Energy Services

–

2020
Market Intelligence Report

–

GreenCape

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

We thank Reshmi Muringathuparambil (lead author), Jack Radmore, Bruce Raw, Mandisa Mkhize, Yaseen Salie, and Seraj Chilwan 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.

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

Cover image courtesy of G3 Energy

18 Roeland Street, Cape Town, 8001, South Africa

Editorial and review: Cilnette Pienaar, Jack Radmore. Lauren Basson and Nicholas Fordyce
Images: City of Cape Town, GreenCape, G3 Energy, New Southern Energy and Nicholas Fordyce
Layout and design: Tamlin Lockhart Art Direction

Contents

List of figures

List of tables

List of abbreviations and acronyms

AEEE	Alliance for an Energy Efficient Economy
BEE	Bureau of Energy Efficiency
BTM	Behind the meter
Capex	Capital expenditure
CO_2e	Carbon Dioxide equivalent
CCT	City of Cape Town
COTS	Commercial Off-the-shelf
C&I	Commercial and industrial
CMVP	Certified measurement and verification personnel
CPI	Consumer price index
CSP	Concentrated solar power
DFI	Development Finance Institution
DoE	Department of Energy (National)
DMRE	Department of Mineral Resources and Energy (National)
DPE	Department of Public Enterprises
dti	Department of Trade and Industry
EE	Energy efficiency
EEMS	Energy Efficient Monitoring System
EG	Embedded generation
EPC	Engineering Procurement Construction
EPCM	Engineering Procurement Construction Management
ERA	Electricity Regulation Act
ES	Energy services
ESC	Energy supply contracting
ESt	Energy storage
ESCo	Energy services company
GW	Gigawatt
GWh	Gigawatt-hours
HVAC	Heating Ventilation and Cooling
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
LCOE	Levelised cost of electricity
MIR	Market Intelligence Report
Mt	Megatonnes
MW	Megawatt
MWh	Megawatt hours
MWp	Megawatt peak
MYPD	Multi-year price determination
NBI	National Business Initiative
NCPC-SA	National Cleaner Production Centre South Africa
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa

OEM	Original equipment manufacturer
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
REIPPPP	Renewable Energy Independent Power Producers Procurement Programme
SALGA	South African Local Government Association
SANEDI	South African National Energy Development Institute
SAPVIA	South African Photovoltaic Industry Association
SAWEA	South African Wind Energy Association
SME	Small- and medium-sized enterprise
SSEG	Small-scale embedded generation
StatsSA	Statistics South Africa
TWh	TerraWatt-hour

Exchange rate used

1 US Dollar = R14.38 (December 2018)

Executive summary

The term 'energy services' is used to describe three interrelated energy market segments in the South African energy space, namely (1) small-scale embedded generation; (2) energy storage; and (3) energy efficiency. These market segments are increasingly bolstered by offerings in the energy finance sector, which present opportunities to financial investors.

There are four main factors driving growth in the energy services market:
The above-inflation electricity price rises; decreasing technology costs; supportive policies, regulations and tariffs; and innovative finance options have all played an important role in driving the growth of the energy services market.

The South African Energy Services market is well established and growing:
The national embedded generation market for installations, operation and maintenance of rooftop solar PV has grown in the last two years. It is expected that the total annual available market could grow to a saturation point of ~500 MWp installed per year on an ongoing basis. This market could reach a total of 7.5 GW of installed capacity by 2035 – a total available market of R75 billion. The installation of an additional 500 MWp in one year translates to the potential creation of ~1 250 jobs. With increasing demand in embedded generation, the SA energy storage market is also expected to grow, and to be valued at ~R5 billion by 2035. It is important to note that in the early stages of this market, the best business case is in larger scale applications such as grid management and resource adequacy applications. It is estimated that this market will reach R15 to 30 billion by 2030. The energy storage market is expected to become the keystone of the future energy services market. Energy efficiency presents an opportunity to investors and businesses. The estimated market by 2035 is R21 billion.

Within embedded generation, there are three emerging opportunities for investors:

- **Rooftop PV system bundling with standardised contracting models.** This opportunity involves aggregating smaller rooftop solar PV projects to reach a scale where they become attractive to larger investors by reducing transaction costs and spreading the risk across the new portfolio.
- **Solar PV for energy resellers.** Property development owners (residential estates or shopping malls, for example) can install solar PV on their premises. They 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.
- **Operations and maintenance-only contracts.** This opportunity is two-fold. It serves to create entrance to market for foreign engineering, procurement and construction companies (EPCs) or investors; and invites smaller EPCs and energy services companies (ESCos) to specialise and take over contracts at renewal periods.

Within the energy storage market, there is an emerging opportunity for investors:

- **Behind-the-meter battery storage.** There are eight storage applications most likely to gain traction in South Africa before 2035. Applications for solar PV self-consumption and backup power represent the behind-the-meter opportunities for high-end customers. Increased resource adequacy, grid management (voltage and frequency), and capital expense deferral are some of the opportunities for distribution utilities.

Within the energy efficiency market, there is an emerging opportunity for investors:

- **Energy efficiency as a service.** Growth and development of the ESCO market.
- **Modernisation.** The retrofitting of South Africa's large stock of existing buildings is expected to become the largest sector within the green building industry by 2020. This opportunity is for ESCos specialising in energy-efficiency measures like lighting, HVAC, and smart metering.

