GreenCape

2022 ENERGY SERVICES MARKET INTELLIGENCE REPORT

GreenCape

GreenCape is a non-profit organisation that works at the interface of business, government, and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Working in developing countries, GreenCape catalyses the replication and large-scale uptake of these solutions to enable each country and its citizens to prosper.

Acknowledgements

This market intelligence report was produced in partnership with the Western Cape Government Department of Economic Development and Tourism. We thank Argon Poorun (lead author), Jack Radmore, Bruce Raw, Reshmi Wolvers and Johan Strydom for the time and effort that they have put into compiling this market intelligence report.

Disclaimer

While every attempt has been made to ensure that the information published in this report is accurate, no responsibility is accepted for any loss or damage to any person or entity relying on any of the information contained in this report.

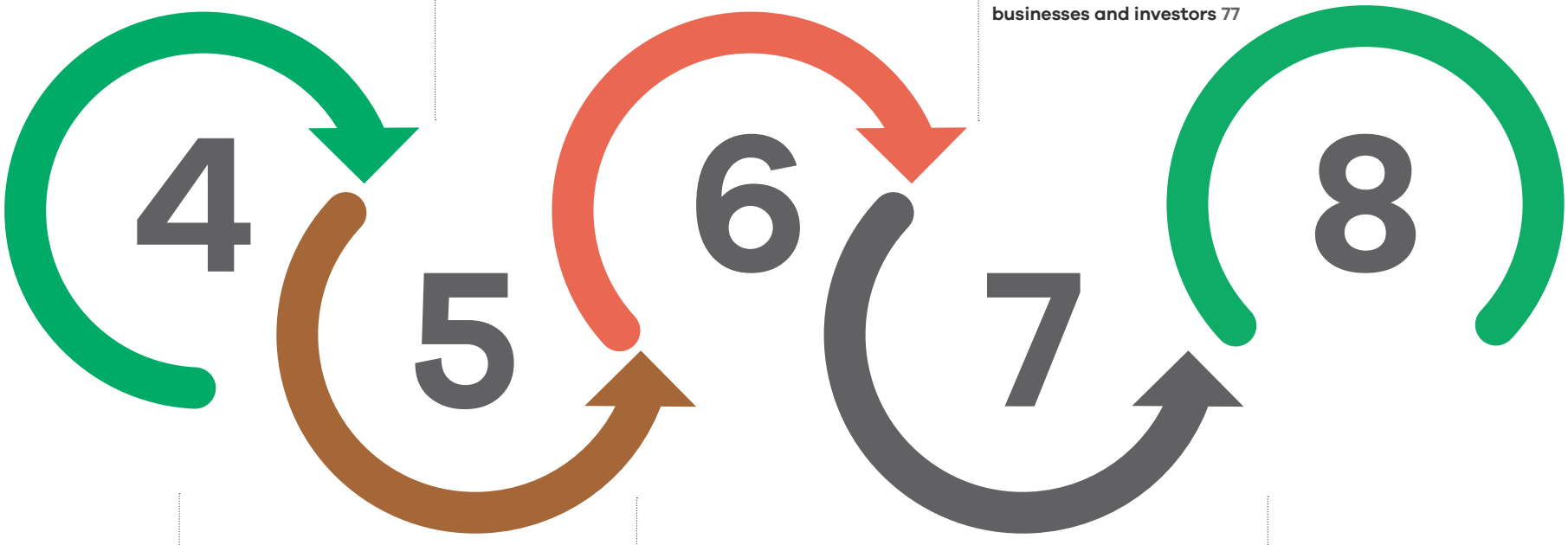
Cover image courtesy of GreenCape.

Subscribe to receive e-mail alerts or GreenCape news, events, and publications by registering as a member on our website: **www.greencape.co.za**

2nd floor, North Wharf, 42 Hans Strijdom Avenue, Foreshore, Cape Town, 8001

Authors:	Argon Poorun and Jack Radmore
Editorial and review:	Cilnette Pienaar, Lauren Basson and Nicholas Fordyce
Images:	GreenCape, Sola Group, New Southern Energy, Adobe Stock and Unsplash
Layout and design:	Tamlin Lockhart

CONTENTS



LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AEEE	Alliance for an Energy-Efficient Economy
AI	Artificial intelligence
BEE	Bureau of Energy Efficiency
BTM	Behind-the-meter
CaaS	Cooling-as-a-Service
CAGR	Compound annual growth rate
C&I	Commercial and industrial
CO2e	Carbon Dioxide equivalent
COTS	Commercial Off-the-shelf
CMVP	Certified measurement and verification personnel
CPI	Consumer price index
CPI	Climate Policy Initiative
DEDAT	Department of Economic Development and Tourism
DoE	Department of Energy (National)
DMRE	Department of Mineral Resources and Energy (National)
DPE	Department of Public Enterprises
ECSA	Engineering Council of South Africa
EE	Energy efficiency
EEMS	Energy Efficient Monitoring System
EG	Embedded generation
EPC	Engineering Procurement Construction
EPCM	Engineering Procurement Construction Management
EPR	Extended Producer Responsibility
ERA	Electricity Regulation Act
ES	Energy Services
ESC	Energy supply contracting
ESt	Energy storage
ESCo	Energy Services company
GW	Gigawatt
GWh	Gigawatt-hours
IEA	International Energy Agency
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
IRP	Integrated Resource Plan
kW	kilowatt
kWh	kilowatt-hours
kWp	kilowatt-peak
Li-ion	Lithium-ion
LIB	Lithium-ion batteries
MIR	Market Intelligence Report
Mt	Megatonnes
MW	Megawatt
MWh	Megawatt-hours
MWp	Megawatt peak
M&V	Measurement & verification
NBI	National Business Initiative
NCPC-SA	National Cleaner Production Centre South Africa
NDCs	Nationally Determined Contributions
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
O&M	Operations & maintenance
PACE	Property Assessed Clean Energy
PAYS®	Pay as You Save®
PPA	Power purchase agreement
PQRS	Power Quality and Renewable Services
PSEE	Private sector energy efficiency

PV	Photovoltaic
RE	Renewable energy
SADC	Southern African Development Community
SAGEN	South-African German Energy Programme
SALGA	South African Local Government Association
SANAS	South African National Accreditation Systems
SANEDI	South African National Energy Development Institute
SAPVIA	South African Photovoltaic Industry Association
SASGI	South African Smart Grid Initiative
SAWEA	South African Wind Energy Association
SSEG	Small-scale embedded generation
StatsSA	Statistics South Africa
TWh	TerraWatt-hour
UPS	Uninterruptible power supply
WC	Western Cape

Exchange rates used:

1 US Dollar = R14.83 (October 2021)

EXECUTIVE SUMMARY

This market intelligence report is compiled for foreign and local investors looking to invest in the South African green economy through project development, asset management, equity, debt, equipment manufacturing, or support services. It highlights investment opportunities in embedded generation and energy efficiency created by South Africa's diversifying energy services market.

The term 'Energy Services' (ES) is used to describe three interrelated energy market segments in the South African energy space, namely (1) small-scale embedded generation (SSEG) encompassing system sizes <1 MWp; (2) energy storage; and (3) energy efficiency (EE).

These market segments are increasingly bolstered by offerings in the energy finance sector, which in and of itself also presents opportunities to financial investors.

There are five main factors driving growth in the ES market: The above-inflation electricity price rises; national energy insecurity; decreasing technology costs; supportive policies, regulations and tariffs; and well-adapted finance options.

Amidst the COVID-19 recovery, there is an increased interest from businesses in improved cost efficiencies and secure energy supply.

The national embedded generation market for installations, operation and maintenance of **rooftop solar PV** has been identified as an important part of the country's immediate efforts towards energy security. Positive regulatory movement, investor sentiment, and steady recovery in the key commercial, industrial and agricultural sectors have led to continued market growth during 2021.

The market is still expected to reach a total capacity of 7.5 GWp by 2035 at a market value of R75 billion, it is estimated that 20% of this market is located in the Western Cape (WC). The annual added capacity of 250-400 MWp nationally is estimated based on the recent footprint of local service providers with the largest market share. This steady growth, which translates to the potential creation of ~1 250 jobs, is significant considering the ongoing need to reduce the current 46,6% unemployment rate[1].

[1] based on the expanded definition, which includes people who were available for work but not looking for a job in Q3 of 2021

Uptake of **energy storage (ESt)**, in particular Lithium-ion batteries (LIB), continued to surge in commercial and agricultural sectors in 2021. The flexibility of application use-cases and the increasing relevance of loadshedding-related risks will lead to an increasingly prevalent role of the storage segment for backup purposes in energy service provision.

The upfront capital cost remains the largest market barrier. The national market is expected to rise to ~ R31 billion with a 6.5 GWh installed battery capacity by 2035 with approximately 15-20% located in the WC.

The **energy efficiency (EE)** market is adapting to solve challenges that have resulted in limited market growth in the past five years.

Many Energy Services Companies (ESCos) have pivoted their primary offerings to include new business models and financing mechanisms which have been tested with early success. This helps to stimulate the demand appetite and uptake in the commercial, industrial and agricultural sectors where there is an increasing open-mindedness to the diverse solutions the EE market provides.

The estimated national market by 2035 is R21 billion with approximately 15% located in the WC.

A number of emerging opportunities have been identified through engagement with an array of ES and green economy stakeholders.

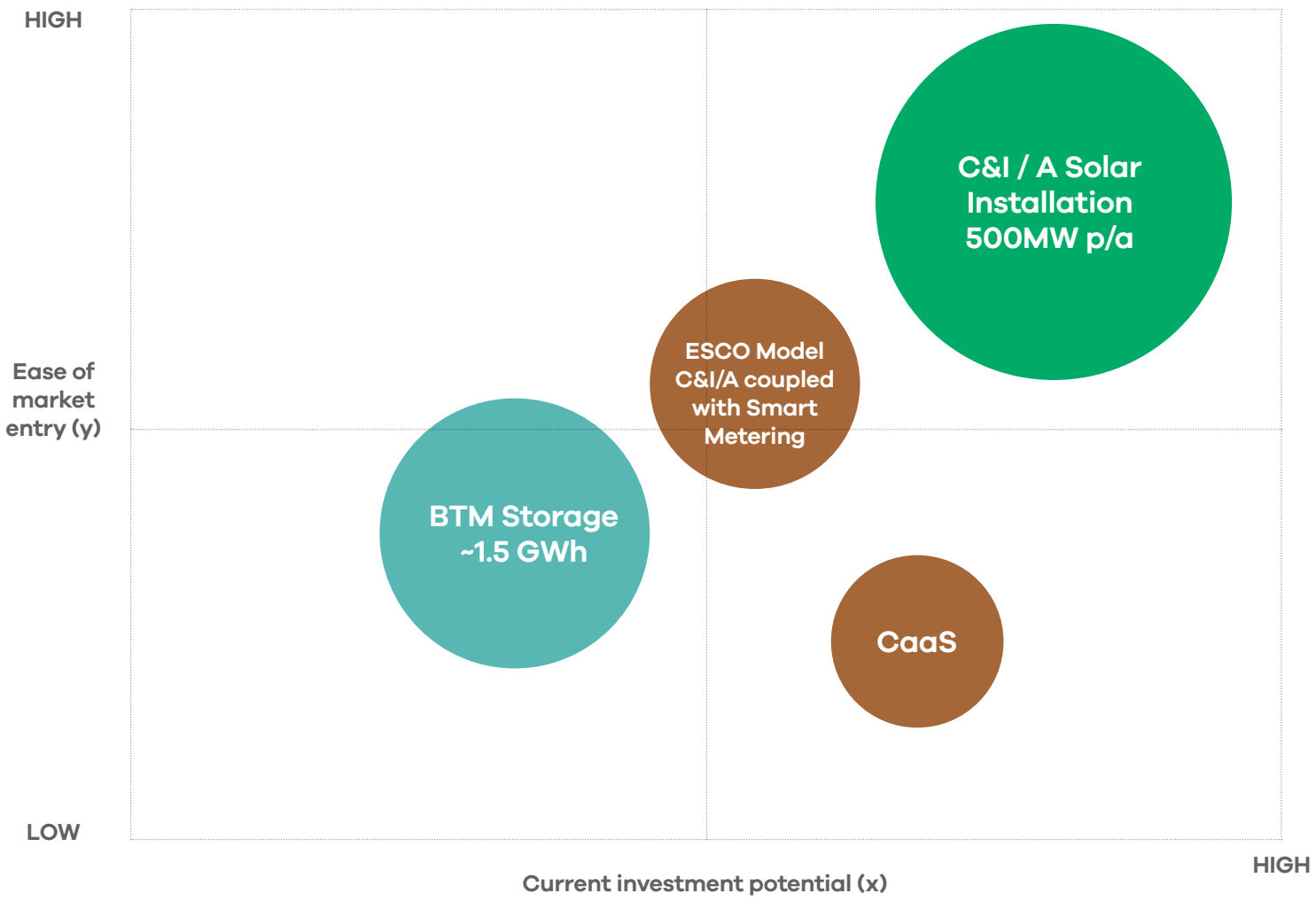


Figure 1: Investment prioritisation matrix of the ES opportunities[2]

Figure 1 provides an indicative summary of ES investment opportunities according to their current investment potential.

[2] List of abbreviations and acronyms

Solar Photovoltaic (PV) Installations (Commercial & Industrial (C&I) / Agricultural (<1MWp for own use)) are a central and dynamic opportunity for investors within the EG market segment. A strong business case continues to drive the growth and footprint of solar PV within the commercial, industrial and agricultural sectors. Over the past few years, increasing maturity has led to a concentration of projects in the 500 kWp - 1 MWp range amongst a handful of market players with strong reputations.

Many of these Engineering, Procurement and Construction companies (EPCs) and developers have now partly diverted their attention and capacity to the >1 MWp space. The potential <1 MWp market is thus now less crowded for service providers and investors to participate and achieve reliable pipelines for acceptable returns. Several promising sub-opportunities can be targeted on a standalone basis or in conjunction with project development. These include:

- Standardised contracts and systems.
- Solar power purchase agreements.
- Project bundling for an aggregate investment.
- Targeting property corporates for energy resale.
- Installation contracting.
- Operations & maintenance-only contract rebuys.

Due to the alignment of local demand and leading municipal support SSEG processes, the WC has proven to be an attractive base for developers to expand from with mobile workforces to the rest of South Africa (SA) and the broader Southern African Development Community (SADC) region.

Behind-the-meter battery storage is a future opportunity for investors in the ESt market segment. This opportunity is still small due to the prohibitive cost of batteries, though it is expected to grow substantially as Lithium-ion (Li-ion) prices continue to decrease over the next 5-10 years.

The need for energy independence and resilience considering ongoing loadshedding is driving demand for back-up power, particularly in commercial, industrial and agricultural applications where the opportunity costs of energy insecurity are high.

The end of the Private Sector Energy Efficiency programme (PSEE) in 2015, growth of the rooftop PV market and high measurement and verification (M&V) costs led to a decline in energy-efficiency market participation, despite this being a low-hanging fruit intervention for consumers. However, within the energy efficiency market segment, there are two innovative emerging opportunities for investors:

ESCO Model Commercial & Industrial (C&I) / Agri coupled with Smart Metering: Improving smart meter technologies and increasing awareness of the opportunity to reduce the commercial, industrial and agricultural bills and improve revenue collection has resulted in growing penetration of smart meters.

However, this has been limited by the disillusionment caused when the necessary accompanying technology interventions and behavioural changes are not implemented. ESCos are now focusing on supplementing meters with user-friendly interfaces, such as mobile applications that optimise the intervention through AI and indicate behavioural changes needed to sustain savings. Attractive returns are still achievable at faster delivery rates in a shared savings model.

Cooling-as-a-Service (CaaS) C&I / Agri: Refrigeration and cooling account for a significant portion of the energy requirements for many commercial, industrial and agricultural businesses. There is significant potential for energy savings of 15-35% through replacing older, end-of-life plants with bespoke and holistically designed systems. Yet, due to the technical complexity, investments in these systems are often perceived as grudge buys as businesses are hesitant to take on the maintenance and performance risks and costs of these systems.

SUMMARY OF MARKET OPPORTUNITIES

This no longer needs to be a barrier, as the CaaS model ensures performance and reliability in exchange at a reduced rate over a long-fixed term.

A key to the significant cost savings potential of CaaS is the guaranteed optimised operating energy performance, as this plays a greater role than capital and maintenance costs in the overall lifecycle of the refrigeration system.

There are very few service providers with the required skills and expertise operating in this market in SA. Given its high demand in key economic sectors, this is a highly attractive opportunity for new entrants and investors.

Table 1: Energy Services opportunities

Opportunity	Key drivers	Requirement & barrier	Expected timeframe	Macro-environment
Solar Installations C&I / Agri (<1 MWp Own Use)	• Strong business case. • Larger developers shifting a portion of focus to >1 MWp projects and wheeling. • Smaller rooftop PV projects can be bundled together to reach a scale where they become attractive to larger investors. • PPAs allow access to energy users who cannot raise upfront capital. • Secondary market in O&M contracts after 2-5 years. • Property owner's resale to tenants. • Foothold into SADC markets.	• High expertise needed to deliver high-quality service, manage risk & ensure good margins. • Cash-strapped end users. • Development and streamlining of municipal SSEG processes.	Immediate.	• Loadshedding and security of supply are major concerns. • Eskom and municipal electricity tariffs on the rise. • COVID-19 economic recovery. • The 2019 Carbon Tax Bill is currently in effect.
Behind the meter (BTM) battery storage – 1.5 GWh	• Back up and UPS application to limit opportunity costs associated with manufacturing and crop cycles.	• Battery pricing still high for the need. • Lack of battery specific PPA / financing / lease. • Additional expertise required to deliver complex hybrid designs.	Medium-term 5 years.	• Load-shedding and security of supply are major concerns. • LIB prices are dropping fast.

Table 1 continued...

Opportunity	Key drivers	Requirement & barrier	Expected timeframe	Macro-environment
Smart metering coupled with ESCO Model C&I / Agri	• Development in technology for wider accessibility and ease-of-use. • Complex time-of-use tariffs. • Monitoring and bill reduction as a service. • Reduces rates of tampering and theft through real-time alerts. • The requirement of a 50% limit on electricity used for water heating[3].	• Willingness to transition from standard prepaid meters. • Privacy concerns. • Lack of understanding benefits and corresponding behavioural change which limits uptake of EE technology and smart meters. • M&V complexity, cost and period length on small-medium sized projects.	Immediate.	• Eskom and municipal electricity tariffs are on the rise. • Utilities lose between 10 and 45% of revenue to tampering and copper cable theft. • Legislative and regulatory changes for greener buildings (SANS10400-XA). • Standardisation regulations (NRS 049). • Energy performance certificates are now mandatory for large buildings[4]. • The 2019 Carbon Tax Bill is currently in effect.
CaaS C&I / Agri	• Potential energy saving of 15-35% for commercial and industrial (C&I) users. • Priority investment for the avoidance of product spoilage. • No upfront capital required.	• A high level of technical expertise required. • Grudge buy if hesitant to handover system performance management.	Immediate	• Eskom and municipal electricity tariffs. on the rise. • The 2019 Carbon Tax Bill is currently in effect. • Very few companies currently offering in SA.

[3] South African National Building Regulations SANS 10400-XA

[4] Energy Performance Certificates

WHAT'S NEW?

This Market Intelligence Report (MIR) updates the opportunities, barriers, and regulations discussed in the 2021 Energy Services MIR. It also outlines emerging opportunities and barriers in small-scale embedded generation, energy storage and energy efficiency.

