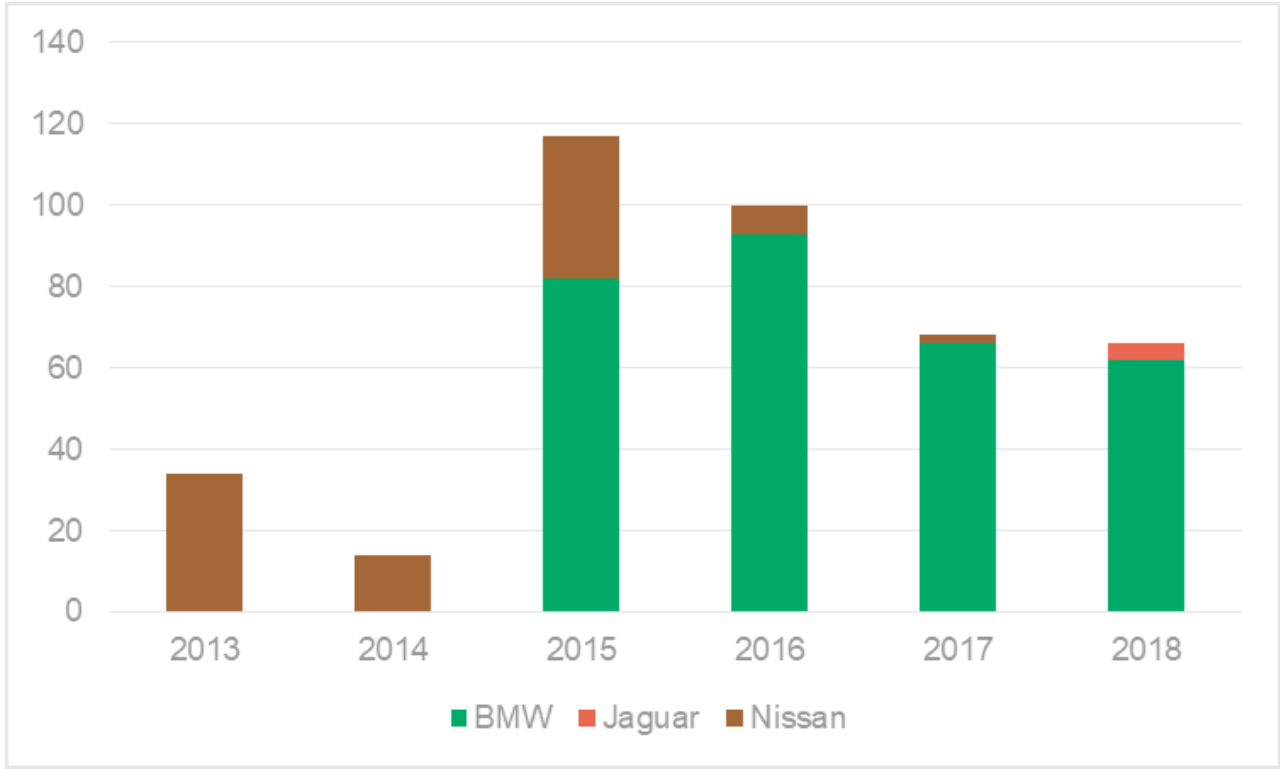
- The automotive market a priority industry in the country.
- Its protected by longstanding policy certainty
- Automotive manufacturers in SA have the advantage of low production costs and have access to new markets through trade agreements with the EU, US and the SADC.
- The industry now produces more than half a million vehicles every year, predominantly for the export market.



Emerging Opportunities – Electric Vehicles

Market growth is slow

- EV penetration in the country is slow with 399 vehicles sold as of Dec 2018.
- Charging infrastructure -120 publicly accessible stations predominantly located in the WC, GP and KZN.
- Manufacturing (export) and EV busses
- Finance, lack of policy certainty and products not fit for market



Thank You

Jack Radmore

Jack@green-cape.co.za

(021) 811 0250

Back up and additional slides

Business case for biogas in South Africa

Viable project models

	Small	Medium
Type	Private	Project finance or SPV
ZAR Value	R2 –R20 million	R20 – R400 million
Typical project size	< 500kW	>500 kW
Site conditions	Feedstock and offtake onsite	Portion of feedstock and/or offtake onsite
Site options	Abattoir, feedlots, chicken farms, malls, piggeries, food processing, fruit and vegetable processing	Mega farm (single supply), centralised farm (multiple feedstock supply)
Revenue model	Electricity and heat and /or gas Digestate zero cost to project	Premium on electricity sales (banking on green energy premium or Eskom rising above fixed escalation), Gas sales - CNG projects > 1.5MW, Combination of on site use, offset disposal fees and heat use Need digestate management process (net zero impact)

Business case for biogas in South Africa

Viable project models

	Small	Medium
Project size	< 500kW	>500 kW
Financing	D:E - 60:40, IRR - 18-25% Debt tenor - 7- 10 years Rate - 10.5- 12% Debt requires tail of 3 years DSCR - 1.3	D:E - 70:30, IRR - 18-25% Debt tenor - 12 years Debt requires tail of 3 years DSCR - 1.3, Debt reserve account 6 months
Cover	Site owner/developer balance sheet strength (different revenue stream options)	Cession rights, buy back options Independent assessment for feedstock/design PR guarantees of plant Continuous feedstock analysis Insurance options
Key considerations	No revenue considered during first 6-12 month commissioning	50% buffer on feedstock supply 1 main feedstock supplier with 2 secondary options