Summary of market opportunities

Opportunity	Key drivers	Requirement & barrier	Expected timeframe	Macro environment
Rooftop PV system bundling with standardised PPAs	■ Economies of scale helps ■ Shift in average and minimum size of projects tendered for across market ■ ESCos can attract investors ■ Property assessed clean energy (PACE) / power purchase agreements (PPAs): better pricing	■ Standardised PPAs ■ Differential between feed-in and self-consumed energy ■ Regulatory certainty (small-scale embedded generation)	10 years	■ The lack of available, affordable finance for smaller projects ■ Smaller clients are not attractive to larger EPCs, so they sometimes ask them to wait until they have a few similarly sized clients ■ Smaller rooftop PV projects are bundled together to reach a scale where they become attractive to larger investors who, up until now, have only been interested in utility-scale RE projects
PV for energy resellers	■ Electricity tariffs ■ Energy security ■ PACE/PPA ■ Wheeling ■ Carbon footprint ■ Continuous revenue stream	■ Regulatory certainty ■ Standardised PPAs ■ Home-owners association approval	5-10 years	■ 1-2 property tenders per month nationally in the last year – green building industry is on the rise ■ Eskom and municipal electricity tariffs on the rise
Operations and maintenance (O&M): taking over contracts or O&M only	■ Renewal of O&M contracts after 2-5 years (project dependent) ■ Specialisation of EPCs ■ Enables foreign project developers and investors to have a footprint in South Africa without a dedicated labour force	■ Option in contracts to change O&M provider ■ Only for cash or bank-financed projects (not PPA)	1-5 years	■ Shoddy workmanship due to cut-throat competition resulted in poorly installed systems ■ As these clients start exploring better EPCs for new projects, they sometimes request takeovers of older projects for O&M component ■ ESCos/EPCs are starting to specialise, focusing on niche services as part of the wider value chain ■ Entrance to market: foreign EPCs trying to get footprint in SA but without a local office can partner post installation with local EPCs to continue doing O&M in the foreign EPC's name, and carry their brand; at the same time creating local employment
Battery storage (BTM) – 1.5 GWh	■ Load-shedding ■ Backup power demand ■ Battery pricing ■ Increase in renewable energy (RE) ■ Electric mobility	■ Battery pricing still high for the need ■ Battery specific PPA / financing / lease	15 years	■ Load-shedding and security of supply are major concerns. ■ Battery storage prices are dropping fast. ■ Electric mobility is gaining momentum
Energy efficiency as a service & modernisation	■ Legislative and regulatory changes ■ Rising energy prices ■ Falling cost of energy-efficient technologies	■ Smaller project sizes ■ Economic downturn	1-5 years	■ New buildings only make up ~5% of total buildings in South Africa Retrofitting of existing buildings is expected to become the largest sector within the green building industry by 2020

What's new?

This MIR provides an update on the opportunities, barriers, and regulations discussed in the 2019 Energy Services MIR. It also outlines emerging opportunities and barriers in small-scale embedded generation and energy efficiency.

What happened in 2019

- The Integrated Resource Plan (IRP) 2019[1] was gazetted in October 2019. The updated document allocates 500 MW per annum for distributed generation for own use of between 1 MW and 10 MW, starting in 2020.
- In February 2019, Parliament passed the long-awaited Carbon Tax Bill, with the first phase of the programme to be implemented from 2019 to 2022. The tax rate will be set at R120 per tonne of carbon dioxide equivalent (CO_2e) produced, and the total tax free allowances can be up to 95%.
- Schedule 2 of the Electricity Regulation Act 4 of 2006 was amended on 10 November 2017. It exempts certain power generation facilities of less than 1 MW in size from having a generation licence. If an installation meets the criteria as stipulated in the amended schedule, the installation can be registered with NERSA, instead of requiring a licence. It is expected that the distribution operators, i.e. municipalities or Eskom, would be in charge of registering the installations and report to NERSA.
- Gwede Mantashe was appointed as the Minister for Mineral Resources and Energy in May 2019.
- In October 2019, the Department of Public Enterprises (DPE) announced the official plan for the unbundling of Eskom into three separate entities – generation, transmission, and distribution – by 2021.
- Rolling blackouts (load shedding) continue as Eskom is unable to match current demand with available supply.

This MIR updates the 2019 report and highlights the following:

- updates on the state of the small-scale embedded generation in South Africa;
- updates on the state of energy efficiency in South Africa;
- the opportunities for players within the Energy Services market;
- Energy Services market drivers and barriers;
- the Eskom utility unbundling plan and its impact on the energy services market; and
- the influence of the 2019 IRP on future opportunities.

[1] The Integrated Resource Plan is a national government document that aims to provide a clear indication of South Africa's electricity demand, how this demand will be supplied, and at what cost.

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.

The need to improve energy efficiency in buildings due to carbon and energy security goals, and to reduce energy costs, has created a demand for energy efficiency and energy service providers. Over the years the concept of energy services and energy services companies (ESCos) has evolved and matured in several markets around the world, including South Africa.

This market intelligence report provides potential investors in the embedded generation, energy storage, and energy efficiency markets with a greater understanding of market opportunities in South Africa, taking into account the size of the opportunities, the level of risk involved, and current barriers.

The report is compiled for foreign direct and local investors (persons or organisations) that are looking to invest directly 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 and provincial economic overview of the energy services market, including:
  - the market context (small-scale embedded generation, energy storage, and energy efficiency);
  - four major market drivers in the South African energy services market;
  - market sizing (small-scale embedded generation, energy storage, and energy efficiency); and
  - key players in the South African energy services market.

The value of the global Energy Services market grew by 8% to USD 33.17 billion in 2019, up from USD 28.6 billion in 2017. Despite differences across countries and regions, projects are generating energy and financial savings upwards of 25%. The global energy services market has shown the ability to impact projects in buildings, industry, and transport in both the private and public sectors around the world (AEEE & BEE 2019).

- This is followed by an overview and update of **policies, legislation, and governance** (Section 3) that guide and affect the energy services (ES) market.
- In Section 4, **emerging 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).

For questions, queries, or to access GreenCape's services, contact the energy services team at: energy@greencape.co.za.

© New Southern Energy

2
Sector overview

Rising electricity prices, dropping technology costs, supportive energy policies and incentives are prompting consumers to explore alternative energy options, driving the growth of the energy services (ES) market in South Africa and creating a thriving value chain.

This section provides an overview of the national and provincial (Western Cape) energy services (ES) context, covering market developments, key industry players, and the size of the market. The term 'energy services' is used to describe three interlinked energy market segments in the South African energy space, namely small-scale embedded generation, which is currently dominated by rooftop solar photovoltaic (PV) systems, energy storage, and energy efficiency. Figure 1 below breaks down the three interlinked energy market segments.