What happened in 2021

[5]Jan – Dec:

- Phased national lockdown in response to the COVID-19 pandemic; lockdown continued with impact on business varying from phase 1-3 based on wave status.
- Rolling blackouts (loadshedding) continue as Eskom is unable to match current electricity demand with available supply.
- Ongoing logistical delays at the ports due to various issues, including container shortages, resulted in cost spikes to imported PV equipment.

March:

- Draft Amendments to the regulations and notices regarding Extended Producer Responsibility (EPR) in the Waste Sector were published for public consultation on 19th March 2021.

EPR means that producers, or a class of producers, including brand owners, will be required to set up procedures, processes and invest resources to manage waste from specific categories, including electronics and electrical equipment such as light bulbs, batteries and solar panels. This comes in conjunction with the landfill ban of all "Hazardous Waste Electric and Electronic Equipment" from August 2021.

- SA launched its updated draft of the Nationally Determined Contributions (NDCs) for public consultation.

August:

- Amendments to Schedule 2 of the Electricity Regulation Act (ERA) 4 of the 2006 gazetted following President Ramaphosa's earlier announcement on 10 June 2021.

[5] As published in the Government Gazette on 8 December 2020, Energy Performance Certificates are now mandatory for the private sector, non-residential buildings with a total net floor area of over 2000m^2, and government buildings of over 1000m^2. The certificates must be displayed at the building's main entrance and submitted to the SANEDI. With the law now in effect, building owners must obtain an implementing EPC within two years.

The Amendment increases the threshold for embedded generation from the current 1 MW to 100 MW without a licence. However, it will still require registration with the National Energy Regulator of South Africa (NERSA).

September:

- Western Cape Municipal Energy Resilience Initiative launched. This fund will make almost R13 million available to qualifying municipalities for research and planning to determine the requirements and potential costs of renewable energy (RE) projects, thereby enabling investor/loan readiness. The projects are to be developed to build energy security and buffer households and businesses from loadshedding in the WC.
- Cabinet approved SA's revised NDC climate change mitigation target range for 2030 for submission to the UNFCCC. SA has revised its target range for 2025 to 398 – 510 Metric mega tonnes of Carbon Dioxide equivalent (Mt CO_2e) and for 2030 to 350 – 420 Mt CO_2e. The updated mitigation NDC proposes a significant reduction in the greenhouse gas (GHG) emissions target ranging up to 2030. The 2025 target range allows time to fully implement the national mitigation system, including those elements in the Climate Change Bill. The 2030 target range is consistent with SA's fair share and improved the preceding NDC target. The upper range of the proposed 2030 target range represents a 28% reduction in GHG emissions from the 2015 NDC targets.

October:

- A joint effort between SolarPower Europe and several solar PV experts active in South Africa and supported by South African-German Energy Programme (SAGEN) and the South African Photovoltaic Industry Association (SAPVIA) resulted in the publication of **O&M Best Practice Guidelines** – SA edition on the 26th of October 2021. This is aimed at aimed at C&I and rooftop solar installations.

Western Cape Municipal Energy Resilience (MER) Initiative

The Municipal Energy Resilience (MER) initiative is a 3-year programme running to July 2023. It is spearheaded by the Department of Economic Development and Tourism's (DEDAT) Energy Directorate within the Green Economy Chief Directorate and supported by the combined efforts of the Department of Local Government (DLG) and Provincial Treasury (PT).

The key objectives of the MER initiative are development, support and capacity building to implement RE projects in municipalities across the province for municipalities, businesses and households to generate, procure and sell their power, including, but not limited to, municipalities transacting directly with Independent Power Producers (IPPs), all aimed at increasing energy and economic resilience.

This MIR updates the 2021 report and highlights the following:

- updates on the state of the SSEG in SA;
- updates on the state of ESt in SA;
- updates on the state of energy efficiency in SA;
- the opportunities for players within the ES market;
- ES market drivers and barriers;
- COVID-19 lockdown and its impact on the ES market; and
- the influence of change in policy and regulations on future opportunities.

1

INTRODUCTION AND PURPOSE

In response to changing demands, energy service providers are broadening their market offerings. The South African Energy Services market holds opportunities for equipment suppliers, project developers, technical advisors, and financial investors.

Over the past ten years, the concept of ES and ESCos has evolved and matured in several markets worldwide, including SA.

This MIR provides potential investors in the small-scale embedded generation, energy storage, and energy efficiency markets with a greater understanding of SA's market opportunities, considering the size of the opportunities, the level of risk involved, and current barriers.

The report is compiled for foreign and local investors (persons or organisations) looking to invest in the South African green economy through project development, asset management, equity, debt, equipment manufacture, or support services.

In what follows:

- The **sector overview** (Section 2) provides a national economic overview of the ES market, including:

  - the market context (small-scale embedded generation, energy storage, and energy efficiency);
  - four major market drivers in the South African ES market;
  - market sizing (small-scale embedded generation, energy storage, and energy efficiency);
  - key players in the South African ES market.

- This is followed by an overview and update of **policies, legislation, and governance** (Section 3) that guide and affect the ES market.

- In Section 4, **opportunities and their related drivers and barriers** are highlighted, followed by sections that outline various **finance and investment incentives** (Section 5), present the case for the **Western Cape as a potential GreenTech hub** for Africa (Section 6), and explain **GreenCape's work within the green economy** (Section 7).

CLICK HERE TO EMAIL GREENCAPE'S ENERGY SERVICES SECTOR DESK

The global ES market is projected to reach USD 127.6 billion by 2028 from an estimated USD 55.8 billion in 2020/21, at a compound annual growth rate (CAGR) of 11%. This growth can be attributed to factors such as new revenue generation streams for utilities, increasing distributed energy resources, decreasing cost of renewable power generation and storage solutions, and availability of national tax benefits for energy efficiency projects **(Emergen, 2021).**


©GreenCape

SECTOR OVERVIEW

Rising electricity prices, energy insecurity, dropping technology costs, supportive energy policies, and incentives prompt consumers to explore alternative energy options driving the growth of the ES market in SA and creating a thriving value chain.

Rooftop solar PV installation at SAB Brewery in Newlands, Cape Town.
©Sola Group

This section provides an overview of the national ES context, covering market developments, key industry players, and market size. The term 'Energy Services' is used to describe three interlinked energy market segments in the South African energy space, namely SSEG, which is currently dominated by rooftop solar PV systems, ESt, and EE. Figure 2 breaks down the three interlinked energy market segments.

2.1. Global Energy Services Market

The global ES market is projected to reach USD 127.6 billion by 2024 from an estimated 55.8 billion in 2020/21, at a CAGR of 11% (Emergen, 2021). This growth can be attributed to increasing distributed energy resources, decreasing the cost of renewable power generation and storage solutions, and availability of national tax benefits for energy efficiency projects.

With a global focus on RE, it is projected that the embedded generation portion of the market will dominate market growth over the next five years.

On a sector basis, the commercial, agricultural and industrial segments are projected to register the fastest growth over the next five years. Although the South African ES market remains nascent within a global landscape, each of these global trends is being seen in the local market.

2.2. South African market context

2.2.1. National electricity landscape

SA's electricity supply is currently dominated by coal-fired power generation. The country has coal-fired generation stations with an installed capacity of 38.7 GW, with the additional coal unit (+725 MW) at Kusile power station coming online. This represents more than 74% of the country's total wholesale/public nominal capacity, amounting to ~52.6 GW. These stations are primarily owned and operated by Eskom, the national power utility. Eskom supplies ~95% of SA's total electricity demand. The remaining 5% of demand is met through municipalities, imports and IPPs.

Small-scale embedded generation

- Generation facilities of less than 1 MW.
- Located at residential, commercial or industrial sites, where electricity is generally consumed.
- Installed on the customer's side of the electricity meter.

Energy storage

- Energy storage systems are technologies in which electric energy is loaded and, when needed, discharged for consumption.

Energy efficiency

- Implementation of behaviour change or technology to reduce energy consumption, while producing the same or greater outputs.

Figure 2: Energy Services interlinked market segments

There has been a distinct flattening in demand since 2010, resulting in reduced dependence on coal-based electricity (87% in 2010 versus 65% in 2020) (Calitz, J. Wright, J.G. (2020). In H1-2021, system demand increased by 5.4TWh relative to H1-2020 (5.0%) but was 2.5TWh less than that experienced in H1-2019 (-2.2%) (Calitz, J. Wright, J.G. (2021)).

Over more than ten years, a historic supply and demand imbalance in SA's single buyer energy model resulted in intensive loadshedding continuing country-wide during 2021. As of November 2021, loadshedding had occurred for 1 136 hours with an upper limit of 2 455 GWh; a 37% YTD increase compared to the 859 GWh upper limit of energy shed in 2020 (Calitz, J. Wright, J.G. (2021)). This equates to 76% of the full year loadshedding in 2020.

Loadshedding has been driven by a combination of factors, including:

- Delayed commissioning and underperformance of new-build coal generation capacity;
- Degradation of the existing Eskom coal fleet energy availability factor (EAF) declining from ~94% in 2002, ~65% in 2020, 67% in 2019/20 to 61.31% for H1[6]-2021;
- An alarming and continued trend increasing Unplanned Capability Loss Factor (UCLF) of up to 15 300 MW was experienced in H1 2021 (Calitz, J. Wright, J.G. (2021)).

2.2.2. The development of the Energy Services market in South Africa

As indicated above, the South African electricity market is currently managed on a single operator model by the state-owned entity, Eskom, responsible for generation and transmission.

It controls a minority share of the distribution market. This single operator model is designed to support developing electricity markets in need of structured long-term infrastructure investments (with 10 – 15-year construction timelines) and diverse demand balancing of centralised generation facilities.

SA's dependence on this single operator model has decreased over the past ten years with the introduction of new technologies, which are cheaper, capable of being decentralised, and lower carbon. The growth of this decentralised market is evidenced by the evolution of the small-scale embedded generation and energy storage markets. Continual increases in the cost of traditional electricity supply have also led to increased demand efficiencies (energy efficiency).

The sections that follow (see Figure 3) detail the market context (small-scale embedded generation, energy storage, and energy efficiency), four major market drivers in the South African ES market, and key players in the South African ES market.

[6] H1 – January to June

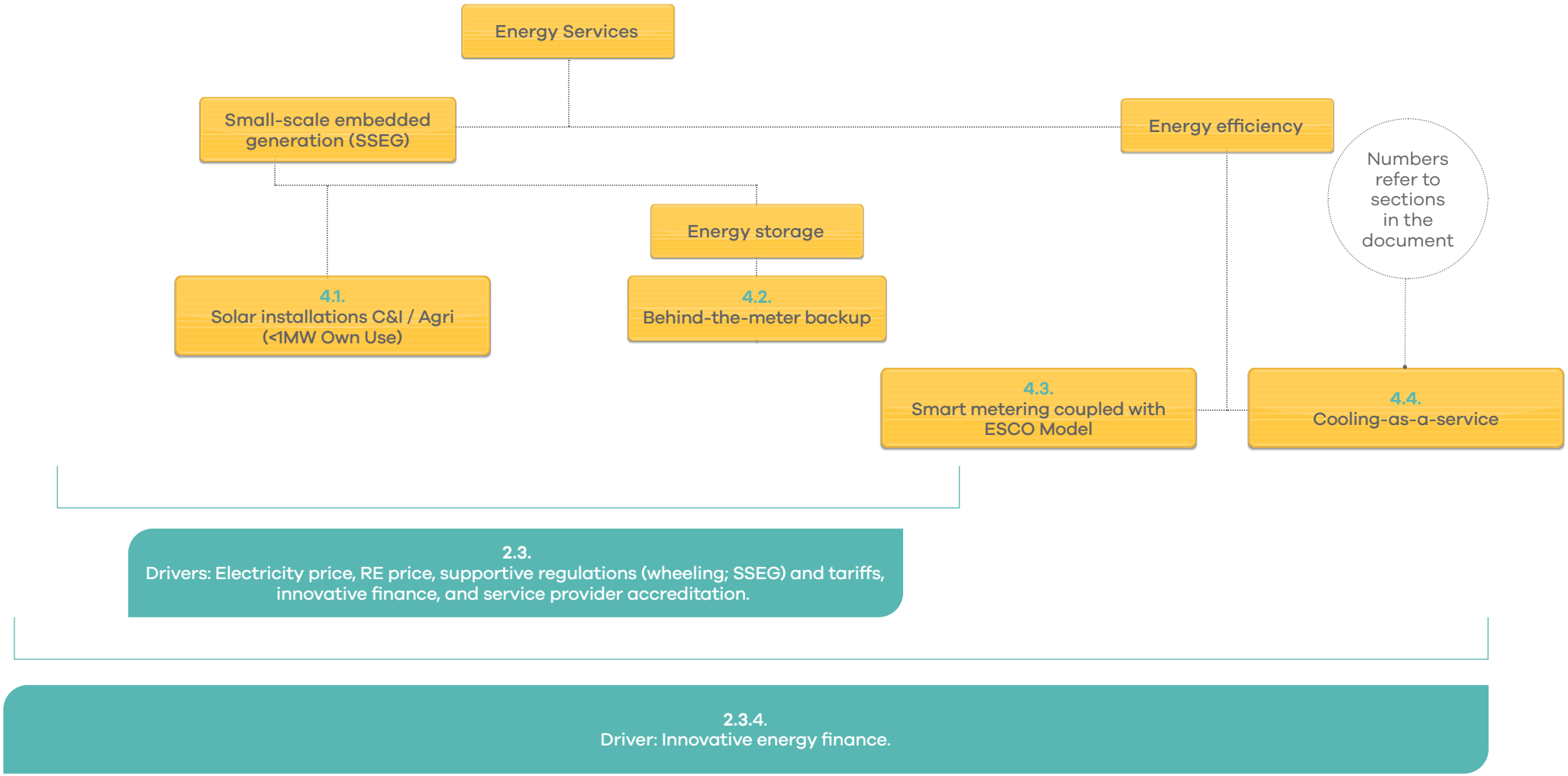


Figure 3: Energy Services sector overview

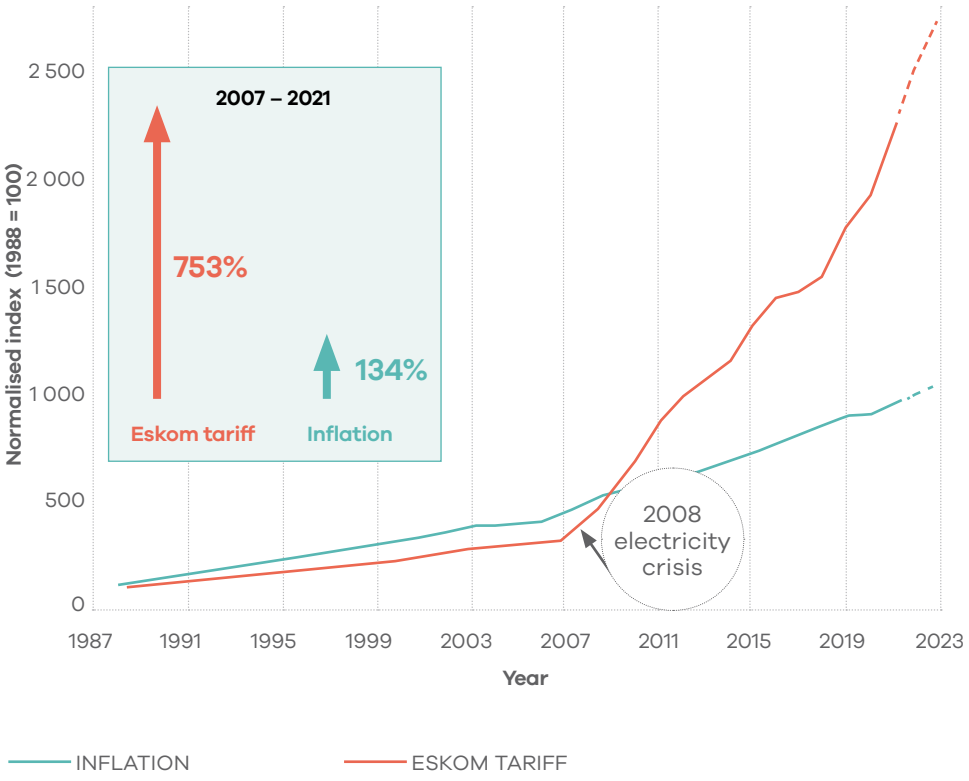


Figure 4: Average Eskom tariff versus inflation (CPI) projected to 2023

Sources: Statistics South Africa (StatsSA) and Bureau of Economic Research (2021)

2.3. Energy Services market drivers

Four major developments are transforming SA's energy market from a monopoly model to a distributed generation model made up of multiple smaller generators, buyers, and sellers:

- rising energy prices;
- falling costs of RE technologies such as rooftop solar PV;
- supportive energy policies and regulations by the local and national government; and
- energy financing programmes and incentives.

In turn, these developments, discussed in more detail below, create significant opportunities for ES investors and businesses, in particular equipment suppliers, project developers, technical advisors, installers, and financial investors.

2.3.1. Rising electricity costs

Rapidly rising Eskom electricity prices have created a sizeable demand for viable alternative energy sources in SA. Figure 4 compares Eskom price increases to SA's inflation rate (as reflected by the Consumer Price Index). The average standard Eskom tariffs have risen by 307% since 2007. Historical data from the Bureau of Economic Research (2021) and StatsSA (2021), shown in Figure 4, reveal that in contrast inflation has just more than doubled since 2007.

NERSA has approved an above CPI increase for Eskom for the past ten years, with increases in the last 6 years shown in Table 2.

Table 2: Eskom price increases 2016-2021

Year	Average price increase	Inflation	Inflation adjusted price (c/kWh)
2016	8.00%	6.34%	96.08
2017	8.20%	5.27%	99.23
2018	5.20%	2.48%	99.82
2019	13.90%	4.13%	108.79
2020	3.90%	2.43%*	116.72
2021	15.63%	5.22%	134.30

The average standard Eskom tariff increased from 116.72 c/kWh to 134.30 c/kWh in 2021. The utility has indicated that more cost-reflective double-digit hikes will be required in coming years.

2.3.2. Falling costs of renewable energy technologies

RE technology prices have been dropping steadily since 2010.

The global average price for commercial solar PV electricity in 2020/21 was 86c per kWh, down from R5.33 per kWh in 2010 (IRENA 2021). This represents a ~84% drop in ten years. This trend of falling technology prices in the South African Small Scale Embedded Generation (SSEG) market is depicted in Figure 5. The South African SSEG market is currently dominated by rooftop solar PV, given the competitive price, technical maturity, and ease of implementation of this technology).