Small-scale embedded generation

- Generation facilities of less than 1MW.
- Located at residential, commercial or industrial sites, where electricity is generally also 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 into the network.

Energy efficiency

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

Figure 1: Energy Services interlinked market segments

2.1. Market context

The South African electricity mix is primarily made up of coal assets, because of limited technology options in the past, and South Africa's abundant supply of coal. According to the national electricity utility, Eskom, South Africa produces approximately 224 million tonnes of coal annually, making it the fifth largest country-level producer of coal in the world. In 2020 South Africa's nominal generation capacity is dominated by coal-fired generation stations with a net output of 38.2 GW. This represents more than 90% of the country's total installed capacity of over 45 GW (Department of Energy 2018).

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

South Africa's dependence on this single operator model has decreased over the past 10 years with the introduction of new technologies, which are cheaper, capable of being decentralised, and more low-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 has also led to increased demand efficiencies (energy efficiency).

The sections that follow detail the market context (small-scale embedded generation, energy storage, and energy efficiency), four major market drivers in the South African energy services market, and key players in the South African energy services market, as shown in Figure 2 below.

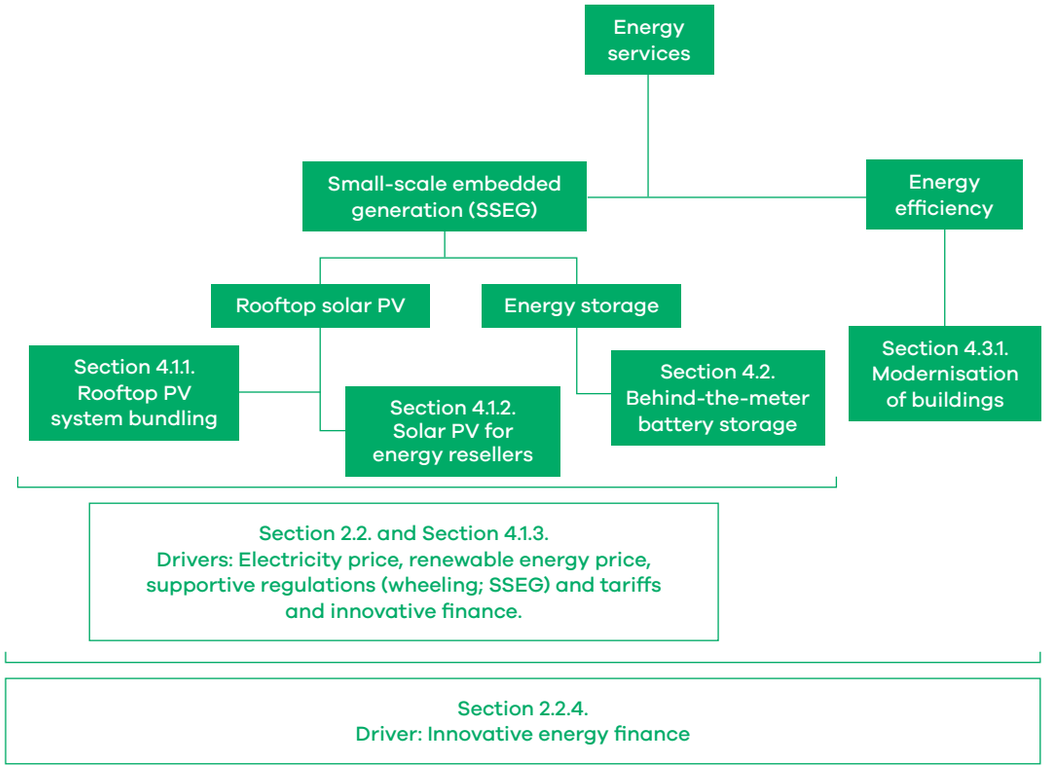


Figure 2: Energy Services sector overview

2.2. Energy Services market drivers

Four major developments are transforming South Africa'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 renewable energy technologies such as rooftop solar PV;
- supportive energy policies and regulations by local and national government; e.g.
  - Integrated Resource Plan 2019
  - Eskom unbundling plan 2019-2021
- innovative energy financing programmes and incentives.

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

2.2.1. Rising electricity costs

Rapidly rising Eskom electricity prices have created a sizeable demand for viable alternative energy sources. Figure 3 compares Eskom price increases to the more conservative increase in South Africa's inflation rate (as reflected by the Consumer Price Index).

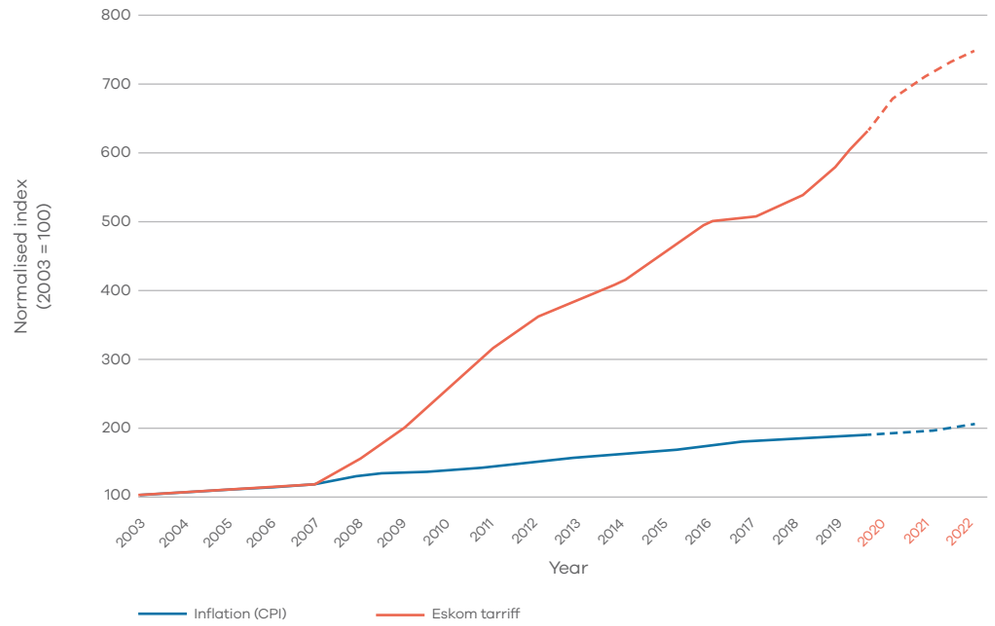


Figure 3: Average Eskom tariff versus inflation (CPI) projected to 2022

Sources: Statistics South Africa (StatsSA) and Eskom (2019)

The National Energy Regulator of South Africa (NERSA) approved Eskom tariff increases of:

- 9.41% in 2020
- 8.1% in 2021
- 5.2% in 2022

This is in addition to the 4.41% tariff increase which was approved by NERSA in 2018 through Eskom's Regulatory Clearing Account (RCA) recovery for the 2015 to 2017 financial years. The purpose of an RCA approval is to allow Eskom to retrieve *justifiable* costs retrospectively by adding them to future years' tariffs. The approved increases are significantly less than the applications by Eskom for yearly tariff increases of 17.1%; 15.4% and 15.5% for the next three years.

The average standard Eskom tariffs have risen by almost 300% since 2007. Historical data from both Eskom (2019) and StatsSA (2019), shown in Figure 3, reveal that while inflation has almost doubled since 2009, Eskom prices have tripled over the same period.

2.2.2. Falling costs of renewable energy technologies

Renewable energy technology prices have been dropping steadily since 2010. Figure 4 shows the average international levelised cost of electricity (LCOE) per renewable energy technology, and the average Eskom tariff in 2010 and 2018. For example, the global average price for solar PV in 2018 was R1.22 kWh, down from R5.33 kWh in 2010 (IRENA 2019), a ~77% drop in eight years. The most significant decreases in average cost have been in solar PV and wind technologies.

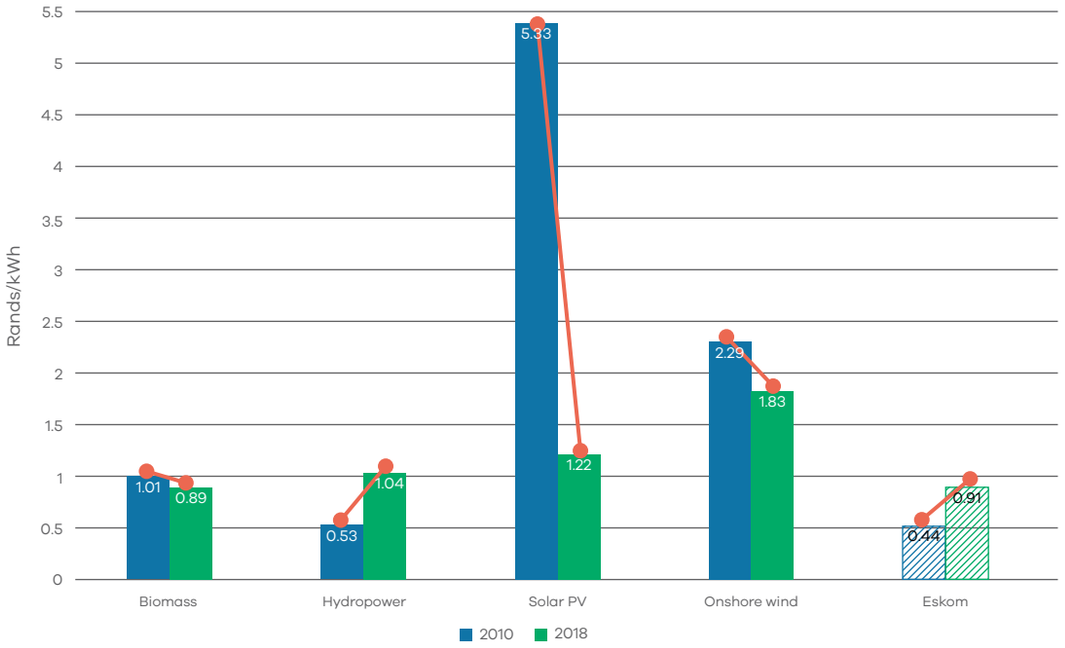


Figure 4: International levelised cost of electricity (LCOE) per renewable energy technology, and Eskom average tariff trajectory 2010-2018 (Rand/kWh)

Source: Adapted from IRENA (2019)[2]

In South Africa small-scale solar PV prices are already less than R1 kWh, as seen in Table 1 bellow.

Table 1: South African solar PV price

System size (kWp)	Capital cost of system (R/kWp)	PPA tariff (LCOE)
< 100 kWp	R 12 000 – R 16 000	R 1.20 – R 1.45
< 500 kWp	R 10 000 – R 14 000	R 0.90 – R 1.25
> 500 kWp	R 9 500 – R 13 000	R 0.80 – R 1.10

As these costs drop across a variety of energy services (ES) technologies, the financial case for investment into ES interventions improves.

[2] Exchange rate: 1 US Dollar = R14.38 (December 2018)

2.2.3. Supportive energy policies and regulations by 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 to reduce carbon emissions, 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.

Local government commitment to providing policy certainty

Regulatory developments as described in Section 3 facilitate the growing uptake of renewable energy options, particularly in the <1 MW 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, 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 on the local government level:

1. **Metropolitan municipalities** around the country, specifically City of Cape Town, Tshwane, City Power (Johannesburg) and Nelson Mandela Bay Municipality, **are challenging the 'single-buyer' model**, which restricts the purchase and sale of electricity to Eskom. These municipalities intend to purchase electricity directly from independent power producers (IPPs) and on-sell this electricity to their customers[3].