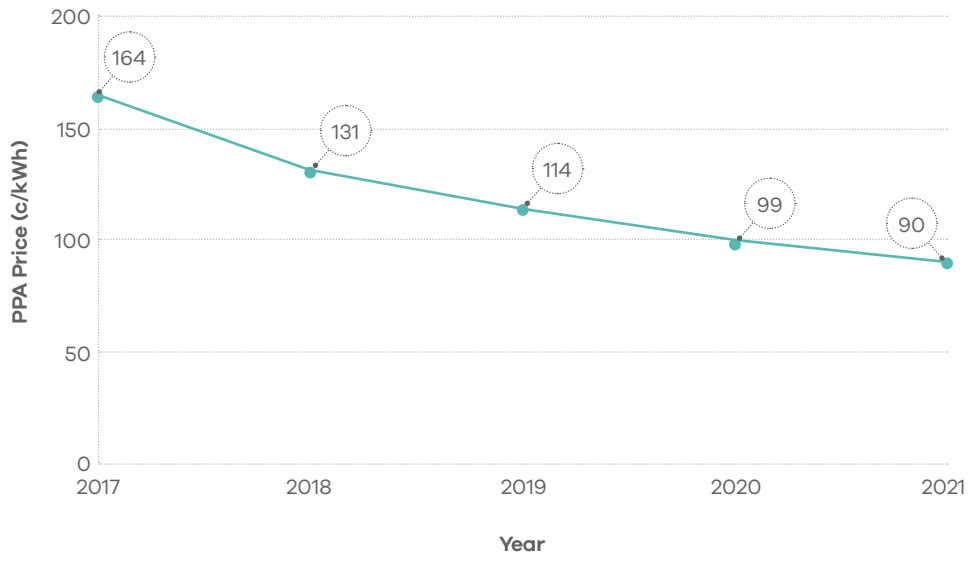


Figure 5: Declining price of solar PV electricity in South Africa from 2017-2021 for a 400 kWp rooftop solar PV system

In SA, the smallscale solar PV levelized cost[7] of electricity is already typically less than R1 / kWh, as reflected in the power purchase agreement (PPA) rates in Table 3.

[7] Levelized cost of electricity, is a measure of the average net present cost of electricity generation for a generating plant over its lifetime.

Table 3: South African small scale solar PV prices 2021

Procurement Options / System Size	<100 kWp	<500 kWp	>500 kWp	>1 MWp
Balance Sheet (per kWp)	R11 000 – R15 000	R10 500 – R13 000	R10 000 – R12 000	R8 000 – R9 500
Debt Finance (5 – 10-year period)	Above amortized plus 5-8% interest pa			
Lease-to-Own (per month excl. escalation pa)	R7 000 – R14 500	R12 000 – R60 000	R50 000 – R100 000	R85 000 – R250 000
Power Purchase Agreement (PPA) (per kWh)	0.90c – R1.20	0.80c – R1.00	0.60c – 0.90c	0.56c – 0.70c

The continued drop in prices and strong business case for small scale solar PV is accelerating the uptake of this technology. The Western Cape DEDAT facilitates this transition through an energy resilience programme in partnership with GreenCape. To date, over 100 business decision-makers have been assisted through provision of relevant information, including on implementation partners, as seen in **Figure 6**:

Contact energysectordesk @greencape.co.ca to get involved in this support.

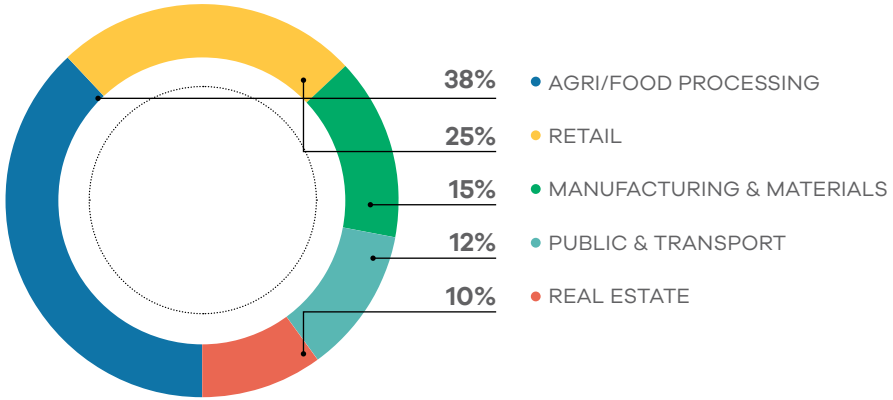


Figure 6: DEDAT Energy Resilience Programme engagements

2.3.3. Supportive energy policies and regulations by the local and national government

The regulatory environment has a direct impact on investment opportunities, market growth, and job creation. To lower demand on the national grid and reduce carbon emissions, the national government has put in place several energy policies and incentives to encourage energy efficiency interventions and alternative energy generation. Section 3 (legislation, regulation, and policy) and Section 5 (funding opportunities and incentives) discuss these in more detail. Regulatory developments as described in Section 3 facilitate the growing uptake of renewable energy options, particularly in the <1 MWp space – from rooftop solar PV systems and small-scale wind energy installations to the uptake of bioenergy.

Similar to the amendments to licensing regulations and guidelines from the Department of Mineral Resources and Energy (DMRE) and NERSA (outlined in Section 3), changes in municipal regulation of SSEG installations have contributed to increasingly conducive market conditions for investors, project developers, equipment suppliers, and technical advisers. Three major changes are taking place at the local government level:

The DMRE has approved municipalities' capacity to buy electricity from independent power producers (IPPs). In amendment to the Electricity Regulations on New Generation Capacity in terms of Section 35(4) of the ERA, of 2006 gazetted by the DMRE in October 2020, municipalities in good financial standing will now be allowed to formulate an energy plan that does not rely solely on the government-owned utility Eskom.

Metropolitan municipalities around the country, specifically the City of Cape Town, George, Tshwane, City Power (Johannesburg), eThekwini and Nelson Mandela Bay Municipality, have undertaken initiatives to purchase electricity directly from IPPs and on-sell this electricity to their customers.

Increasing off-take agreement options under third party grid access regulations for small scale embedded electricity generators.

- As allowed by the National Regulator and implemented by local municipalities, electricity wheeling will allow generators to transport electricity over existing grid infrastructure to a willing buyer anywhere in the municipality or country. Wheeling frameworks are being pioneered by the following distributors: The City of Tshwane, Nelson Mandela Bay Metropolitan Municipality, the City of Cape Town, Stellenbosch, Drakenstein and Eskom.
- The release of regulations that allow private sector energy trading[8] will also open the market to private sector PPAs and on-sales to private consumers using the national and local distribution networks.

These new off-take options present an opportunity for high and **medium voltage C&I** customers with large energy bills that warrant it and **buildings that currently are not able to install rooftop PV**. The associated costs for making use of a local distribution utility network remain high (30c /kWh – 90c /kWh off-peak vs. peak time).

[8] Electricity trading is the transportation of electrical energy from a generator to a separate electrical load by making use of municipal or Eskom grid infrastructure and PPAs. The difference is that a private sector electricity trader or third party will purchase the electricity, pay the local municipality/Eskom to wheel it over their network, and sell it to a willing customer.

In addition to enabling RE technologies, these off-take options would provide a platform for municipalities to engage and retain customers. By offering an additional avenue to prosumers[9], municipalities would propose a new service to electricity generators and consumers interested in procuring clean energy.

The **country-wide rollout of national small-scale embedded generation rules, regulations, and tariffs** to promote the safe and legal uptake of SSEG for its own use[10].

Table 4 and **Figure 7**, on the subsequent pages, present data obtained by the South African Local Government Association (SALGA) on the uptake of SSEG processes in municipalities by October 2021.

Figure 7 shows the upward trend of municipalities adopting SSEG processes from 2016 to 2021.

Ground-mounted solar PV installation at Marlenique Estate, Western Cape Province. **©New Southern Energy**

[9] A prosumer is an entity or person who produces and consumes a product, in this case, electricity.

[10] The generation of electricity on the load site where it will also be consumed.

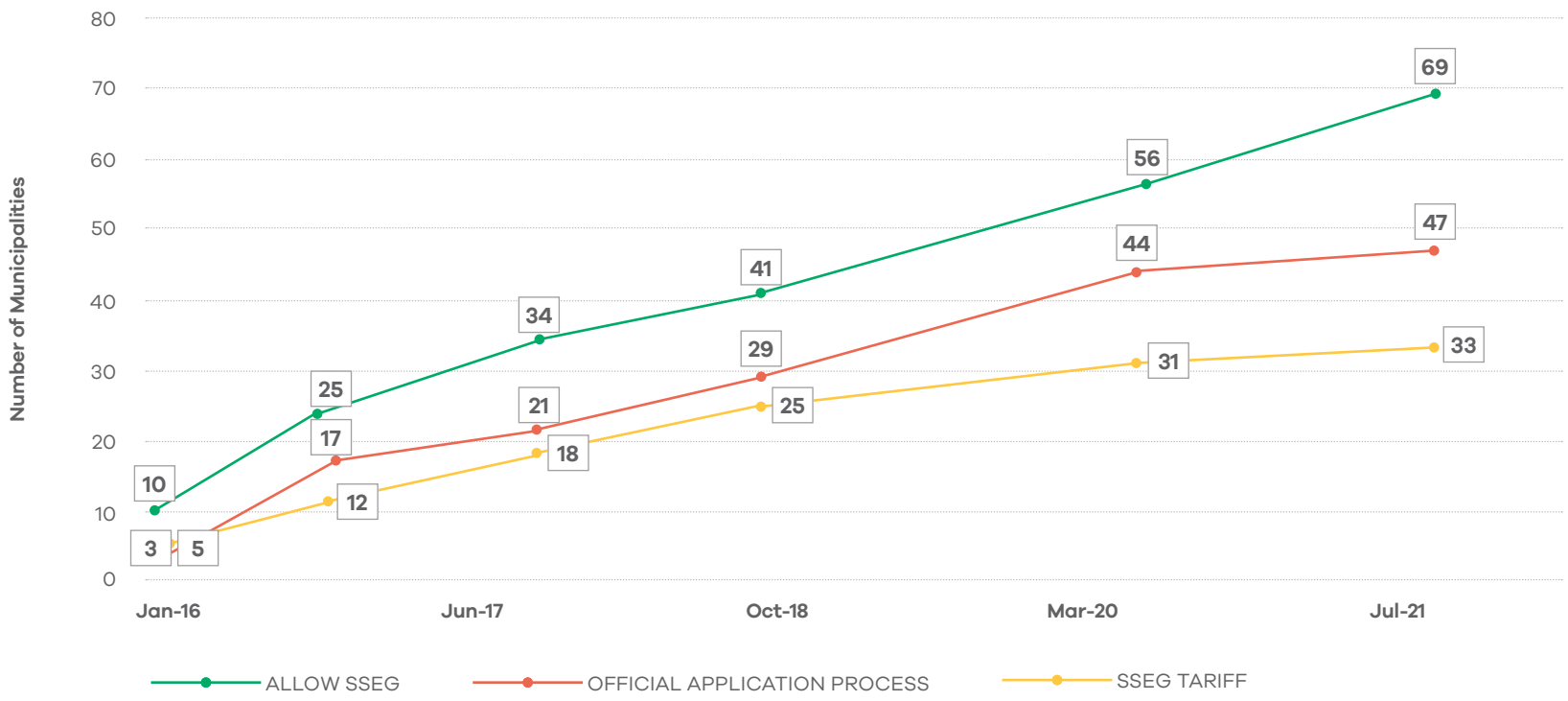


Figure 7: Uptake of SSEG processes in municipalities

Source: SALGA 2021

Table 4 gives a regional breakdown of municipalities that allow SSEG installations on their distribution network, those with a formal application process, and those with NERSA-approved SSEG tariffs allowing them to credit customers for excess electricity exported onto their distribution networks.

The table also shows the percentage of the national registered SSEG systems in each province.

The Western Cape remains the leading province in terms of supportive energy policies and regulations by the local municipalities.

Table 4: Provincial SSEG uptake summary 2021

Source: SALGA 2020, 2021

Provinces	Number of municipal electricity distributors in the province	Number of municipalities allowing SSEG installations[11]	Number of municipalities with official application processes	Number of municipalities with SSEG tariffs	Percentage of national registered SSEG systems in 2020
Eastern Cape	22	8	6	3	4%
Free State	17	3	2	0	N/A
Gauteng	9	6	3	2	46%
Kwazulu-Natal	25	8	2	1	13%
Limpopo	16	6	5	1	1%
Mpumalanga	14	8	6	3	6%
Northern Cape	24	9	4	3	2%
North West	13	5	3	0	6%
Western Cape	25	24	22	18	23%
TOTAL	165	68	47	31	–
% of licensed distributors:		41%	28%	20%	–

Table 5 gives a more detailed overview of the municipalities that allow SSEG installations within their municipalities, either on a case-by-case basis or through an application process.

[11] Not considering local grid capacity constraints

Table 5: List of municipalities allowing SSEG to connect to the grid

Source: SALGA 2020, 21

Province	Municipality	Allow SSEG onto the network?	Have an official SSEG application process?	Have a NERSA approved SSEG tariff?
Eastern Cape	Blue Crane Route	Yes	No	No
	Buffalo City	Yes	Yes	Yes
	Dr Beyers Naude	Yes	Yes	No
	King Sabata Dalindyebo	Yes	Yes	No
	Kouga	Yes	Yes	Yes
	Makana	Yes	Yes	No
	Nelson Mandela Bay	Yes	Yes	Yes
	Raymond Mhlaba	Yes	No	No
Free State	Mafube	Yes	Yes	No
	Maluti-A-Phofung	Yes	No	No
	Manguang	Yes	Yes	No
Gauteng	Ekurhuleni	Yes	Yes	No
	Emfuleni	Yes	No	No
	Johannesburg	Yes	Yes	Yes
	Merafong City	Yes	No	No
	Midvaal	Yes	No	No
	Tshwane	Yes	Yes	Yes
	Rand West City	Yes	No	No

Table 5 continued...

Province	Municipality	Allow SSEG onto the network?	Have an official SSEG application process?	Have a NERSA approved SSEG tariff?
KZN	Alfred Duma	Yes	No	No
	eThekwini	Yes	Yes	Yes
	Greater Kokstad	Yes	Yes	No
	Kwadukuza	Yes	No	No
	Msunduzi	Yes	No	No
	Ray Nkonyeni	Yes	No	No
	Umhlathuze	Yes	No	No
	Umlalazi	Yes	No	No
Limpopo	Ba-Phalaborwa	Yes	Yes	No
	Elias Motswaledi	Yes	Yes	No
	Ephraim Mogale	Yes	Yes	Yes
	Greater Tzaneen	Yes	Yes	No
	Polokwane	Yes	Yes	No
	Thaba Chweu	Yes	No	No

Table 5 continued...

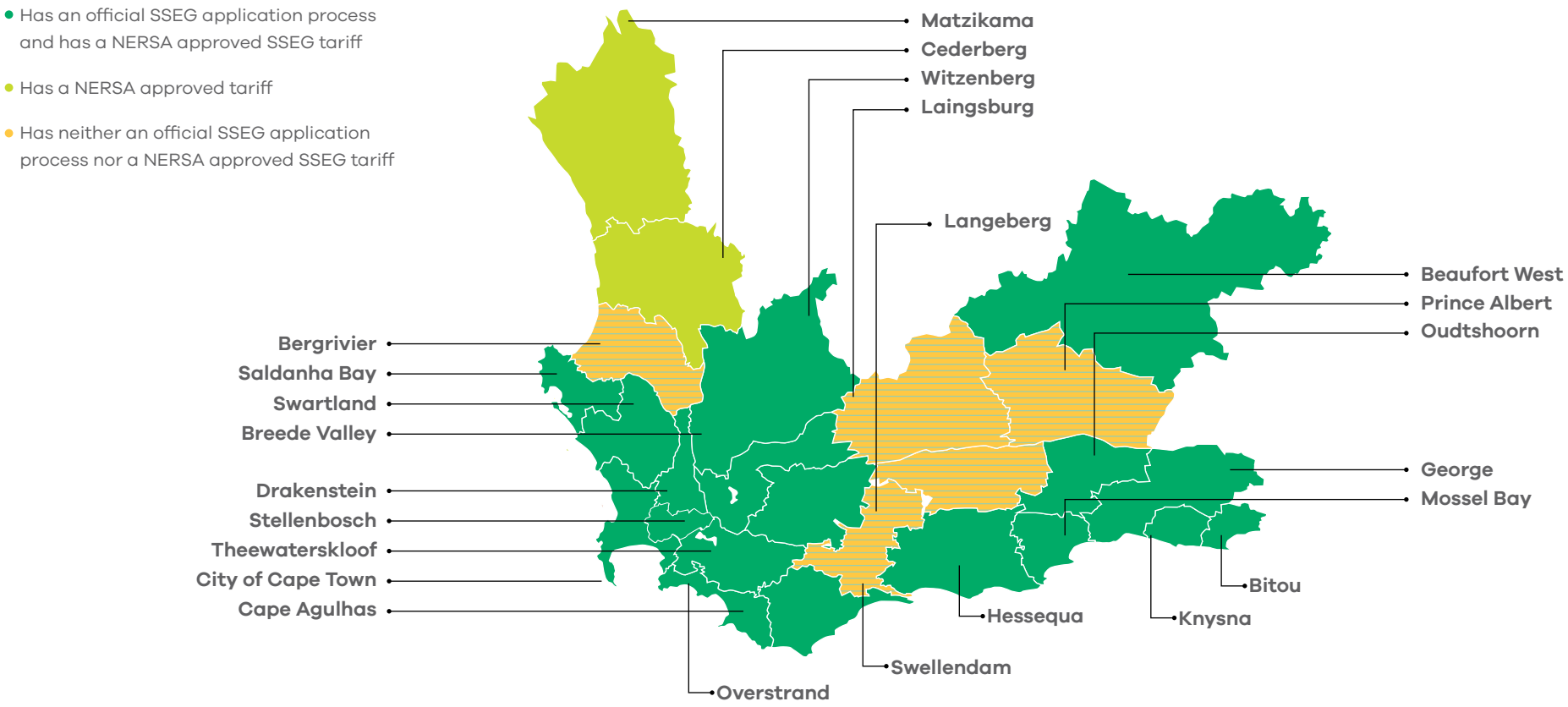
Province	Municipality	Allow SSEG onto the network?	Have an official SSEG application process?	Have a NERSA approved SSEG tariff?
Mpumalanga	Emalahleni	Yes	Yes	Yes
	Govan Mbeki	Yes	Yes	Yes
	Mbombela	Yes	Yes	Yes
	Msukaligwa	Yes	Yes	No
	Steve Tshwete	Yes	Yes	No
	Thaba Chewu	Yes	No	No
Northern Cape	Emthanjeni	Yes	No	No
	Gamagara	Yes	Yes	Yes
	Hantam	Yes	No	No
	Kai!Garib	Yes	Yes	Yes
	Karoo Hoogland	Yes	Yes	No
	!Kheis	Yes	No	No
	Nama Khoi	Yes	No	No
	Sol Plaatjie	Yes	Yes	Yes
	Thembelihle	Yes	Yes	No
	Ubuntu	Yes	Yes	No

Table 5 continued...

Province	Municipality	Allow SSEG onto the network?	Have an official SSEG application process?	Have a NERSA approved SSEG tariff?
North West	JB Marks	Yes	Yes	No
	Kgetlengrivier	Yes	No	No
	Matlosana	Yes	Yes	No
	Rustenburg	Yes	Yes	No
	Tswaing	Yes	No	No
Western Cape	Beaufort West	Yes	Yes	Yes
	Bergrivier	Yes	No	No
	Bitou	Yes	Yes	Yes
	Breede Valley	Yes	Yes	Yes
	Cape Agulhas	Yes	Yes	Yes
	Cederberg	Yes	No	Yes
	Cape Town	Yes	Yes	Yes
	Drakenstein	Yes	Yes	Yes
	George	Yes	Yes	Yes
	Hessequa	Yes	Yes	Yes
	Kannaland	Yes	No	No
	Knysna	Yes	Yes	Yes
	Laingsburg	Yes	No	No

Table 5 continued...

Province	Municipality	Allow SSEG onto the network?	Have an official SSEG application process?	Have a NERSA approved SSEG tariff?
Western Cape	Matzikama	Yes	No	Yes
	Mossel Bay	Yes	Yes	Yes
	Oudtshoorn	Yes	Yes	Yes
	Overstrand	Yes	Yes	Yes
	Prince Albert	Yes	No	No
	Saldanha Bay	Yes	Yes	Yes
	Stellenbosch	Yes	Yes	Yes
	Swartland	Yes	Yes	Yes
	Swellendam	Yes	No	No



There is a large range of SSEG feed-in tariffs across the municipalities listed in Table 5. While the average tariff remains low, it is still a potential added benefit, built on an already strong business case for own generation. Figure 8 shows the feed-in tariffs across the municipalities in the WC.