2. **Increasing off-take agreement options** for local embedded electricity generators. Electricity wheeling, as allowed by the DMRE and implemented by local municipalities, will allow generators to wheel their electricity to a willing buyer anywhere in the municipality or country. This is currently being implemented by City of Tshwane, Nelson Mandela Bay Metropolitan Municipality, the City of Cape Town, and Eskom. The release of regulations that allow private sector energy trading, will also open the market to private sector power purchase agreements and on-sales to private consumers using the national and local distribution networks[4]. For a more detailed explanation of wheeling and trading, see Table 2 on page 12.

[3] There is currently a court case to determine if it is within a municipality's mandate to undertake this role. Further analysis will be included once a ruling has been made.

[4] One licence has been allocated to PowerX, but the process by which more licences can be allocated is yet to be finalised.

Table 2: Increasing off-take agreement options – electricity wheeling and trading

Electricity wheeling	Electricity trading

The wheeling of energy is an exciting driver for the uptake of energy services, specifically SSEG, in South Africa. Wheeling is the transportation of electrical energy from a generator to a separate electrical load, by making use of municipal or Eskom grid infrastructure and power purchase agreements (PPAs). The municipality/Eskom operates in an administrative role to facilitate the transaction between the generators of clean power, and electricity users interested in buying electricity from renewable energy sources. Wheeling has gained traction in City of Tshwane, Nelson Mandela Bay Metropolitan Municipality and the City of Cape Town over the past year. It is expected that similar frameworks will be adopted across the country by 2025.
 	
The adoption of wheeling frameworks around the country provides SSEG investors with alternative offtake agreements and improved potential returns. It creates new business cases as the opportunity sizing is determined by the consumption profile of the off-take, and not the generation technology, as it is not limited to the user's site, or roof space in the case of PV.
 	
It will present an opportunity for the following cases:
▪ **medium-voltage C&I sector companies** with large energy bills that warrant it;
▪ **buildings that currently are not able to install PV** on their rooftop, such as:
  ▪ new buildings lacking adequate structural/ wind buffer;
  ▪ buildings with asbestos roofs that cannot be tampered with, which currently make up a significant portion of older building stock; and
  ▪ tenants who do not own the buildings and will struggle to have any structural changes approved.
 	
In addition to enabling renewable energy technologies, this business model would provide a platform for municipalities to engage and retain customers. Through offering an additional avenue to prosumers[5], municipalities would propose a new service to electricity generators as well as consumers interested in procuring clean energy.
 	
This represents both an opportunity for investors in the SSEG market to increase their off-take agreements and reduce their risk profile.
	The release of a licence allowing private sector energy trading has opened the market to private sector power purchase agreements, and on-sales to private consumers using the national and local distribution networks. There is currently only one company (PowerX) that has a confirmed national energy trading licence. The process by which further licences will be granted is unclear at this stage.
	
	Much the same as wheeling, 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 power purchase agreements (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. The municipality/ Eskom operates in an administrative role to facilitate the transactions, and takes a fee for this service.
	
	This represents both an opportunity for investors in the SSEG market to increase their off-take agreements and reduce their risk profile, and an opportunity for investors interested in investing in other electricity trading entities.

3. **Country-wide rollout of national small-scale embedded generation rules, regulations, and tariffs** to promote the safe and legal uptake of SSEG for own use[6].

Table 3 represents the best level of information obtained by the South African Local Government Association (SALGA) on the uptake of SSEG processes in municipalities by October 2018. Figure 7 shows the upward trend of municipalities adopting SSEG processes (i.e. allowing installations on their electricity grids, having an application process for customers, and having a NERSA-approved tariff). By October 2018, ~41 municipalities in South Africa have published SSEG regulations[7], including all eight metropolitan municipalities. Twenty-five of these municipalities also have NERSA-approved SSEG tariffs for one or more customer groups. They represent approximately 15% of all the municipalities that have electricity distribution licences[8].

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

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

[7] Municipalities publish these regulations on their individual websites to detail the application process for safe and legal installation of SSEG systems within the municipal electricity grid.

[8] To see a list of municipalities that allow SSEG, please visit the SALGA website – Status of SSEG in SA: https://www.sseg.org.za/status-of-small-scale-embedded-generation-sseg-in-south-african-municipalities/

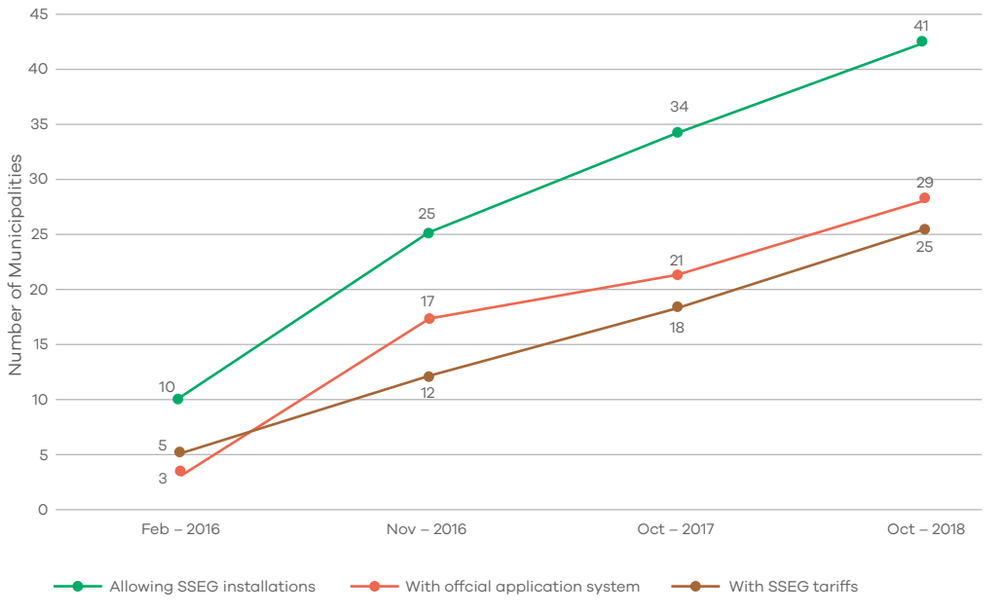


Figure 5: Uptake of SSEG processes in municipalities

Source: SALGA 2018

© G8 Energy

Table 3 gives a provincial breakdown of municipalities that have SSEG processes.