The average residential feed-in tariff is R0.70 /kWh, and the average commercial feed-in tariff is R0.71 /kWh, as shown in Figure 8 below. These align with the Eskom summer standard time purchase tariff. As the Eskom purchase price continues to increase, there is scope to increase this feed-in tariff to track these increases.

In 2020 the City of Cape Town implemented a 25c /kWh SSEG feed-in tariff incentive above the existing feed-in tariff. This is valid until 30 June 2022 for all new customers. This means the feed-in tariff would be as high as R1 /kWh.

Figure 8: Western Cape residential and commercial SSEG feed-in tariffs 2020/21

Source: NERSA, 2021; GreenCape Analysis

There is currently no guarantee of the structure and cost of municipal consumption and feed-in tariffs from year to year. Municipalities are moving tariffs to be more cost-reflective[12], with the bulk of their costs derived from energy time-of-use purchases from Eskom.

These changes at the municipal level complement legislative updates on a national level. Together, these changes herald a freer, more 'liberalised' electricity market, in which stakeholders can be more empowered in their energy choices.

Figure 9 and Figure 10 show the fixed portion of the current residential and commercial SSEG tariff in the Western Cape[13].

In the Western Cape, typical municipal SSEG fixed costs per residential customer vary widely between as low as R350 and as high as R2200 (e.g., for 80A 3-phase connection) per month (combined service and network costs).

[12] Two-part tariffs with both variable and fixed portions.

[13] Two-Part Pricing (also called Two Part Tariff) = a form of pricing in which consumers are charged both a fixed price and a usage fee (per-kWh).

Revenue impact assessments completed by several municipalities indicate that SSEG fixed charges in the range R300-R600 are likely to provide cost coverage and allow for the foundation of a new service model. The average fixed SSEG residential fee in the Western Cape is R562 per month.

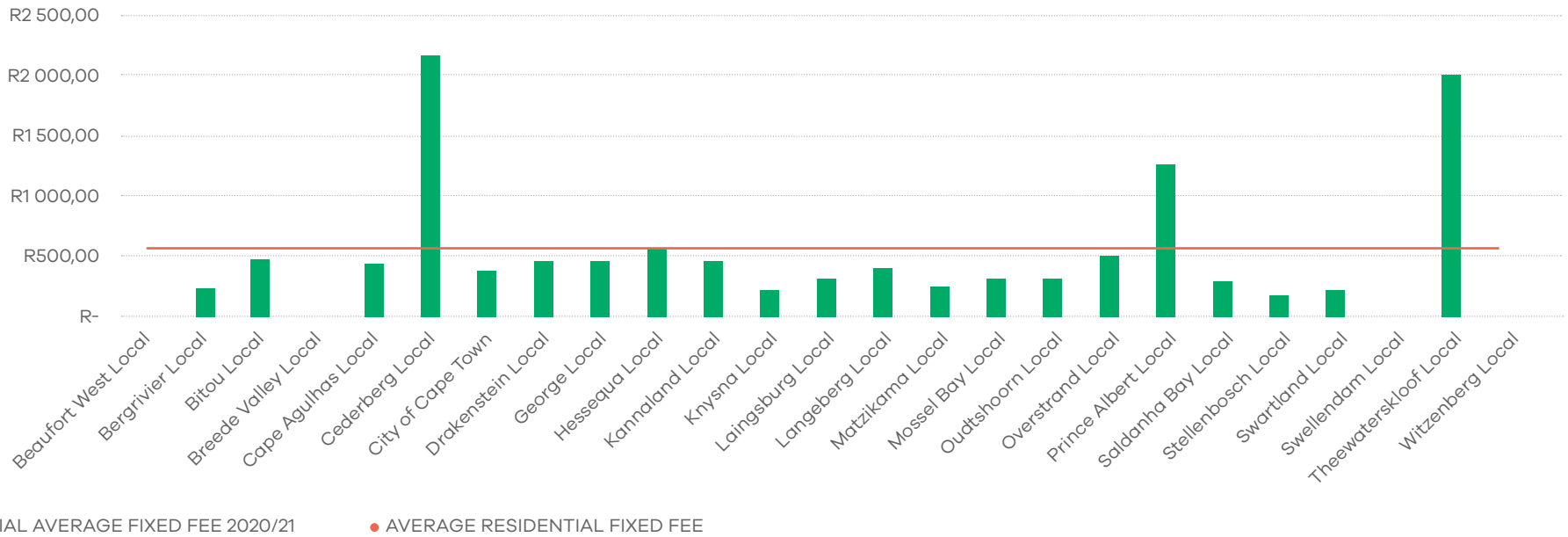


Figure 9: Western Cape residential SSEG fixed tariffs 2020/21

Source: NERSA, 2021

It is often unnecessary for commercial customers already on a fixed charge to change this charge when installing SSEG. **The average commercial SSEG fixed monthly charge in the Western Cape is R1 580,** as seen in Figure 11 below.

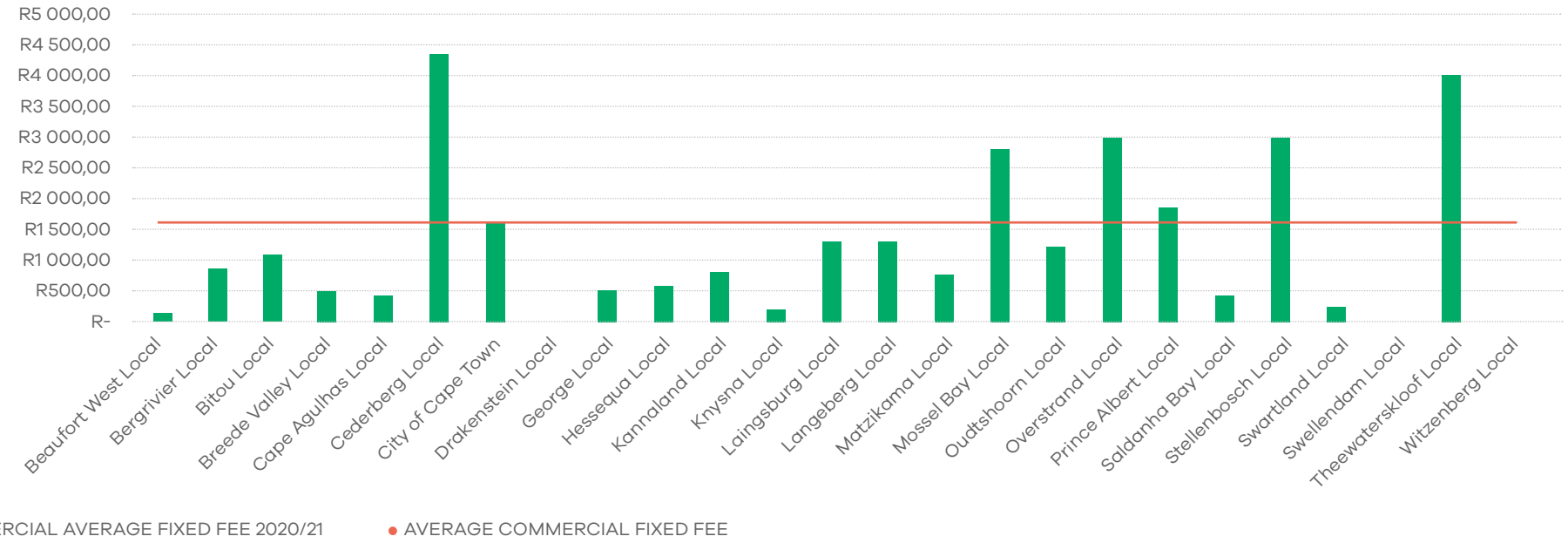


Figure 10: Western Cape commercial SSEG fixed tariffs 2020/21

Source: NERSA, 2021

2.3.4. Energy finance: facilitating the right type of finance into the sector

The growth of the South African ES market is aided by 'green' energy finance offerings that facilitate tailored finance solutions for the energy sector. A South African Climate Finance Landscape report, published by GreenCape and the UCT Graduate School of Business (GSB) Bertha Centre for Social Innovation and Entrepreneurship in partnership with Climate Policy Initiative (CPI) in 2021, has tracked R62.2 billion in annual climate finance invested in SA for 2017 and 2018. This is a baseline for the scale of financing put towards a low-carbon and climate-resilient economy in SA. Private actors accounted for an average of R35.3 billion of the funds tracked per year during 2017 and 2018. 100% of this investment was tracked in climate mitigation sectors (clean energy, energy efficiency and demand-side management).

Corporates and commercial financial institutions accounted for a combined annual investment of R29.5 billion or 47% of the tracked disbursements in the South African landscape, all of which were in clean energy. Substantial profits reduced technical and project risk and decreased technology costs have continued to attract financial players to the South African clean energy sector.

Within this growing landscape, several exciting finance mechanisms are being tested in the market. For more information on the following, please visit the GreenCape website:

- **Property Assessed Clean Energy (PACE):** PACE is a financing mechanism that enables low cost, long-term funding for energy efficiency, RE, and water conservation projects installed by ESCos on properties. The investment is recovered as a portion of the monthly rates collected by the respective municipality.
- **Pay as You Save® (PAYS®):** PAYS® is an inclusive financing solution that allows all utility customers to access cost-effective energy efficiency upgrades and distributed RE assets regardless of income, credit history, or renter status (The Lab 2018). This is particularly important for financing programmes that aim to serve market segments that are hard to reach. Of the three mechanisms listed, this is the least developed in SA.

CLICK HERE TO ACCESS THE PAYS INDUSTRY BRIEF

- **The Green Outcomes Fund (GOF):** GOF is a first of its kind structure in SA, which incentivises local fund managers to increase investment in green Small, Medium and Micro-Sized Enterprises (SMMEs). In the ES context, it is particularly directed at local service providers and equipment manufacturers.

FOR MORE INFORMATION ON GOF, PLEASE VISIT THE GOF WEBSITE

Financing for SSEG, specifically rooftop solar PV, is underpinned by thousands of small contracts with consumers. Traditionally, commercial banks have favoured big solar/wind farms because they are generally based on contracts with investment-grade utilities and international companies. Only in the past three years have the majority of the commercial banks started to provide tailored mechanisms for rooftop solar PV investments.

Commercial and residential debt largely remains closely tied to strong individual credit scores and existing bank-customer relations. However, in **2017, the big five banks in South Africa started to focus on rooftop PV's unique financing needs,** providing more targeted, patient, and affordable finance packages for commercial and residential solar PV.

The inclusion of the commercial banking sector unlocks the SSEG opportunity for end-users and installers, EPCs, and ESCos by providing accessible and affordable financing[14].

Banks' offerings include mechanisms covering 70% to 100% of capital costs with a five- to ten-year loan repayment. However, by using pre-selected EPCs and meticulous energy audits, banks ensure that financed projects are designed so that the customer's savings generated from the solar installation are greater than the loan repayments. This results in a positive cash flow.

Since 2020, there has been an improvement on PV asset class risk profiles resulting in reduced finance costs. Commercial banks saw a significant growth of successful projects on their loan books, with portfolios tripling between 2018 and 2020. As a result, perceived risk is stabilising, and finance offerings are becoming more competitive. Commercial banks are also exploring new approaches to loan collateral. Whereas in the past, security has been tied to the asset or balance sheet of the client, financiers increasingly prefer agreements that tie security to the property on which the asset is installed. Amortising debt is still the most cost-competitive form of finance for invest-to-own scenarios. However, financiers have noted that PPAs, whilst more expensive, are growing for the following main reason - cash flow stability. A PPA provides a clear indication of electricity costs, and the client does not always want to own the system or take on the performance risk. This is especially true for large corporate clients.

In 2021, a greater diversity of investors moved into the SSEG sector driven by positive regulatory sentiment around wheeling and the raising of the cap on generation without requirement for a licence to 100 MW. A greater pool of debt and equity partners in the market is expected to facilitate the increased delivery of PPA projects. This dovetails with unlocking segments of the commercial, industrial and agriculture sectors that are still cash-constrained during the COVID-19 recovery period.

ACCESS TO INNOVATIVE FINANCE INDUSTRY BRIEF

2.4. Key players

Figure 11 shows the ES value chain and key players in the value chain, with the roles of specific actors outlined in Table 6.

The value chain is based on the stages of a generic energy intervention, showing the types of services or products provided by key players. This represents a simplified view of a vertically integrated value chain. In practice, the roles of these actors often shift with relative fluidity. For example, the boundary between a project developer, an EPC, and installer is often blurred, with players taking on different roles depending on the size, cost, ease of implementation, or other project-specific factors.

[14] Most commercial banks do not offer standalone services. e.g., for solar PV finance, customers would need to make use of other bank products as well (a business account, etc.).

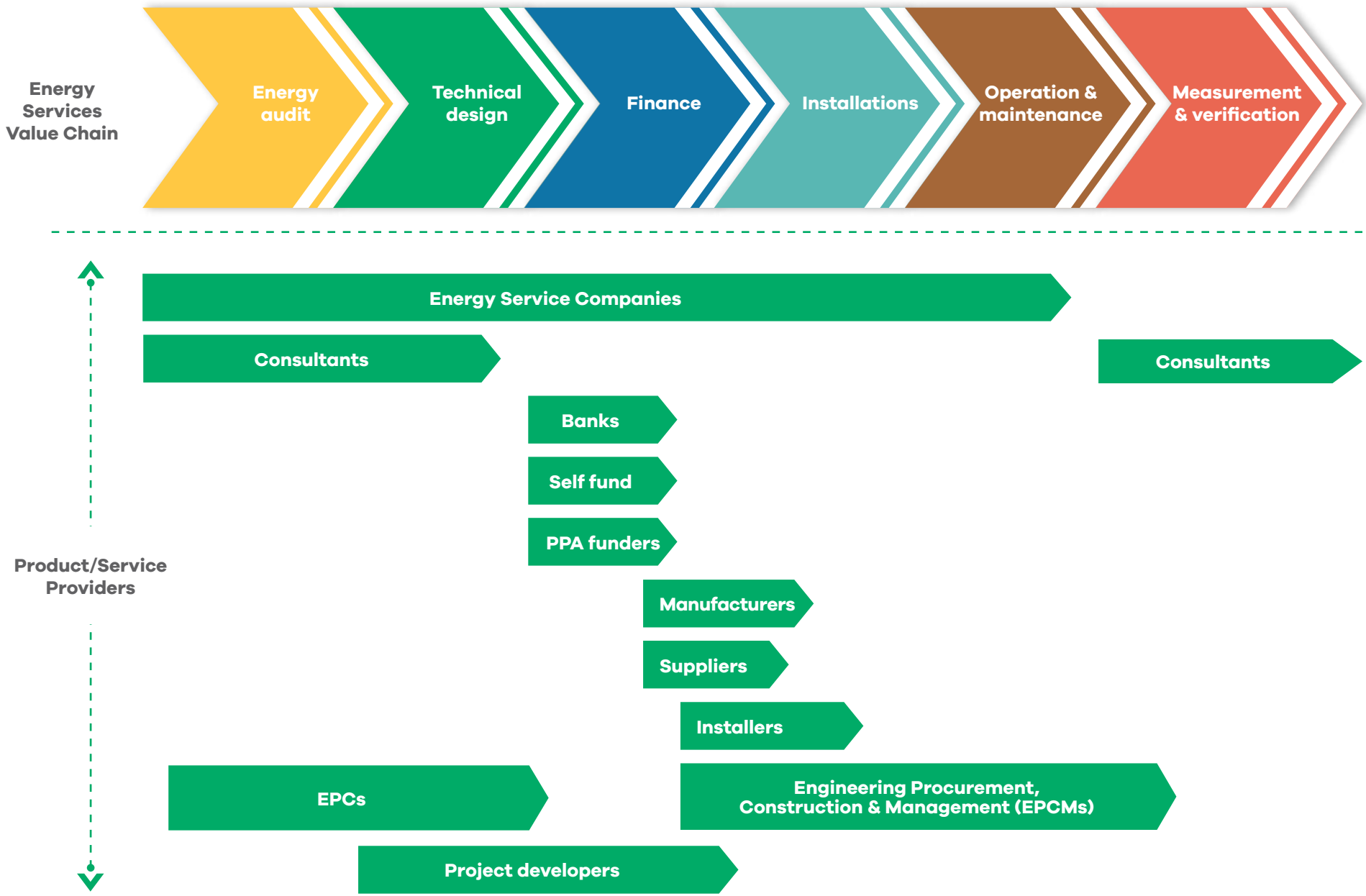


Figure 11: ES market value chain

Table 6: Roles of key players in the ES value chain

Key player	Role
ESCos	ESCos are active across the whole value chain, including measurement and verification, although independent consultants ought to perform this function. There are two generic ESCo-type energy contract models: • **Energy supply contracting** (ESC), which delivers units of energy. • **Energy performance contracting**, which provides energy savings determined by comparison to an established and agreed-upon baseline.
Consultants	Consultants include energy auditors, planning engineers, certified measurement and verification professionals (CMVP), accountants, and lawyers.
Financiers	Financiers provide funding and financing mechanisms to realise projects. • **Project finance** – commercial banks (commercial and asset finance, self-funded individuals (with cash reserves) and PPA financiers (such as private equity funds, debt facilities). • **Funding for ESCos** (not detailed in the diagram) – commercial banks, private equity funds, corporate foundations, private and family foundations, and venture capitalists.
Manufacturers and suppliers	Manufacturers and suppliers include technology suppliers or original equipment manufacturers (OEMs). They manufacture and supply equipment and form part of typical energy efficiency or supply interventions.
Installers	Most energy service companies, EPCs and project developers use specialised installers for both energy efficiency and SSEG (technology-specific).
EPCs	EPCs design interventions, procure and install tailored turnkey energy efficiency and/or RE solutions.
EPCMs	Under an EPCM contract, the owner maintains more control of the project. The contractor manages the construction project, but only under the direction of the owner. With an EPCM contract, the owner is responsible for hiring suppliers, construction workers and other contractors, and the EPCM contractor will manage these contractors.
Project developers	Project developers handle tasks that focus on moving the project along toward successful completion. In the ES value chain, they play more of a business development role as they focus on, for example, project design and procurement but make use of specialised installers.

As with much of SA's green economy, small- and medium-sized enterprises (SMEs) dominate the ES value chain. As the market continues to develop, disruption will be a feature of this nascent economic sector. Adapting to this rapid growth is easier for SMEs as pre-existing corporate structures, and sunk investments do not hamper them. That said, their growth could be stifled by their inability to scale up fast enough to take advantage of opportunities.

2.5. Energy Services market size

Using the total available market for the SSEG (solar rooftop PV systems) installed in the country, energy storage, and capital leveraged in energy efficiency interventions implemented by South African energy users, **SA's total available ES market is valued at ~R131 billion by 2035 with an estimated R35 billion in the WC.**

The total available market is the total untapped demand for a product or service in the ES market. The total available market size detailed in this MIR represents an estimate of the ES market, based on only three of the currently dominant ES market components – small-scale embedded generation (solar PV[15]), energy storage, and energy efficiency. The estimate does not consider smaller technology market segments that are also part of this market sector, such as small-scale wind energy, waste-to-energy, solar thermal, and diesel generators.

2.5.1. SSEG – rooftop solar PV market size

One of the major contributors to growth in the ES market has been the demand for rooftop solar PV. By the end of 2017, there was 387 MWp of installed solar PV rooftop systems throughout SA (CSIR, 2019). In 2021/22, despite intermittently scheduled stages 2-4 COVID-19 lockdown, the market continued to grow.

In 2021/22, it is estimated that the total installed solar PV rooftop systems throughout SA grew from 1.15 GWp to ~1.5 GWp, with between 250 MWp and 400 MWp having been installed in SA in the last 12 months.

The total annual available market should continue to grow at a rate of 300-500 MWp installed per year, reaching a total of 7.5 GW of installed capacity by 2035. **Assuming a cost of R10/Wp, this installed capacity growth represents a total available market of R5 billion a year and a total available market of R75 billion by 2035.** The installation of an additional 500 MWp in one year translates to the potential creation of ~1 250 jobs.

The C&I sectors in SA continue to present the largest near-term opportunity for installations, with a projected ~70% of the total verified systems installed in that sector. The reason for this is two-fold – affordability and need.

The C&I sector generally incurs higher electricity costs for being the highest energy users. The sector also has electricity use profiles that align well with solar PV generation times. Businesses in this sector also often operate from large premises with large roof spaces, which are attractive from an installation point of view. In 2021, the average size of an installation in the C&I sector, considering only those systems <1 MWp, is ~350 kWp.

According to Quantec import data, 400-500 MWp of solar panels have been imported into SA per annum in the past two years. Contributing factors to rates of imports over 2021/22 will be the ramping up of REIPPP projects, post COVID-19 hard lockdowns recovery, global PV prices and ease of flow through logistical ports from Asia.

[15] Currently, the South African SSEG market is dominated by rooftop solar PV, given the competitive price, technical maturity, and ease of implementation of this technology.

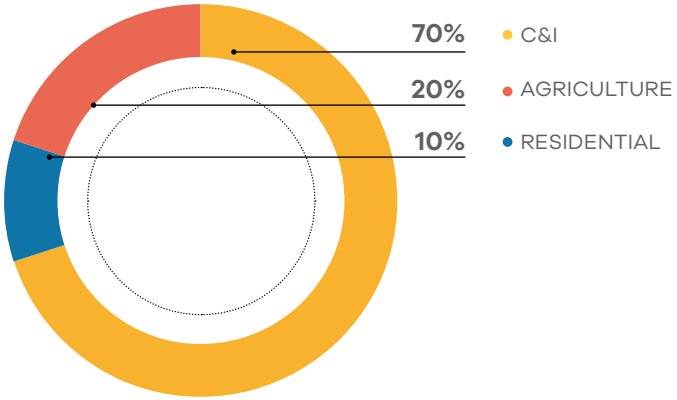


Figure 12: Distribution of solar PV installations across end-user segments in SA

To date, it is estimated that the Western Cape accounts for 25% of the national SSEG rooftop PV footprint, which in 2021 is ~375 MWp – 450 MWp. Assuming a cost of R10/Wp, this installed capacity represents a current national market of between R3.75 billion and R4.5 billion per year. Assuming the national market continues to grow at ~500 MWp per annum by 2030, and the Western Cape maintains at least 20% market share of this growth, the local annual market growth would be ~R1billion.

2.5.2. Energy storage market size

Developments in battery storage technologies are emerging as the latest trends influencing the ES market in the next 5-10 years.

The most promising short duration application (<4hrs) is Li-ion batteries in the agricultural and industrial sectors. Vanadium redox flow batteries (VRFB) are also expected to become a strong medium-long duration application (>4hrs).

However, the development of this segment is still in an early stage in SA. Overall, growth in this space is driven primarily by loadshedding though battery prices are still prohibitively high.

Despite a slowdown in price declines, the global energy storage market is estimated to grow from around 4 GW of annual deployments in 2019 to a total size of more than 15 GW in 2024.

Assuming that 5% of the current installed rooftop solar PV market has installed behind-the-meter energy storage to combat loadshedding (approximately 4 hours of backup storage required) and a cost of R8/Wp, **the current market ranges between R1.5 billion and R2.5 billion**. The potential market will depend on the growth of the solar PV market. Assuming that **by 2035**, 30% of the annually installed solar PV systems have installed behind-the-meter energy storage, **the South African market would be approximately R31 billion with 6.5 GWh installed battery energy capacity.**

The potential market will depend on the growth of the solar PV market. Assuming the Western Cape maintains a 25% market share (as with the rooftop solar PV market), the current market ranges between R375 million and R625 million. Assuming that by 2035, 30% of the annually installed solar PV systems in the Western Cape have installed behind-the-meter energy storage, the provincial storage market would be approximately R7.7 billion with 1.6 GWh installed battery energy capacity.

There are a few companies participating in or considering local LIB assembly. This would mainly be the importation of the Li-ion cells and locally manufacturing the balance of equipment. SA has the availability of the primary resources needed in the manufacturing of the battery in SA and its neighbouring countries, and there is a large opportunity to manufacture locally due to the synergistic development of the electric vehicle market. Recent developments include:

- Geological exploration work will soon restart at the Zebediela nickel project on the northern limb of the Bushveld Complex in Limpopo, South Africa. The Bushveld Complex hosts an estimated 11.9 million tons of nickel and ranks third in terms of nickel sulphide content globally. (Class 1 nickel is sought after for EV lithium-ion batteries, whilst Class 2 nickel is mainly used in nickel pig iron and the steel industry).
- **Metair** will partner with the South African Institute for Advanced Materials Chemistry (SAIAMC), located at the University of the Western Cape (UWC) - which houses the only pilot scale LIB cell assembly facility in Africa - this will see the company invest R3m over three years to pilot a prototype lithium production project from January 2021. Production will focus on mining cap lamp cells, 12V Li-ion automotive batteries, 48V LIBs for energy storage applications, and solar panel recharge technology.
- The **Megamillion Energy Company** intends to be Africa's first large-scale producer of LIBs by launching a pilot Gigafactory in 2020/21.

LINK TO EV MARKET INTELLIGENCE REPORT

- South African company **I-G3N** has successfully raised R20m (US$1.3m) from Edge Growth and the ASISA ESD initiative as part of the Green Outcomes Fund. IG3N (Pty) Ltd is a female-owned manufacturing start-up that assembles LiFePO4 batteries in SA, working towards its mission of providing accessible and affordable clean energy. This investment will help I-G3N meet the increasing demand for high quality, locally made, and trusted battery storage solutions. I-G3N is part of a few LIB manufacturers that serve installers of solar and backup power systems in Southern Africa, with LiFePO4 battery products reported to have the lowest failure rates in the market.
- **Battery Power Industries** have established a key supply chain for battery packs for the mobility market, initially supplying mining but expanding wider outreach into other industries.

2.5.3. Energy efficiency market size

ESCOs are those companies that offer innovative financial models for energy efficiency projects based on achievable energy savings in SA. The industrial and commercial sectors are most attractive to ESCOs, as shown in Figure 13.

On average, energy efficiency projects in SA are relatively small. The average capital cost of a South African ESCo project is under R2 850 000 (NBI, 2016). Commercial financing is not currently viable for small projects such as these. As such, the bundling of these smaller projects can create a more attractive investment pipeline.

Although average project sizes in SA remain small, energy savings remain significant. This is reflected in the National Business Initiative (NBI) findings through its now-discontinued PSEE programme. This programme identified and facilitated the implementation of a sizeable set of energy efficiency opportunities in the private commercial sector between 2013 and 2015, as shown in Table 7.

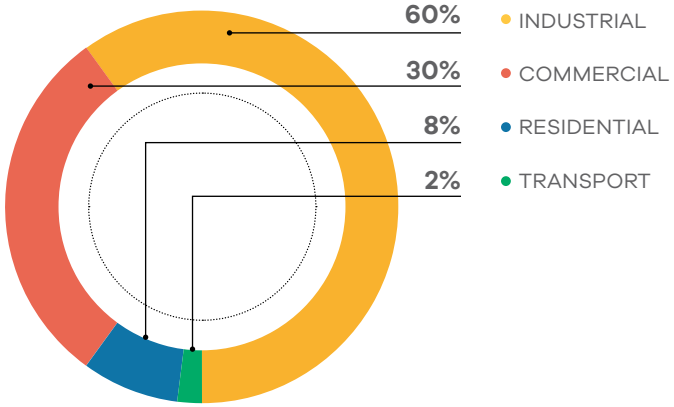


Figure 13: ESCos market for energy efficiency in South Africa

Table 7: Total energy savings opportunities and capital leveraged for small and large businesses identified by the now-discontinued Private Sector Energy Efficiency (PSEE) programme

Source: Adapted from NBI (2016)

Type	Identified	Implemented	Remaining opportunity	The percentage still to be realised
Number of sites	1 103	336	767	70%
Number of opportunities	6 921	796	6 125	88%
Annual energy savings	2 087 GWh	129 GWh	1 958 GWh	94%
Lifetime energy savings	21 896 GWh	646 GWh	21 250 GWh	97%
Lifetime carbon savings	449 $MTCO_2e$	17 $MTCO_2e$	432 $MTCO_2e$	96%
Capital leveraged	R3.5 billion	R69.5 million	R3.4 billion	98%
Average payback of opportunities	2.3 years	0.9 years	–	–
Annual energy usage	5 861 GWh	362 GWh	–	–

The capital leveraged in the PSEE was R69.5 million, which has resulted in 646 GWh of energy savings over the programme period (R0.10/kWh). Table 7 represents a sample of energy end-users and the number of opportunities within the sample that have gone untapped. There is a significant opportunity for further energy efficiency interventions across many economic sectors and businesses – suggesting substantial market opportunities for ES market players.

Compared to the annual electricity consumption in SA, the 2 087 GWh savings identified through the PSEE represents only a small fraction of the potential energy efficiency market. SA's annual energy use in 2021 is ~787.5 TWh, with electricity making up ~208 TWh of this total (IEA, 2021; Enerdata, 2021). Industry is the largest energy consumer, with direct use of coal and coal-based electricity being the major energy sources, as shown in Figure 14 and Figure 15.

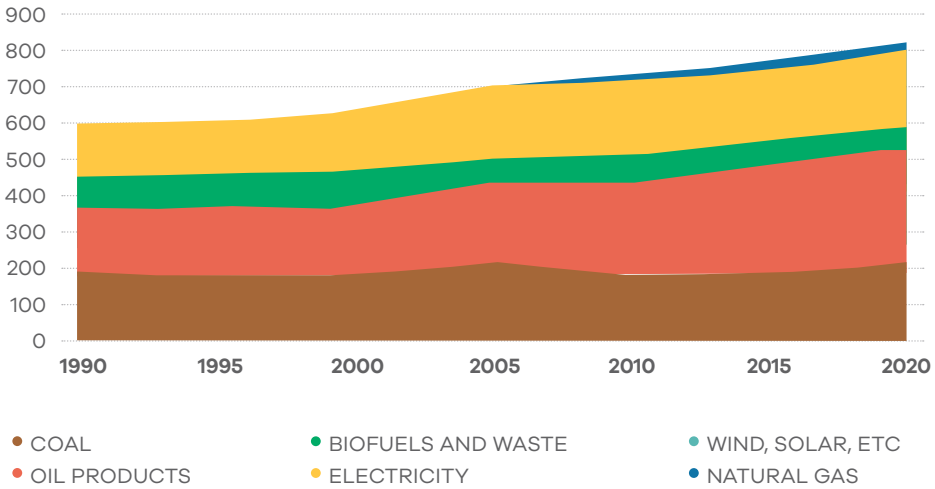


Figure 14: Energy consumption in South Africa by Source (TWh)

Source: IEA 2021, Enerdata 2021

Energy consumption in South Africa was over 800 TWh in 2020. ©Unsplash

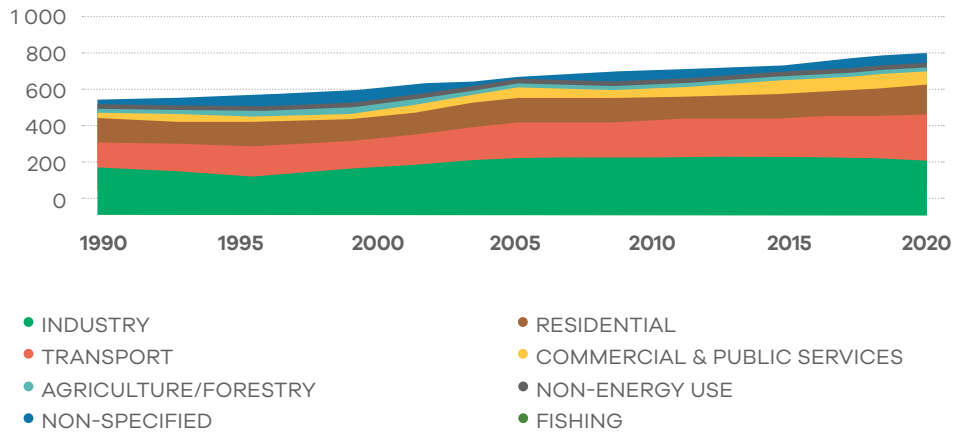


Figure 15: Energy consumption in South Africa by sector (TWh)

Source: IEA 2021, Enerdata 2021

Conservatively assumed, annual energy savings of 15% of total electricity consumption are possible (the PSEE programme findings show 20% to 35%). In that case, potential energy efficiency savings could be as much as 30 TWh. **At a conservative rate of R0.10/kWh, the estimated annual total available market is R3 billion.** GreenCape's most recent market evaluation suggests the total available market size could reach R25 billion by 2035.

As part of the WC three-year Municipal Energy Resilience (MER) programme, a basic analysis was done on the electricity demand within each municipality in the province, as seen in Table 8. Conservatively assumed, annual energy savings of 15% of total electricity demand are possible (the PSEE programme findings show 20% to 35%). In that case, potential energy efficiency savings could be as much as 2.4 TWh. At a conservative rate of R0.10/kWh, the estimated annual total available market is R240 million.

Table 8: Western Cape demand and consumption 2021

#	Municipality	Total annual demand (MWh)	Total Western Cape %	Cumulative %
1	Drakenstein	794 013	4.9%	4.9%
2	George	494 426	3.1%	8.0%
3	Stellenbosch	429 174	2.7%	10.7%
4	Breede Valley	353 989	2.2%	12.9%
5	Langeberg	318 868	2.0%	14.9%
6	Mossel Bay	318 217	2.0%	16.9%
7	Saldanha Bay	266 658	1.7%	18.5%
8	Overstrand	251 968	1.6%	20.1%
9	Witzenberg	212 300	1.3%	21.4%
10	Knysna	202 421	1.3%	22.7%
11	Swartland	202 166	1.3%	23.9%
12	Oudtshoorn	176 121	1.1%	25.0%
13	Bitou	116 309	0.7%	25.7%
14	Hessequa	94 032	0.6%	26.3%
15	Matzikama	87 718	0.5%	26.9%
16	Bergrivier	83 294	0.5%	27.4%
17	Cape Agulhas	77 526	0.5%	27.9%
18	Cederberg	69 812	0.4%	28.3%

Table 8 continued...

#	Municipality	Total annual demand (MWh)	Total Western Cape %	Cumulative %
19	Theewaterskloof	64 494	0.4%	28.7%
20	Beaufort West	62 700	0.4%	29.1%
21	Swellendam	55 902	0.3%	29.5%
22	Kannaland	34 274	0.2%	29.7%
23	Prince Albert	10 043	0.1%	29.7%
24	Laingsburg	8 273	0.1%	29.8%
25	City of Cape Town	11 281 976	70.2%	100.0%
	Total	**16 066 672**	–	–

POLICY, LEGISLATION, AND GOVERNANCE

Several acts, regulations and policies guide the development of the electricity sector, with the main guiding document being the Integrated Resource Plan (IRP) 2019.

Several acts, regulations and policies guide the development of the electricity sector, with the main guiding document being the Integrated Resource Plan (IRP) 2019.
©Adobe Stock

3.1. Governance

National and local government with input from several relevant industry bodies guide the development of the ES sector in South Africa (SA).

3.1.1. National government

Several government departments and institutions guide the development of the ES sector:

- **The DMRE** is the custodian of all energy policies and energy security in SA.
- **The Department of Public Enterprises (DPE)** is responsible for the country's energy infrastructure, primarily for state-owned entities such as Eskom.
- **Eskom** is a state-owned energy utility. It owns most of the electricity generation and transmission infrastructure. It is an essential player in the electricity sector, especially as a delivery vehicle for numerous government programmes.
- **South African National Energy Development Institute (SANEDI)** is responsible for achieving the National Energy Efficiency Strategy (NEES) objectives, the main strategy guiding the uptake of energy efficiency projects in South Africa. SANEDI's primary function is to direct, monitor and conduct applied-energy research, development, demonstration and deployment. It also must undertake specific measures to promote green energy and energy efficiency in SA.
- **NERSA** regulates the electricity sector, with the DMRE as the custodian department. NERSA's main ES related responsibilities are licensing and registrations, pricing and tariffs, promoting competition, compliance monitoring and dispute resolution.

3.1.2. Local government

- **The local (municipal) government** is the arm of government closest to the end-users. Municipalities are responsible for a large portion of electricity distribution in the country.

City of Cape Town Climate Change Strategy

Several local strategic policies are driving change on a metro level.

The City of Cape Town Climate Change Strategy was approved by Council in May 2021. The below quote from the strategy summarises its intent:

"The City of Cape Town Climate Change Strategy is designed to provide high-level strategic guidance for decision making, planning, and programme and project development and implementation regarding climate change. This strategy should be read in conjunction with the city's Climate Change Action Plan, which provides a higher level of detail in specific actions that will be implemented to achieve the vision, desired outcomes and goals of this strategy.

Having a clear climate change strategy in place enables the city to take action to reduce

and prepare for these risks (adaptation) and to take action to pursue high ambition in reducing greenhouse gas (GHG) emissions (mitigation) to approach carbon neutrality by 2050. The strategy also aims to ensure that the co-benefits of climate change adaptation and mitigation – including job creation, improved health, reduced risk, improved energy and water security, and a range of other benefits – are maximised in the implementation of the strategy."

3.1.3. Industry bodies

- **South African Biogas Industry Association (SABIA)** is a non-profit organisation that recognises the potential market for biogas and the need to represent the industry. It facilitates network and information exchange between experts on advancing the field.

- **South African Energy Storage Association (SAESA)** is a non-profit organisation that aims to guide policy to allow for the accessibility of storage projects and advocate and advance the energy storage industry in SA.

- **South African Photovoltaic Industry Association (SAPVIA)** is a not-for-profit organisation that represents the solar PV industry in SA. It aims to ensure that solar PV is the generation technology of choice in SA and the rest of Sub-Saharan Africa supporting the country's socio-economic development targets.

- **South African Wind Energy Association (SAWEA)** is a not-for-profit, member-driven association that aims to enable a commercial wind power industry in SA.[16]

3.2. Legislation and regulation

ERA 4 of 2006 as amended by the Electricity Regulation Amendment Act 28 of 2007 (ERA). These regulations guide the issuance of licences for generators and transmitters, wheelers, and distributors of electricity.

The Amended Schedule 2 of the ERA 4 of 2006 on 5 October 2021, The Amendment serves to increase the threshold for embedded generation from the current 1 MWp to 100MWp without needing a licence.

Under the current South African policy and legal framework, any generation, transmission or distribution facility shall be licensed or registered with NERSA.

There are three stages in the process: Registration, licensing and ministerial determination. Embedded generation with a capacity between 100 kWp and 100 MWp requires registration with NERSA but does not need to be part of a ministerial determination and does not require a generation licence. A breakdown of these requirements can be found in Table 9 below. Essentially, there are three separate concepts to clarify in this process, registration with NERSA; generation licensing with NERSA; and application for connection (distributor registration).