Table 3: Provincial breakdown of SSEG uptake

Province	Number of municipal electricity distributors in the province	Number of municipalities allowing SSEG installations	Number of municipalities with an official SSEG application system	Number of municipalities with SSEG tariffs
Eastern Cape	22	4	3	2
Free State	17	1	1	2
Gauteng	9	4	3	2
KwaZulu-Natal	25	1	1	1
Limpopo	16	3	1	1
Mpumalanga	14	2	1	0
Northern Cape	24	3	1	0
North West	13	1	1	0
Western Cape	25	22	17	17
TOTAL	**165**	**41**	**29**	**25**
Percentages of licensees	–	25%	18%	15%
Under development	–	–	9	6

Source: SALGA 2018

Table 4, overleaf, 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.

[9] The number of municipal electricity distributors in each province is an estimate by SALGA, based on the 165 distribution licences issued to municipalities by NERSA and the municipal mergers that have occurred over time.

Table 4: List of municipalities allowing SSEG to connect to the grid

Province	Municipality	Province	Municipality
Eastern Cape	Buffalo City Metropolitan Municipality	Western Cape	Beaufort West Local Municipality
	Kouga Local Municipality		Bergrivier Municipality
	Nelson Mandela Bay Municipality		Breede Valley Local Municipality
	Makana Local Municipality		Cape Agulhas Local Municipality
Free State	Mangaung Metropolitan Municipality		City of Cape Town
Gauteng	City of Johannesburg		Cederberg Municipality
	City of Tshwane		Drakenstein Municipality
	Ekurhuleni Metropolitan Municipality		George Local Municipality
	Midvaal Local Municipality		Hessequa Local Municipality
KwaZulu-Natal	Ethekwini Municipality		Kannaland Municipality
Limpopo	Ephraim Mogale Local Municipality		Knysna Municipality
	Polokwane Municipality		Laingsburg Municipality
	Mogalakwena Local Municipality		Langeberg Municipality
Mpumalanga	Govan Mbeki Municipality		Mossel Bay Municipality
	Steve Tshwete Local Municipality		Oudtshoorn Municipality
Northern Cape	Dawid Kruiper Municipality		Overstrand Municipality
	Gamagara Local Municipality		Prince Albert Local Municipality
	Sol Plaatje Municipality		Saldanha Bay Municipality
North West	City of Matlosana		Stellenbosch Municipality
			Swartland Municipality
			Theewaterskloof Local Municipality
			Witzenburg Municipality

Source: SALGA 2018

There is a large range of SSEG tariffs across the municipalities listed in Table 4. While the average tariff remains low, there is still a string of business cases to be made, built on the value of self-consumed electricity. There is currently no guarantee on the structure and cost of municipal consumption and feed in tariffs from year to year. Municipalities are moving tariffs to be more cost reflective, with the bulk of their costs coming in the form of energy time of use purchases from Eskom.

These changes at municipal level complement legislative updates on a national level, e.g. the gazetted Integrated Resource Plan 2019 and future changes such as the unbundling of the national utility, Eskom. Together these changes herald a freer, more 'liberalised' electricity market, in which all stakeholders are empowered in their energy choices.

National Government - 2019 Integrated Resource Plan (IRP 2019)

The Integrated Resource Plan is a national government document that aims to provide a clear indication of South Africa's electricity demand and how this demand will be supplied, and at what cost.

In May 2011 the then Department of Energy (now Department of Mineral Resources and Energy) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The IRP 2010 was intended to be a 'living plan' that would be reviewed by key stakeholders at least every two years. However, this was never done and resulted in an energy mix that failed to adequately meet the constantly changing supply and demand scenarios in South Africa.

Since 2010/11, there have been several draft revisions of the IRP that have been distributed for public comment. In 2018, the latest IRP was released for public comment. In October 2019 the final IRP 2019 was gazetted with the aim to provide policy certainty to the market. The 2019 IRP is detailed in Section 3.3.

Unbundling the national electricity utility (Eskom)

The South African government has decided to unbundle the national electricity utility (Eskom) into three subsidiaries, namely Eskom Generation (generation entity), Eskom Transmission (transmission entity) and Eskom Distribution (distribution entity). The aim of this new business model is to improve the power utility through greater transparency and accountability, and to allow stakeholders a more efficient approach to address generation, transmission and distribution challenges separately. The process of unbundling will take place over several years (2019 – 2022). It will ensure that the generation capacity runs uninterrupted, and that South Africans will receive un-interrupted electricity. The Department of Public Enterprises office outlines the plan through a myriad of objectives, with key objectives listed below in Table 5.

Table 5: Key objectives of the Eskom unbundling

Key Objectives	1	**Reduce reliance on coal to other cleaner and cheaper energy sources indicated in the IRP 2019**
	2	Create three separately managed and operated subsidiaries: Generation, Transmission and Distribution
	3	Optimisation of the operations and governance competency (including climate change impact)
	4	Implementation of cost-effective business practices for each entity
	5	Maintain the livelihood of the workers, and communities located and economically dependent on coal mines

Transmission Entity (TE): systems and market operator. In the immediate future, the creation of the transmission entity is a priority as it is the keystone in Eskom's reform. This entity will be wholly owned by Eskom Holdings and its core functions will be to act as an unbiased electricity market broker, to promote capital investment within the industry, and to catalyse energy efficiency and cost sustainability. Once restructuring is complete, the Transmission Entity (TE) will become the buyer for purposes of the power purchase agreements (PPAs) entered into with generators. All existing PPAs between Eskom and various IPPs will have to be transferred to the TE. The TE will continue to own and develop key infrastructure such as substations, transformers, and ~33 000 kilometres of transmission lines. The key responsibilities of the TE are detailed in Table 6 overleaf.