Table 9 details the current NERSA licensing and registration and the connection (distributor registration) application for different SSEG system sizes.

Table 9: Licensing and registration for different system sizes

		<100 kW	100 kW-1 MW
NERSA	Registration	No[17]	Yes
	Licensing	No	No
Municipality/ Eskom	Application for connection	Yes	Yes

[16] This association tends to be of greater relevance for utility scale renewables but is retained here for completeness with regards to energy sector as a whole.

[17] For this to be true, there must be an existing point of connection, the local distribution utility must keep a register of such installations and the local distribution utility must prescribe the conditions for connection.

Table 10 details the generation facilities of between 100 kW and 1 MW that require registration with NERSA and an application for connection (Distributor/Transmission utility) as per the Amended Schedule 2 of the ERA 4 of 2006 on 5 October 2021.

Table 10: Licensing and registration for different system types

	System types	Application for connection	Registration	Licensing
1	Generation facilities that only provide standby or backup electricity for the duration of a blackout (no size limit and with or without storage).	Yes	No	No
2	Generation facilities that do not have a point of connection with the distribution (no size limit and with or without storage).	Yes	No	No
3	Generation facilities smaller than 100 kW.	Yes	No	No
4	Non-wheeling facilities of no more than 1 MW: • located close to or adjacent to the end-user customer or purchaser of the energy where there is import and export at the same point of supply (otherwise known as net-metering). • Connect "behind the meter" (the generation facility connects and feeds energy within the purchaser's connection infrastructure). • Do not use the transmission or distribution systems to convey energy to the purchaser's system.	Yes	Yes	No
5	Wheeling and trading facilities[18] • situated away from the purchaser, with wheeling arrangements in place to convey the electricity to a purchaser through the transmission and/or distribution system. The generator or owner of the facility must have a connection agreement with the relevant distributor or the transmission company.	Yes	Yes	No
6	Generation facilities for demonstration purposes have no point of grid connection and will only be in operation for less than 36 months.	Yes	Yes	No

[18] Cannot charge customers more than they would have paid through another provider and must have entered into service delivery agreement or similar agreement that regulates the relationship between the trader and the distribution or transmission utility.

Legally, the registration and licensing of embedded generation rests with NERSA and not municipalities. Regulation is an administrative activity, and NERSA has developed the applicable procedures. Nonetheless, there is still confusion around application for registration (to NERSA) and application for connection (to the electricity distributor).

Wheeling & Energy Trading Licences: The development of wheeling frameworks and the issuing of energy trading licenses is opening up space for an increasingly distributed electricity market. NERSA-issued energy trading licenses authorise the trading of power anywhere in SA, enabling the procurement of electricity generated from renewable resources and sale directly to customers. The licence provides for the use of the national transmission & distribution network managed by Eskom but requires additional permission to use any municipal network.

National Energy Act 34 of 2008: The National Energy Act was promulgated to ensure that diverse energy resources are available to the South African economy in sustainable quantities and at affordable prices to support economic growth and poverty alleviation. The Act takes into account environmental management requirements and interactions among economic sectors. It provides for developing the Integrated Energy Plan (IEP) and the formation of the South African National Energy Development Institute (SANEDI).

National Energy Efficiency Strategy (NEES) 2005, 2008, post-2015: The aim of the original NEES (2005) was 'to explore the potential for improved energy utilisation through reducing the nation's energy intensity (thus reducing greenhouse gas emissions) and decoupling economic growth from energy demand' (Modise, 2013) by achieving overall sectoral energy intensity reduction targets of 12% by 2015. In 2008 and 2011, the NEES was reviewed to discuss its scope and elements.

This updated strategy document builds on the original NEES. It is framed to complement the policies and strategies put forward by other national departments. The draft document was published for public comment in December 2016 but has not yet been finalised.

South African National Building Regulations SANS 10400-XA: 2011 Energy usage in buildings is being replaced with a revised version introducing tighter requirements of the energy performance components of building standards for public, commercial and residential building sectors. It is expected that the required performance level in SANS 10400-XA will be increased to the voluntary SANS 204 standards for buildings.

SANS 10142-1-2 DC wiring code will be posted by early 2022. This will allow electricians to issue a Certificate of Compliance (COC) for the DC side of an SSEG installation. In the past, professionally registered engineers needed to sign off installation to ensure compliance.

Energy mandatory reporting 2015: The Department of Energy (DoE) published draft Regulations regarding Registration, Reporting on Energy Management and Submission of Energy Management Plans in March 2015. The threshold for the submission of energy management plans is set at 400 000 Gigajoules total energy consumption per year. Companies will have to demonstrate efficiency improvements through the energy management plans. Additionally, as part of the DMRE's Energy Efficient Monitoring System (EEMS) to track efficient consumption of energy within SA and the trends involved, it is mandatory for all energy users consuming over 180 TJ per year to submit their energy consumption data to the DMRE. Companies using 400 TJ or more per year are required to submit a detailed energy management plan. The reporting requirement applies to all forms of energy.

Municipal Energy Efficiency and Demand Side Management (EEDSM) Programme: The DoE provides selected municipalities with grants for the planning and implementation of energy efficiency projects across their public infrastructure. Typical technology categories include traffic, street lighting and water service infrastructure (pumps).

Energy Performance Certificates: As published in the Government Gazette on 8 December 2020, Energy Performance Certificates are now mandatory for the private sector, non-residential buildings with a total net floor area of over 2 000sqm, and government buildings of over 1 000sqm. The certificates must be displayed at the building's main entrance and submitted to the SANEDI. With the law now in effect, building owners are required to obtain an EPC within two years. As of December 2021, there are only four South African National Accreditation Systems (SANAS) accredited EPCs who will need to service the ~200k building requiring evaluation in this time period.

The Carbon Tax Act, No. 15 of 2019 was gazetted in May 2019 and came into effect on 01 June 2019. The carbon tax will be applied over two phases: Phase 1 will be from 01 June 2019 to 31 December 2022, and phase 2 will be from 2023 to 2030. Phase 1 will not have an impact on electricity prices. The carbon tax rate will be imposed at an amount of R120 per tonne of carbon dioxide equivalent (tCO_2e) emitted. However, taking the tax-free thresholds into account, this rate will range closer to R6 and R48 per tCO_2e. This rate will increase by CPI +2% per year until 31 December 2022. The Act has assumed a 'polluter pays' principle to the tax. This relatively low tax rate and range of tax-free allowances in Phase 1 are designed to incentivise large emitters to transit to a low carbon profile before Phase 2. Once the tax results have been reviewed at the end of Phase 1, changes to rates and tax-free thresholds will be applied before the next phase begins. This would especially affect businesses with high fuel and electricity consumption.

The impact of the carbon tax on the uptake of solar and other renewable forms of energy (which present a great case for carbon offsetting) is still to be determined and will be monitored.

Nationally Determined Contributions under the Paris Agreement: SA submitted its first **NDC** on 1 November 2016, outlining its pledge to transition to a lower-carbon economy. The NDC covers adaptation, mitigation as well as finance and investment requirements and is based on equity. In March 2021, SA launched its updated draft of the NDC for public consultation. The finalised targets indicate SA intends to limit GHG emissions to 398-510 MtCO2e by 2025, and to 350-420 MtCO2e by 2030, significantly lower than the mitigation targets communicated in 2016. These new targets will also see SA's emissions decline in absolute terms from 2025, a decade earlier than planned.

3.3. Policy and white papers

White Paper on Energy Policy of 1998: This paper identifies the need for energy demand-side management and the promotion of energy efficiency in SA. Appropriate and supportive energy policies are required to attain the energy efficiency and conservation targets embodied in the IRP framework, detailed below. The white paper effectively supports the national DMRE's mandate to ensure safe and sustainable energy provision for socio-economic development by suggesting that it pursue energy efficiency programmes as one of the lowest cost options for reducing energy consumption.

White Paper on Renewable Energy 2003: A policy document that laid the early foundation for the promotion of RE technologies such as solar, hydro, biomass and wind in SA. It set a ten-year target for the inclusion of RE technologies into the national grid thereby leading to a cleaner and more diversified energy mix. The objectives of the White Paper on RE of 2003 were to:

- Ensure that an equitable level of national resources was invested in renewable technologies;
- direct public resources to implementation of RE technologies;
- introduce suitable fiscal incentives for RE and;
- create an investment climate for the development of the RE sector.

Integrated Energy Plan (IEP) 2016: The IEP guides the country's broader energy needs. The IEP was developed in terms of the National Energy Act of 2008. The plan seeks to ensure diversity of energy supply and security by combining the objectives of the country's climate change, energy supply, and energy demand plans and aspirations. The latest draft IEP was released in November 2016 for public comment by March 2017. An updated energy plan is yet to be published at the time of writing.

The primary difference between the IEP and the IRP is that the IRP focuses on electricity, its supply, and NERSA's ability to grant licences. At the same time, the IEP considers the whole energy sector and the implication of different prices.

Integrated Resource Plan (IRP) 2019: First promulgated in 2011, the IRP guides electricity provision in SA. Its custodian is the DMRE. The IRP, a living document that the DMRE is to update every two years, is developed in the context of the IEP. The IRP provides 1) an overall plan indicating the quantities of various electricity sources to meet the country's electricity demand in the next 20 years (the typical planning horizon) and 2) guidance for future energy infrastructure investments. Thus, it largely determines the country's generation mix. After several iterations and a long wait, the IRP 2019 was gazetted in October 2019.

4

MARKET OPPORTUNITIES, DRIVERS AND BARRIERS

The evolving South African energy landscape creates opportunities for investors, financiers, project developers, component manufacturers and suppliers in the small scale embedded generation and energy efficiency markets.

The following market opportunities have been identified through engagement with an array of ES and green economy stakeholders. Each opportunity is outlined in greater detail in the sub-sections that follow. A brief overview is provided in **Table 11**.

Table 11: Energy Services opportunities

Energy services sector	Emerging opportunities in 2021/22
Small-scale embedded generation	**Solar Installations (C&I / Agri) (<1 MWp Own Use):** A strong business case continues to drive the growth and footprint of solar PV within the C&I and agricultural sectors. There are a range of sub-opportunities which can be targeted on a standalone basis or in conjunction with project development. These include: • Standardised contracts and systems. • Solar PPAs. • Project bundling for an aggregate investment. • Targeting property corporates for energy resale. • Installation contracting. • O&M-only contract rebuys.
Energy storage	**BTM battery storage back-up and uninterruptible power supply (UPS):** The need for energy independence and resilience in light of ongoing load shedding is driving demand in backup power and UPS applications, particularly in commercial, industrial and agricultural applications where the opportunity costs of energy insecurity are high. This opportunity is still small due to the prohibitive cost of batteries, though it is expected to grow significantly as Li-ion prices continue to decrease over the next 5-10 years.
Energy efficiency	**Smart metering coupled with ESCO Model (C&I / Agri):** Developing smart metering technologies and increasing awareness of the opportunity to reduce commercial, industrial and agricultural bills and improve revenue collection has resulted in growing penetration of smart meters over standard prepaid meters in municipalities. ESCos are now focusing on supplementing meters with user-friendly interfaces such as mobile applications that optimise the intervention through AI and indicate behavioural changes needed to sustain savings. **CaaS (C&I / Agri):** Refrigeration and cooling account for a significant portion of the energy requirements for many commercial and retail businesses. There is significant potential for energy savings of 15-35% through replacing older, end-of-life plants with bespoke and holistically designed systems. A key to the significant cost savings potential of CaaS is the guaranteed optimised operating energy performance, as this plays a greater role than capital and maintenance costs in the overall lifecycle of the refrigeration system. There are very few service providers with the required skills and expertise operating in this market in SA. Given its high demand in key economic sectors, this is a highly attractive opportunity for new entrants and investors.

4.1. Small-scale embedded generation – Solar installations (C&I/Agri) (<1 MWp own use)

A strong business case continues to drive the growth and footprint of solar PV within the commercial, industrial and agricultural sectors. Increasing maturity over the past few years has led to a concentration of projects in the 500 kWp – 1 MWp range amongst a handful of market players with strong reputations. Many of these developers and EPCs have now diverted part of their attention and capacity to the >1 MWp space, which opened up by lifting the generation licence threshold to 100 MW. The potential market is thus now much larger for service providers and investors to participate and achieve reliable pipelines for feasible return. The other major driver for this market is the diversity of promising sub-opportunities targeted on a standalone basis or in conjunction with project development. These promising sub-opportunities include:

- **Standardised contracts and systems**
  The standardised contracting of projects in a portfolio and the use of commercially available off-the-shelf (COTS) systems can help project developers reduce the transactional costs of each project. The off-taker, technology, and commercial risks can be spread across the portfolio. This unlocks improved market lending rates for the end consumer and stimulate an untapped market section.

- **Solar Power Purchase Agreement (PPAs)**
  A PPA is a contract between a generator of electricity and a buyer to purchase electricity (whether physically or notionally) at a pre-agreed price which for the C&I sector is usually 40% less than the municipal tariff; and for a pre-agreed period – typically between 10-20 years with lower terms resulting in higher PPA rates. In this arrangement, the generator maintains ownership of the asset and ensures optimum performance and maintenance, recovering the cost at a premium in the provided tariff.

  From 2020, the COVID-19 economic lockdown has increased the prevalence of PPAs as businesses were forced to take a more conservative approach with their balance sheets. It is estimated that PPAs now account for 30-40% of new C&I rooftop PV projects. This will continue to increase as customer confidence grows.

- **Project bundling for an aggregate investment**
  Bundling smaller rooftop PV projects together creates a scale where they become attractive to investors. This "bundling" can occur before projects are built as a pipeline strategy or be a refinancing driver post-construction.

- **Targeting property corporates for energy resale**
  In traditional resale, property development owners (residential estates or shopping malls, for example) can benefit from bulk electricity discounted from municipalities and sell it to their tenants at the retail rate instead of the potentially less preferential individual unit tariffs.

  Similarly, the property developer can install a solar PV system, benefiting from a reduced PPA rate. The developer can then 'on-sell' the electricity generated by the PV system to tenants at a rate equivalent to the higher residential or commercial tariff, depending on the development.

- **Installation contracting**
  Partnering with EPCs who prefer to finance and focus on developing projects pre-installation than deliver the on-site construction and supervision of teams. The barrier to entry to train workers is relatively low, and large installed workforces can be scaled quickly around a relatively small number of supervising professional engineers. The DC wiring code once published will further add to the feasibility of this opportunity as it will remove the costly requirement of an Engineering Council of South Africa qualified professional engineer (ECSA Pr Eng.) to sign-off on the regulatory safety compliance of PV systems, in favour of a much more feasible route via an electrician issuing a Certificate of Compliance (CoC).

- **Operations & Maintenance-only contract rebuys**
  Partnering at the post-installation stage with EPCs who prefer to finance and focus on developing projects by taking over the O&M contracts to continue the O&M in their name and carry their brand. Considering that O&M contracts typically get renewed every two to five years (dependent on the project), this creates considerable opportunities over the next 5 to 10 years.

Additionally, SA, particularly the WC, is seen as a strong strategic foothold for developing projects throughout the country and into the broader South African Development Community (SADC) region. Many EPCs and developers have taken this approach due to the province's leading progress in developing enabling SSEG municipal processes, a large agricultural demand base, and increasing sub-contracting pipeline phases post-project development.

It is estimated that the Western Cape accounts for 25-30% of the national SSEG footprint, which in 2021 is ~375-450 MWp.

Table 12: Barriers and drivers of the solar Installations C&I / Agri (<1 MWp own use) opportunity

Drivers	Barriers
An increasingly strong business case makes investment decisions attractive for energy users who prioritise long-term resilience to rising electricity tariffs.	**Installations of poorly designed, sub-par systems.** Partially mitigated by the PV Green Card, but poor quality still a risk, particularly on smaller projects.
The raising of embedded generation license threshold has decreased the level of competition on 150-500 kWp projects as many established market players are shifting capacity to larger projects.	**Regulatory certainty** as the sector is still adapting to the most recent developments in municipal processes, system registration and wheeling.
Access to finance has been unlocked with commercial banks dedicating specific portfolios to supporting SSEG projects.	**Tariff uncertainty** as municipalities have the ability to change or remove feed-in-tariffs on an annual basis which makes long term projections difficult.
Zero capital options such as PPAs make PV accessible energy users which may be particularly cash-constrained in the COVID-19 recovery period.	–

4.2. Energy storage – behind-the-meter battery storage back-up and uninterruptible power supply (UPS)

There are several technologies making in-roads in the South African back-up energy storage sector. Li-ion and lead-acid battery technologies (See **Table 13**) are the most tried and tested.

They remain the leaders in this market, with the former being a dominant choice due to its short duration performance, slower charging times, and proven operational stability.

There has been an 82% decrease in the cost of LIBs since 2012 and there are further indications for continuing this trend due to improvements in technology, manufacturing, and the scale shows promise (See **Figure 16**).

Table 13: Battery technology comparison

(Source: GreenCape Analysis)

Technology	Efficiency	Lifetime (yr)	Energy Density (Wh/l)	Discharge Time
Compressed air	50-80%	20-40	2-6	2hr – 24hr+
Lead-acid	70-85%	3-5	30-50	1min - 8hr
Li-ion battery	85-95%	10-15	200-400	1min - 8hr
Sodium Sulphur	80-90%	10-15	150-250	sec - 8hr
Flow battery	75-90%	10-20	20-70	sec - 10hr

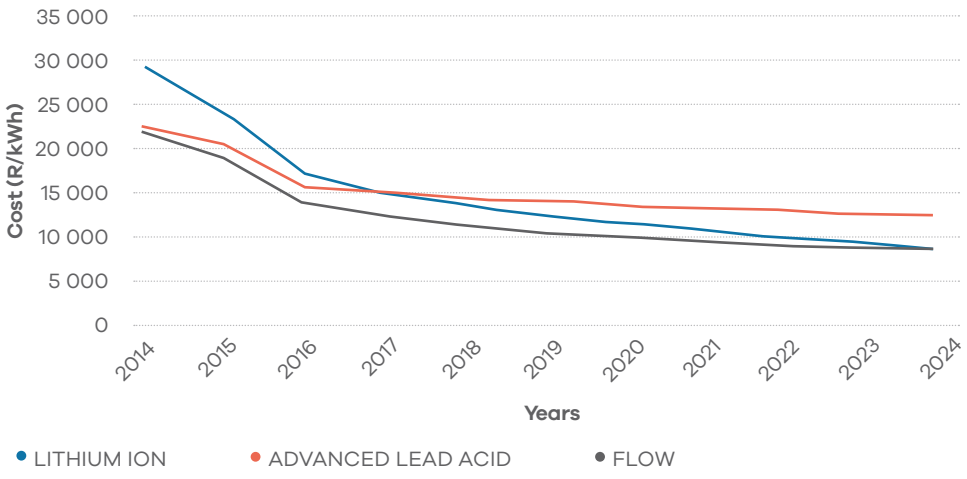


Figure 16: Behind-the-meter energy storage cost projections per technology 2014-24

Source: Adapted from IFC (2017a)

However, the market's growth remains constrained by prohibitive costs compared to diesel generators, typically at approximately three times the levelized cost per kWh.