Table 6: Key responsibilities of the new Transmissions Entity (Eskom Holdings)

Key responsibilities	**1**	**System and market operator**
	2	Manage the electricity selling function across all stakeholders
	3	Facilitate electricity selling function through open market model
	4	Dispatch the generators according to least-cost merit order
	5	Balance electricity supply and demand in real time

Generation Entity. The Generation Entity (GE) is responsible solely for generation. The current power plant base will be separated into a number of feasible smaller generation units with the intention that, over time, the generation market will become more competitive and decentralised (including renewable energy generators).

All Eskom-owned power plants will be housed in this entity. The entity will contract with the Transmission Entity for the right to sell electricity and use the grid in the same way as IPPs currently do. This would create a level of competition in the industry between private generators and the new generation entity. The key responsibilities of the GE are detailed in Table 7 below.

Table 7: Key responsibilities of the new Generation Entity (Eskom Holdings)

Key responsibilities	**1**	**Maintain and improve current generation assets**
	2	Develop new price-competitive generation assets
	3	Reduction of the price and cost of coal while maintaining the quality of coal
	4	Reduce emissions through discovery and use of cleaner coal processes

Distribution Entity. The Distribution Entity (DE) will be authorised to buy from the Transmission Entity, licensed municipal generators, and embedded generation. The roadmap states that further consideration will be given to the structure of the distribution sector as a whole, and that the appropriate policy structures need to be developed. This is a fundamental shift towards an open and competitive market, and should be welcomed by the private sector. The wheeling framework, such as the one co-designed by GreenCape for the City of Cape Town, can be a viable tool that ensures these local municipalities are adequately supported to generate revenue and provide electricity to their communities.

Eskom's financial sustainability

Eskom's unsustainable debt status, including its failure to service even the interest payments on this debt, is the single biggest risk to Eskom and contributes directly to South Africa's deteriorating investment grade. Eskom has failed to finance its own borrowings, even with a more than 500% tariff increase, over the recent years. In order to pave the way out of this debt crisis, the Minister of Finance tabled a Special Appropriation Bill that will allocate a further R26 billion in 2019/20 and R30 billion more in 2020/21, on top of the R350 billion guarantee.

The implications of Eskom's reform plan to the RE sector in South Africa

While Eskom undergoes this massive transformation, the energy services industry, particularly SSEG, is expected to gradually gain more access to the market through enabling regulatory determinations from NERSA, DMRE and all other regulatory bodies. Table 8 details the impact of the Eskom unbundling decision on the renewable energy industry.


© GreenCape


© Solar MD

Table 8: The impact of the Eskom unbundling decision on the renewable energy industry

Eskom unbundling decision	Industry impact
The Transmission Entity will be the buyer	The renewable energy (RE) industry requires consistent and sufficient procurement rounds to achieve sizeable growth that has the potential to boost the local manufacturing industry, local content, create jobs, etc. A separately managed "transmission" unit and intra-company competition will drive the market, increase the willingness of lenders to explore favourable financing rates (locally and internationally), and drive insurance premiums down due to the reduced risk factor currently linked to Eskom. The transmission entity (TE) will play a major role in enabling competition in the market, as this will allow the RE industry to attain and maintain a sustainable growth rate that has previously been hindered by the politically influenced delays. This may also support the growth of the small-scale embedded generation and distributed generation markets, as the TE seeks cheaper generation sources.
Open market model and intra-company electricity trading	The TE should stimulate the market through an open-market model that allows open access to the national and local electricity grids.
Eskom finance crisis	It remains unclear how the Eskom debt issue will be resolved. Most likely it will be transferred to National Treasury. Uncertainty will continue to affect international investors' perception of South Africa's REI4P programme. However, the TE establishment will hopefully stimulate the industry over a short-term period and offer risk-adjusted returns for the investors.

2.2.4. Innovative finance facilitating the right type of finance into the sector

The growth of the South African energy services market is aided by 'green' energy finance offerings that facilitate the tailored finance solutions for the energy sector. A number of exciting finance mechanisms are being tested in the market. Three of these are outlined below.

Property assessed clean energy (PACE)

According to PACENation[10], PACE is a financing mechanism that enables low-cost, long-term funding for energy efficiency, renewable energy, and water conservation (resource efficiency) projects installed by ESCos on properties where rates are collected by the municipalities instead of by Eskom.

There are a few key elements of a successful PACE programme:

- It is voluntary for all parties involved.
- It can cover 100% of a project's hard and soft costs.[11]
- It provides long financing terms of up to 20 years, which makes it especially viable for the commercial sector.
- It can be combined with municipal and government incentive programmes.
- The installed system is permanently affixed to a property.
- It can be repaid through the "special assessment" on the rates account and collected by the municipality of the PACE entity.

As explained in Figure 6, the PACE entity provides financing to the energy services company or installers who want to install resource-efficient technology on a property. Once the project's feasibility has been assessed by the PACE entity, the project is then financed by the PACE entity.

Municipalities perform rate collection services for a small administration fee, which includes a 'special rate/tax' on the property's rates bill. This is used to re-pay the PACE entity for financing the installation. This 'special assessment' is linked to the property (irrespective of its owner).

[10] https://pacenation.us/ – A movement of people and organisations who are joined in their support for PACE financing

[11] Hard costs are infrastructure construction costs. Soft costs are all other costs that are not directly related to infrastructure and construction costs, such as services, legal, and administration costs.

If there is a default on payments, the municipality responds in much the same way as when other rates are overdue. The current or future owner will be liable to pay the overdue amount. The building owners are only liable to pay the special rates for as long as they are the owners. However, they must meet the criteria set out by the PACE entity when they first approach or are approached by the ESCo that installs the service.

Future potential owners must agree to the 'special rate' on the rates bill and agree to continue to pay this before they may own the building.

PACE is an international initiative; however, local programmes are being explored and tailored to meet regional market needs. Regardless of the model, there are several items that hold true for every PACE programme.