Table 14: Cost Comparison of Li-ion vs diesel generator in 2021

(Source: GreenCape)

Technology	Pros	Cons	Cost Range R/kWh
Lithium-Ion[19]	Low operating and maintenance cost.	High upfront cost. Recharge time. The lifespan of 3500 cycles (10 years depending on use).	R 4 000 – R10 000
Diesel Generator	Higher energy density – 27x Li-ion. The lifespan of 20 000 hrs (20 yrs depending on use).	Rising diesel prices. Chance of breakdown. Potential carbon tax on emissions.	R2 500 – R3 000

[19] Battery lifetime and resulting replacement costs are highly dependent on the nature of usage

Applications in SSEG systems has thus been limited to scenarios where the customer is willing to pay a premium driven by motivations such as the long-term carbon tax implications of generator use, or the loadshedding opportunity costs associated with the spoilage of products/crops, or long downtimes for manufacturing production lines. Alternatively, installers are still more likely to opt for PV-diesel or PV-diesel-battery hybrid designs to provide greater flexibility and optimise on costs per kWh. Notably, as uptake increases and EPCs move to capitalise on a potential new market segment, there have been growing pains in bridging the gap of additional technical expertise to deal with the complexity of designs compared to a conventional grid-tied PV system or diesel backup system.

Communication of proper system use, and monitoring is also a key success factor in ensuring maximum performance and return on investment.

It is predicted that **penetration will accelerate in the long-term (5-10 years) when Li-ion prices have dropped past a tipping point against time-of-use tariffs** allowing **numerous value stacking options** such as peak reduction and arbitrage to **become economically viable.**

- **Value Stacking:** The ability to leverage the same equipment, system, or process to deliver multiple benefits that maximise the financial impact.
- **Peak Reduction:** The battery storage unit is charged at low power usage levels and discharged at times of high-power levels. The aim is to reduce the maximum peak power consumption: the resulting power price is reduced, and electricity costs are reduced.
- **Peak Arbitrage:** The battery storage unit is charged during off-peak periods and discharged during peaks to take advantage of the tariff difference.

Table 15: Barriers and drivers of the BTM storage opportunity

Drivers	Barriers
Loadshedding has created the need for the provision of backup power in the commercial, industrial and agricultural sectors to ensure the security and resilience of the power supply against the cost of disruption.	**Diesel generators** can currently perform the same function at three times less cost per kWh.
BTM battery prices have declined considerably.	**High upfront costs** still limit market growth; this can be countered by focused financing mechanisms, e.g. tariff structures, incentives or battery-specific lease agreements (PPAs).
The carbon tax will be an increasingly relevant cost implication for agricultural & industrial diesel generator use over the next decade.	**Value stacking options** are not yet economically viable given the relative cost of storage to time-of-use (TOU) tariffs.
–	**Rules and regulations** for behind-the-meter energy storage are still in a nascent stage.

4.3. Energy efficiency in the commercial and industrial (C&I) and agricultural sectors

Energy service companies (ESCos) deliver energy efficiency as a service that is financed based on energy savings. Given the need to increase financing rapidly and significantly for energy efficiency, interest in this model continues to grow.

The greatest need and interest is from commercial and agriculture projects, with larger industrial-scale projects covering 30% of the market (NBI, 2016), as seen in Figure 17.

Financing these projects is a major barrier for most small-medium sized ESCos.

According to the Alliance for an Energy-Efficient Economy (AEEE) and Bureau of Energy Efficiency (BEE), in SA, the average project size is relatively small. In addition, half of all projects fall in the small-medium sized range (R3-8 million capital cost – **Figure 19**). The **12L tax rebate** run by SANEDI aims to incentivise EE projects by providing 95c/kWh saved as demonstrated over a baseline 12 month period measured by a SANAS accredited Measurement and Verification (M&V) Body which assigns an M&V professional. In an April 2020 press release, SANEDI stated through the 12L tax Incentive, they delivered more than 24 TWh in energy savings which equates to a total gross rebate of R19.9 billion to South African taxpayers since November 2013. It is however difficult for small-medium sized projects to take advantage of the 12L tax incentive due to the lengthy and cost-prohibitive measurement and verification process, which squeezes out both client interest and returns.

Figure 18 details the average capital cost of energy efficiency projects in South Africa.

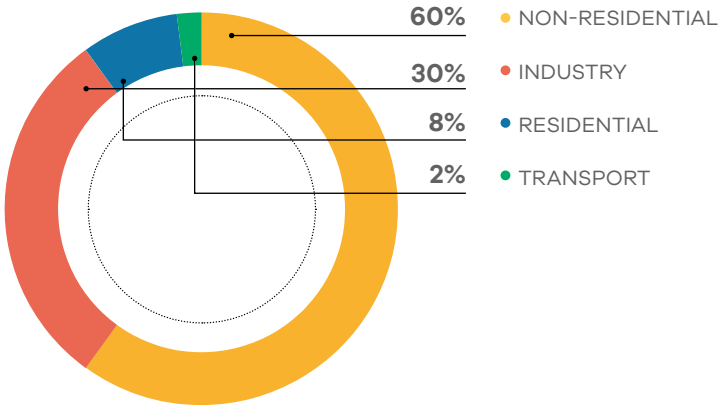


Figure 17: Distribution of energy efficiency projects by sector in South Africa

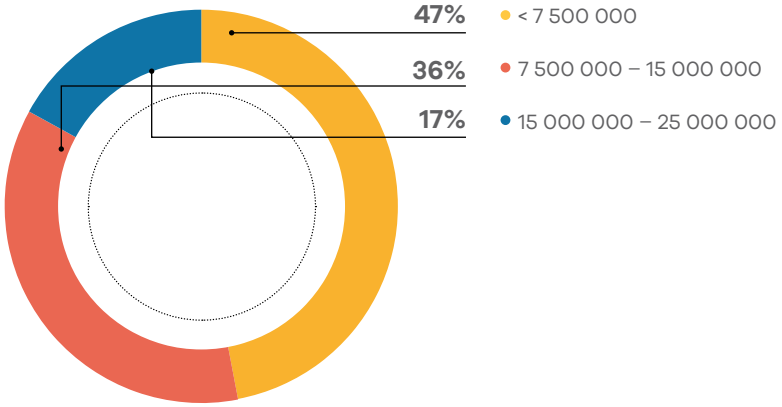


Figure 18: Average capital cost of energy efficiency projects in South Africa

Source: NBI, 2016

Still, over the past three years, commercial banks have gained experience in understanding the low-risk profile of EE projects and have extended their financing options to support both small and large projects. The implementation of green bonds and concessional loans are also being explored in the market after being identified through a series of industry-wide SANEDI / World Bank workshops in 2021 – *Development of Sustainable Financing Mechanisms for Demand-Side Energy Efficiency Market Transformation in South Africa, as having the most catalytic potential to overcome the existing financing barriers.*

4.3.1. ESCO model coupled with smart metering

The ramping up of electricity tariffs has spurred the transition towards smart meters, which empower energy users by providing real-time electronic monitoring and billing of consumption data. The fastest-growing segment has been the residential sector, though willingness is not widespread due to privacy concerns.

This is followed by commercial buildings (hotels, residential lodges, shopping complexes, offices) and industrial processing plants.

Greater demand-side awareness and transparency also encourages load reductions during peak hours and reduces strain on the grid. While smart meters are still tagged with deterring upfront capital costs, affordability will improve with further development in the technology and wider penetration. Another key driver is enabling municipalities to improve grid reliability, billing collection, credit control and minimise theft by offering real-time alerts. However, municipal-wide implementation would require significant coordination and investment from the municipalities for.

The Smart Grid Vision 2030 initiative laid down by SANEDI as a part of the South African Smart Grid Initiative (SASGI) is anticipated to enhance the demand for smart electricity meters in South African cities. The Smart Grid Readiness Test initiated by SANEDI assists municipalities in assessing their readiness for investing in a smart grid network. The programme has resulted in the large-scale rollouts of smart meters across the City of Tshwane, Nelson Mandela Bay and Johannesburg.

ESCos have been educating their target market on the opportunity and difficulty in securing consistent EE projects of a medium-large size (>R 3 million) to absorb operational costs such as contracting and project risks that have led to tight margins.

Energy-efficient lighting projects are a common example of low-hanging fruit value that might not get off the ground without sufficient scale. As a result, the opportunities in this market have moved towards longer-term "energy-as-a-service" offerings where savings are shared. ESCos are now focusing on supplementing meters with user-friendly interfaces such as mobile applications that optimise the intervention through artificial intelligence (AI) and indicate behavioural changes needed to sustain savings. Aggregated loads such as water heating on commercial properties are also being targeted to reach bigger project scales. This coincides with developments in the national market for resource-efficient green buildings, which has grown exponentially since 2010 and is expected to be valued at R13.6 billion by 2030 (IFC 2017b).

To date, more than 400 buildings have been certified by the Green Building Council in SA across its various categories, saving ~600 million kWh of energy per year (GBCSA, 2021). New buildings only make up ~5% of total buildings in SA, and retrofitting existing buildings is expected to continue as the largest sector within the green building industry in 2022.

Market-wide feasibility summaries for commercially available energy efficiency technologies provided by ESCos in SA are provided in **Figure 19** & **Figure 20** (SANEDI, 2021). This information is an aggregate of national project data with the aim of directing investment into feasible EE technologies.

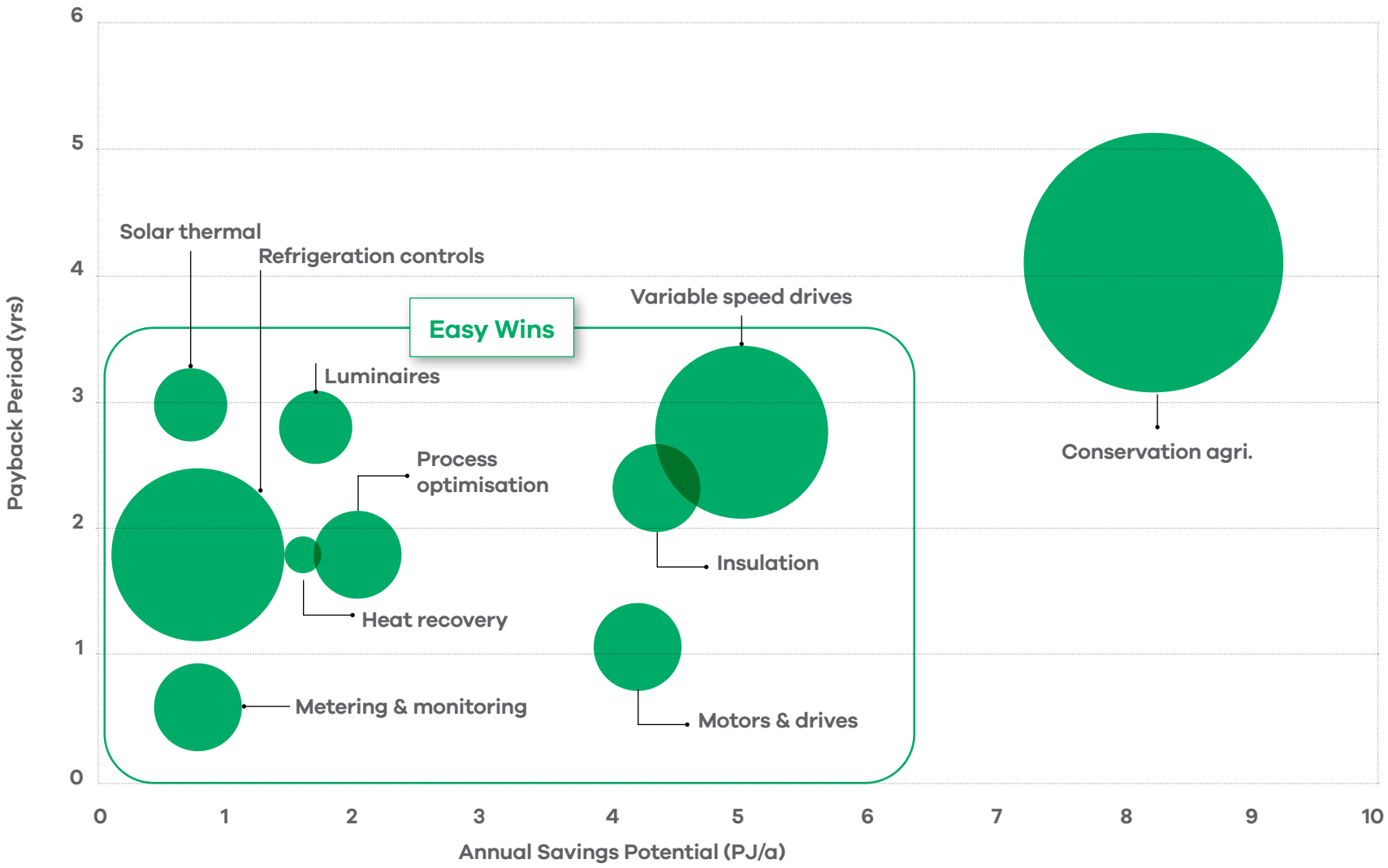


Figure 19: Feasibility efficiency technologies for agriculture sector

Source: SANEDI, 2021

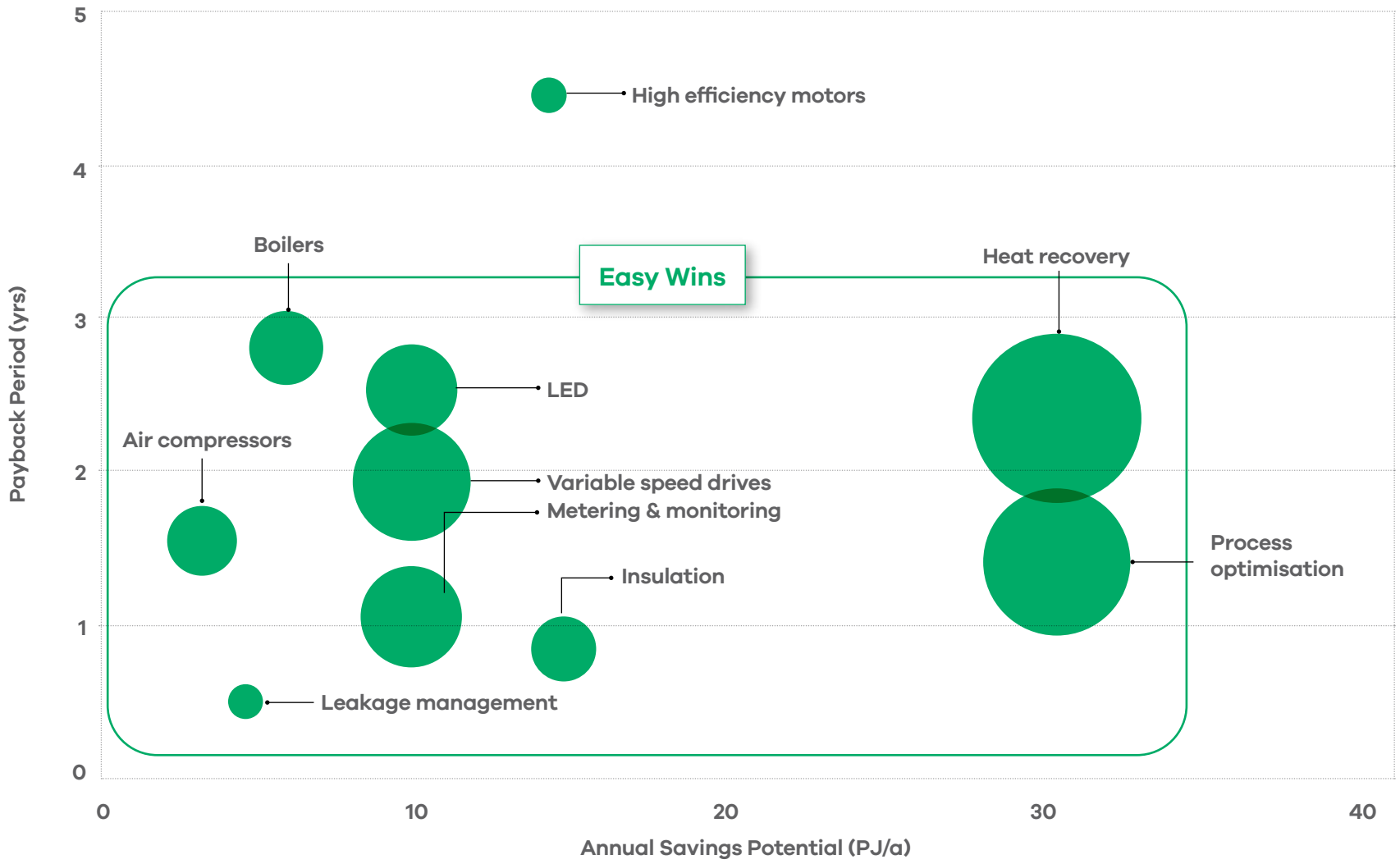


Figure 20: Feasibility efficiency technologies for the C&I sectors

Source: SANEDI, 2021

Table 16: Barriers and drivers of smart metering coupled with ESCO Model C&I / Agri

Drivers	Barriers
The need for consumption monitoring and bill reduction is leading to uptake of smart meter integrated systems on the savings sharing model.	A large portion of energy users still show an **unwillingness to transition from standard prepaid meters** and may have concerns regarding privacy.
Rising electricity tariffs and complex time-of-use tariffs are driving energy users towards solutions that increase the transparency of their utility bill.	**Recession and COVID-19 economic downturn** have decreased the appetite of the residential and commercial market to engage in EE investments.
Allowing C&I users to reduce and manage their **carbon tax** contributors.	**Limited Access to finance** for small-medium sized projects.
Standardized regulations for smart meters have been published (NRS 049), providing regulatory certainty.	**Cost prohibitive and lengthy M&V process** makes 12L inaccessible for small-medium sized projects.
Municipalities are supportive of the current private sector-led transition due to the greater level of grid reliability and revenue collection possible, without the need to commit significant investment.	Industrial sector **staff members are hesitant as EE interventions and metering disrupts what they see as business as usual.**
A wide array of well-established technologies is available in the market to achieve desired savings.	–

4.3.2. Cooling-as-a-service

Refrigeration and cooling account for a significant portion of the energy requirements for many commercial and retail businesses. There is significant potential for energy savings of 15-35% through replacing older, end-of-life plants with bespoke and holistically designed systems. Yet, due to the technical complexity, investments in these systems are often perceived as grudge buys as retailers are hesitant to take on the maintenance and performance risks and costs of these systems. This no longer needs to be a barrier, as the CaaS model ensures performance and reliability at a reduced cost over a long-fixed term.

CaaS involves building and business owners paying for the cooling service instead of investing in the infrastructure that delivers the cooling. The technology provider owns the cooling system, maintains it, and covers all operational costs, including electricity.

The periodic payments made by the customer are fixed-cost-per-unit and based on metered usage, whereby the client does not bear any risk related to the performance of the cooling equipment, and the technology provider has the incentive to install the equipment offering the lowest life cycle cost to make the service more cost-effective. The clients benefit from high-quality cooling at better prices and do not need to divert any budget into acquiring the system. Technology providers benefit from a continuous income stream and can establish long-term relationships with their clients.

The technology providers can be recapitalised by banks and other investors through innovative mechanisms like sale-leaseback or dedicated special purpose vehicle (SPV) structures. In the sale-leaseback mechanism, the provider sells the equipment to the bank and leases it back for the duration of the CaaS contract, with the CaaS contracts serving as collateral. Applicable payment guarantees, reducing the default risk to which technology providers are exposed, can be endorsed to the bank.

CLICK TO VIEW THE CAAS SUMMIT INITIATIVE

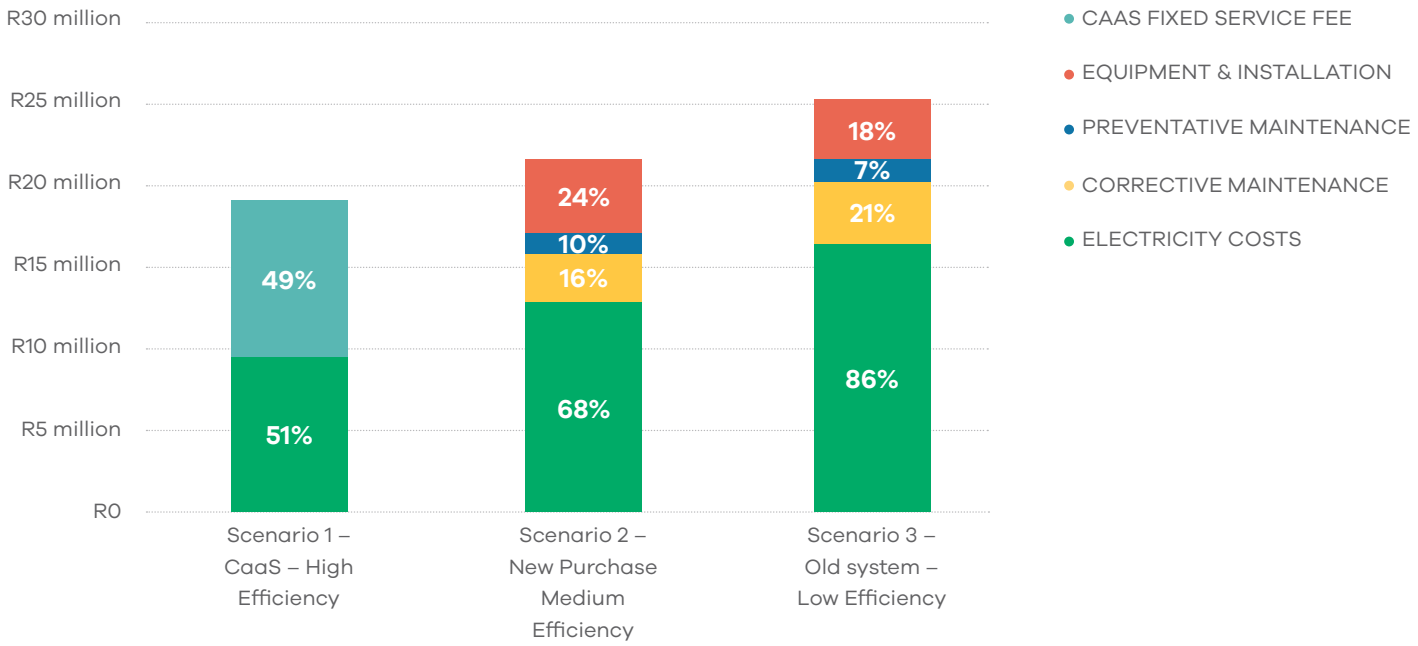


Figure 21: Illustrative savings in CaaS model for a supermarket

Source: GreenCape, 2021

A key to the significant cost savings potential of CaaS is the guaranteed optimised energy performance as this plays a greater role than capital and maintenance costs in the overall project lifecycle of the refrigeration system as depicted in a real scenario in **Figure 21**:

There are only a handful of companies operating in this space in SA despite increasing awareness and demand for the benefits of this intervention. The estimated currently served market of 160 MW is likely only a small fraction of the overall potential conservatively estimated to be 5 GW in the Western Cape and 25-30 GW nationally.

CLICK TO VIEW THE CASE STUDY

Table 17: Barriers and drivers of the CaaS opportunity

Drivers	Barriers
Rising electricity tariffs as cooling makes up a significant portion of total energy costs of many commercial, industrial and agricultural operations.	**A high level of technical expertise is required** to realise bankable savings over the project term.
Unreliability of older refrigeration systems leading to the risk of product spoilage, stock losses and reputational damage which can be reduced through **improved refrigeration system reliability.**	**Recession and Covid-19 economic downturn** have decreased the appetite of the residential and commercial market to engage in EE investments.
Affordability as CaaS does not impact on the balance sheet since **no upfront capital is required.**	–

©Unsplash

FUNDING AND INCENTIVES

A range of general and sector-specific funding solutions and incentives is available to investors, manufacturers, and service companies in the green economy. It covers Development Finance Institutions (DFIs), local public and private sector financiers and investors, and a considerable range of tax incentives.


©Adobe Stock

South Africa ranks as one of the top 15 nations in the world in terms of driving the green growth agenda (ahead of Australia, Singapore, and Finland). This drive is on the back of a range of funding solutions and tax incentives available to green technology manufacturers and service companies, as well as those who use or procure such goods and services.

The South African Climate Finance Landscape looks at detailed project-level data, understanding in detail the source, disbursement, instrument and use. The insights can support public and private role-players with information to shape sectoral strategies and selected policies and improve coherence and coordination between public and private level spending in the sectors. The South African Climate Finance Landscape has tracked R62.2 billion in annual climate finance invested in SA. Find out more here.

5.1. General database web page

The GreenCape Finance Desk hosts a web page with a number of Green Finance resources that cover funding and incentives available to companies operating in the green economy. A few of the available database are highlighted below.

The Green Finance Desk (GFD) primarily acts as a facilitator in the financing of green projects and green business. The GFD works across all sector desks at GreenCape. For more support please visit https://www.greencape.co.za/content/sector/green-finance

ACCESS TO THE SOUTH AFRICAN CLIMATE FINANCE LANDSCAPE

5.1.1. Green Finance Database

In conjunction with the Western Government Department of Economic Development and Tourism, GreenCape maintains a database of funding sources and incentives that may be relevant to green economy investors. The database contains information on more than 150 funding opportunities, including an overview of the opportunity and relevant contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online[20].

5.1.2. Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online[21]. These incentives cover local manufacturing, critical infrastructure grants, small enterprise development and a diverse set of sector specific incentives (i.e. Aquaculture Development and Enhancement Programme).

[20] https://www.green-cape.co.za/content/focusarea/green-finance-databases

[21] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf

5.1.3. Finfind database

Finfind[22] is an innovative online finance solution that brings together SMME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

Wesgro has partnered with Finfind to assist local companies seeking finance for their business. See more here: https://wesgro.finfind.co.za/quiz/disclaimer/wesgro

5.1.4. AlliedCrowds database

AlliedCrowds[23] is the first complete aggregator and directory of alternative finance providers in the developing world. Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.
- Reports, including a number specifically about African funding sources, can also be downloaded for free.
- Businesses / organisations can also contact Allied Crowds to create a customised funding database. This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

Click the buttons below to access the relevant content

GREENCAPE'S GREEN FINANCE WEB-PAGE

GREEN FINANCE DATABASE

GOVERNMENT FUNDING AND INCENTIVE BOOKLET

FINFIND WEBSITE

ALLIED CROWDS WEBSITE

[22] https://www.finfindeasy.co.za/

[23] https://alliedcrowds.com/

THE WESTERN CAPE: AFRICA'S GROWING GREENTECH HUB

The Western Cape is a world-class investment destination.

Ground-mounted solar PV at MArlenique Estate, Western Cape.
©New Southern Energy

The province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is also a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life.

In 2017, Cape Town was ranked among the top 21 global investment destinations by Foreign Direct Investment (fDi) Intelligence, a division of the Financial Times.

A great place for green business

There are compelling reasons why the Western Cape Province is viewed by many as Africa's green economy hub. Coupled with a strong and rapidly growing market for green technology and services in South Africa and beyond, the Western Cape offers:

- Africa's renewable energy and cleantech hub, with a critical mass of leading companies present.
- Local presence of major professional services and financiers.
- Significant market opportunities for businesses and investors in agriculture, energy services, utility scale solar and wind, waste, water, bioeconomy and resource efficiency.
- A supportive government that has made ease of doing business and the green economy key priorities.
- Five universities with comprehensive R&D capabilities and dedicated green economy skills programmes.
- A range of investment incentives in the Atlantis Special Economic Zone (SEZ) for Green Technologies.

Supporting businesses and investors

The province also offers dedicated support for businesses and investors focusing on greentech and services, including:

Western Cape Department of Economic Development & Tourism: Driving the green economy policy landscape in the Province.
InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

City of Cape Town Enterprise and Investment: Creates an enabling environment to attract investment that generates economic growth and job creation in Cape Town
GreenCape: Provides dedicated support and market intelligence to green economy sectors.
Wesgro: The official investment and trade promotion agency for the Western Cape.
SAREBI: A business incubator providing nonfinancial support to green entrepreneurs.
SARETEC: Offers specialised industry-related and accredited training for the wind and solar industries.

Market opportunities in the province and South Africa

Some of the major market opportunity areas in the province and South Africa in the next five years are outlined in the graphic on the next page (see individual MIRs and the GreenCape website for more information).

R&D capabilities and skills

The region's five universities – University of Cape Town, Stellenbosch University, University of the Western Cape, the Cape Peninsula University of Technology and the George campus of the Nelson Mandela Metropolitan University – underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.

ATLANTIS SPECIAL ECONOMIC ZONE FOR GREEN TECHNOLOGIES

The Atlantis SEZ is a zone dedicated to the manufacturing and provision of services in the green technology space - technologies that reduce or reverse the impact of people on the planet. Wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials are all examples of green technologies that will be welcomed to the zone.

The zone welcomes manufacturers, service providers, suppliers and other players in the value chains of different green technologies. The SEZ is situated in the Atlantis industrial area north of Cape Town, south of Wesfleur, east of Dassenberg Road, and west of the Witsand community.

Why invest in the Atlantis SEZ?

There are strong and growing South African and African markets for greentech. The South African greentech manufacturing market is worth at least R30bn; with a growing greentech market in the neighbouring countries. South Africa has opportunities in energy, waste, agriculture, transport and other sectors and is a great entry point for the whole of Africa, in particular the SADC region.

Atlantis is a great location and development ready. 94 hectares of zoned development-ready land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links, whilst boasting fibre connectivity too. Atlantis is also close to major ports, roads, universities and greentech markets.

Investors have access to extensive investment support through the One Stop Shop for investor support and the rest of the investor support ecosystem, which includes InvestSA, GreenCape, the City of Cape Town, and Wesgro. Together the ecosystem provides information and advocacy; market intelligence; facilitated access to permits and licenses, planning and development approval; and skills training.

Investors and tenants are accessing attractive incentives in the form of tax relief and allowances, employment tax incentives, fast-tracked development approvals, fee exemptions and subsidies.

There is an attractive, wide-ranging skills base to recruit from with 5 universities and many more colleges in the province, and a large range of unskilled, semi-skilled, technical and professional candidates.

FOR MORE INFO, CLICK TO EMAIL THE ATLANTIS SEZ BUSINESS DEVELOPMENT EXECUTIVE

atlantis special economic zone cape town

CLICK TO VIEW THE ATLANTIS SEZ WEBSITE

GREENCAPE'S SUPPORT TO BUSINESSES AND INVESTORS

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions.
Our vision is a thriving prosperous Africa, mobilised by the green economy

New Southern Energy


©GreenCape

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Our vision is a thriving prosperous Africa, mobilised by the green economy

Working in developing countries, GreenCape catalyses the replication and large-scale uptake of green economy solutions to enable each country and its citizens to prosper. We work with businesses, investors, academia and government to help unlock the investment and employment potential of greentech and services, and to support a transition to a resilient green economy.

We assist businesses by removing barriers to their establishment and growth and provide our members with:

- free, credible and impartial market information and insights
- access to networks of key players in government, industry, finance and academia
- an advocacy platform to help create an enabling policy and regulatory environment for green business

We assist local, provincial and national government to build a resilient green economy by providing:

- support on the development of standards, regulations, tools and policies
- expert technical knowledge on key sectors in the green economy
- access to networks of key players across business, academia, and internationally

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, representing backgrounds in finance, engineering, environmental science and economics.

Our market intelligence reports form part of a working body of information generated by sector desks and projects within GreenCape's three main programmes – energy, circular economy and resources.

Benefits of becoming a GreenCape member

We currently have over 2 500 members, and offer free membership. Becoming a member of GreenCape will give you access to the latest information regarding developments in the various sectors; access to tools, reports, and project information; and offer you the opportunity – through our networking events – to meet and interact with various stakeholders in the green economy.

CLICK HERE TO BECOME A GREENCAPE MEMBER

We have facilitated and supported ~R42bn of investments in renewable energy projects and manufacturing. From these investments, more than 19 000 jobs have been created.

Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under-used resources:

435 000 fossil GHG emissions saved (equivalent to the electrical usage of 117 840 households in SA);

Over R150 million in financial benefits (additional revenue, cost savings and private investments);

398 economy wide jobs.

REFERENCES


©New Southern Energy

AEEE and Bureau of Energy Efficiency (BEE) 2019. The International Energy Services Conclave 2019 – Energy Efficiency for Business Competitiveness in New Delhi. Available from: < https://www.iea.org/topics/energyefficiency/escos/> Accessed 01st November 2017.

Bureau of Economic Research. 2021. Economic Outlook South Africa. Available from: <https://www.ber.ac.za/BER%20Documents/Economic-Outlook/?doctypeid=1058 > Accessed 27th October 2021

Carbon Trust. 2021. Sustainable Financing Mechanisms For Demand Side Energy Efficiency Market Transformation In South Africa. Stakeholder workshop meetings.

Department of Tourism. 2017. The Green Tourism Incentive Programme. Available from: <https://goo.gl/XkWBkK> Accessed 01st November 2017.

Department of Energy 2018. South African Energy Sector Report. Available from: <http://www.energy.gov.za/files/media/explained/2018-South-African-Energy-Sector-Report.pdf> Accessed 01st November 2019.

Enerdata. 2021. South Africa Energy Information. Available from: <https://www.enerdata.net/estore/energy-market/south-africa/ > Accessed 27th October 2021

Emergen. 2021. Energy as a Service Market By Service Type. Available from: <https://www.emergenresearch.com/industry-report/energy-as-a-service-market> Accessed 27th October 2021

Eskom. 2017. Historical average price increase. Available from: <https://goo.gl/eaAC9W> Accessed 08th November 2017.

Eskom. 2018. Tariffs and charges (Megaflex tariff). Available from: < http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariffs_And_Charges.aspx> Accessed 14 March 2018.

Global Innovation Lab for Climate Finance (The Lab). 2018. Pay As You Save for Clean Transport – Instrument Analysis. Available from: <https://www.climatefinancelab.org/wp-content/uploads/2018/02/Pay-As-You-Save-for-Clean-Transport_Instrument-Overview.pdf> Accessed 12th October 2018.

Green Building Council of South Africa (GBCSA). 2021. Green Building in South Africa: Guide to Costs & Trends. Available from: <https://gbcsa.org.za/wp-content/uploads/2019/08/2019GreenBuildingBooklet-Final-1.pdf> Accessed 14th October 2021.

Energy Market Trends 2021. Energy as a Service Market by Services Type End-User And Region – Global Forecast to 2024 Available from: https://www.prnewswire.com/news-releases/the-global-energy-as-a-service-market-is-projected-to-grow-at-a-cagr-of-10-8-from-2019-to-2024--300864712.html Accessed 12th October 2021.

International Energy Agency (IEA). 2014. Africa Energy Outlook: A focus on energy prospects in Sub-Saharan Africa, World Energy Outlook special report. Available from: <https://goo.gl/LxBaP0> Accessed 07th December 2017.

International Energy Agency (IEA). 2019. South Africa: Statistics Data Browser 2017. Available from: <https://www.iea.org/statistics/?country=ZAF&isISO=true> Accessed 30th October 2019.

International Finance Corporation (IFC). 2017a. Energy storage trends and opportunities in emerging markets. Available from: <https://goo.gl/PbVbDu> Accessed 07th December 2017.

International Finance Corporation. 2017b. Green buildings market intelligence: South Africa company profile. Available from: <https://goo.gl/ciscic> Accessed 04th December 2017.

International Renewable Energy Agency (IRENA). 2019. Renewable Power Generation Costs in 2018. International Renewable Energy Agency, Abu Dhabi. Available from: <https://www.irena.org/publications/2019/May/Renewable-power-generation-costs-in-2018> Accessed 25th October 2019.

Modise, M. 2013. Overview on the National Energy Efficiency Strategy (NEES) Post 2015. Presentation given at the Integrated Energy Plan Public Workshop. Available from: <http://www.energy.gov.za/files/IEP/jhb_workshop/Overview-on-the-National-Energy-Efficiency-Strategy-Post2015-26Sep2013.pdf> Accessed 19th December 2017.

National Business Initiative (NBI). 2016. The Private Sector Energy Efficiency Programme: two years of focused energy-efficiency interventions in the private sector 2013-2015. Available from: <https://goo.gl/Qxozid> Accessed 06th November 2017.

National Cleaner Production Centre South Africa (NCPC-SA). 2017. Annual Highlights 2016/17. Available from: <https://goo.gl/HtnkQR> Accessed 02nd November 2017.

National Treasury. 2016a. Package of measures to deal with climate change: The carbon tax and energy efficiency tax incentive. Johannesburg: s.n.

National Treasury. 2016b. Minimum threshold for local production and content for solar photovoltaic systems and components. Pretoria: National Treasury.

Navigant Research 2017. ESCo Market Overview. Available from: <https://www.navigantresearch.com/research/esco-market-overview> Accessed 03rd November 2017.

NERSA. 2021. Western Cape Tariffs. Available from: <https://www.nersa.org.za/wp-content/uploads/bsk-pdf-manager/2021/01/Western-Cape-Province-approved-tariffs-for-2020-21.pdf> Accessed 11th November 2021

PQRS. 2017a. Database Q2 2017 [Microsoft Excel Spreadsheet]. Cape Town: PQRS.

PQRS. 2017b. Demystifying the total installed PV capacity for South Africa Nov 2016. Available from: <http://pqrs.co.za/data/demystifying-the-total-installed-pv-capacity-for-south-africa-nov-2016/> Accessed 29th November 2017.

PQRS. 2018. The PV quality assurance program. Available from: <https://pqrs.co.za/the-pv-quality-assurance-program/> Accessed 16th November 2018.

PV GreenCard. 2018. The PV GreenCard. Available from: <https://www.pvgreencard.co.za/> Accessed 16th November 2018.

SALGA. 2020. Status of small-scale embedded generation (SSEG) In South African Municipalities. Available from: <https://www.sseg.org.za/wp-content/uploads/2019/03/Status-of-Small-Scale-Embedded-Generation-in-Municipalities. pdf> Accessed 15th October 2021.

SALGA. 2021. Telephonic conversation.

SANEDI. 2016. Energy storage and South Africa. Available from: <http://www.sapvia.co.za/wp-content/uploads/2016/11/Energy-Storage-SAPVIA-Nov2016.pdf> Accessed 27th November 2017.

SAPVIA. 2018. Role of SAPVIA. Available from: <http://www.sapvia.co.za/role-of-sapvia/> Accessed 16th November 2018.

SAWEA. 2018. Vision and Purpose. Available from: <https://sawea.org.za/about/> Accessed 16th November 2018.

South Africa. 1962. Income Tax Act, No. 58 of 1962, Section 12. Pretoria: Government Printer. Available online: < http://sars.mylexisnexis.co.za/> Accessed 12 March 2018.

Statistics South Africa. 2021. CPI History. Available from: <http://www.statssa.gov.za/?page_id=1871> Accessed 08th October 2021.

Wright & Calitz. 2021. Statistics of utility-scale power generation in South Africa H1-2021. Available from: <https://researchspace.csir.co.za/dspace/handle/10204/12067>

GreenCape

The writing of this MIR was made possible with the generous support of the Western Cape Government of South Africa.

Western Cape Government
FOR YOU
Economic Development and Tourism