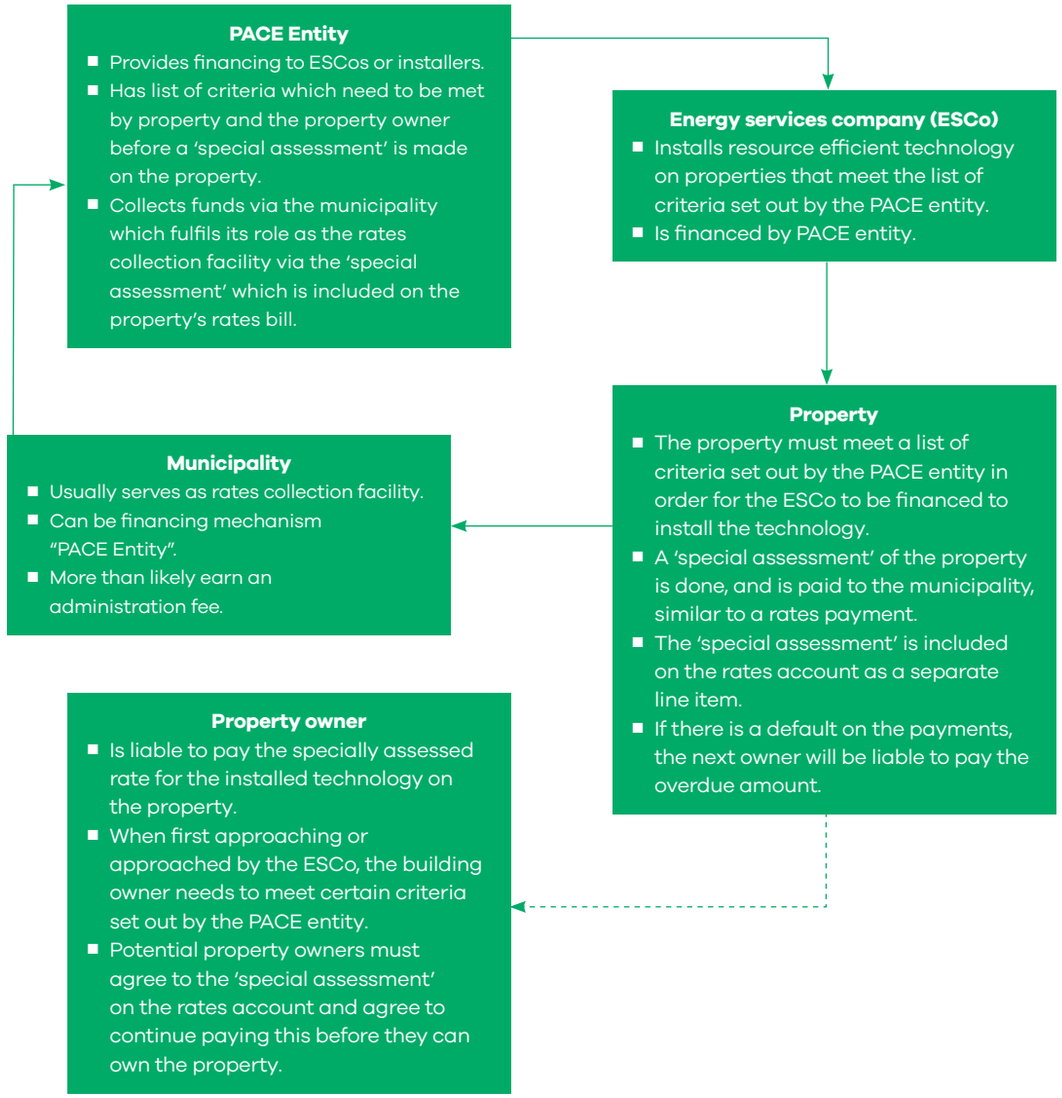


Figure 6: PACE financing mechanism

Property owners have reacted favourably to PACE internationally because external investors can fund projects so that there are no out-of-pocket costs for the property owners. Since PACE financing terms extend to 20 years, it is possible to undertake deep, comprehensive retrofits that have meaningful energy savings and a significant impact on the bottom line. The annual energy savings for a PACE project usually exceeds the annual assessment payment, so property owners are immediately cash-flow positive. It would be premature to calculate a potential market size as the exploration of this model has only just started in South Africa.

Commercial bank offering[12]

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 two 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 solar 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 may reduce some opportunities for less traditional investors such as equity funds; however, it could unlock the SSEG opportunity for end-users and installers, engineering, procurement and construction contractors (EPCs), and ESCos by providing accessible and affordable financing[13].

Banks' offerings include mechanisms that cover 70% to 100% of capital costs with a five- to ten-year loan repayment. However, by making use of 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.

Commercial banks are understandably risk averse, seeking high returns on their investments. The fact that they see this market as a meaningful opportunity, and have designed specific funding mechanisms for SSEG systems, is indicative of the reduced risk in the market as well as the potential financial returns available in the market.

© Nicholas Fordyce

[12] More information on commercial banks' offerings and other innovative green finance mechanisms is available in GreenCape's Energy Finance industry brief. Access it here: https://www.greencape.co.za/content/financing-solar-pv/

[13] 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.).

Table 9: South African commercial banks on solar PV for C&I

Solar PV in the C&I Sector	absa	NEDBANK	Standard Bank
Main investment instrument for PV	■ Depends on customer profile and their needs. ■ The main funding opportunities to date have been for customers installing solar PV and integrating energy production into their existing business. Therefore lending is against existing balance sheets (with a view of the cash flows from the installation). This changing with growth in Absa's lending to commercial and industrial power purchase agreements. ■ Asset finance, unsecured finance and property finance products are all potential financing solutions.	■ Nedbank secures term-loan financing over the underlying assets of the project. ■ There is an installment sale/ asset-based finance option, and structured finance options for power purchase agreements.	Debt solutions are tailored to suit client needs and could include: ■ Instalment sale loans. ■ Medium term loans.
Investment size requirements	Absa currently focuses on individual projects of up to 1 MW, due to greater clarity around embedded generation and no licensing requirements, and have financed commercial and industrial installations as small as 30 kWp.	■ No minimum size. ■ Nedbank must be the sole primary banker to the obligor.	There is no real limit for loans for solar PV installations; however, Standard Bank typically finance individual projects up to 999 kWp in size. Larger portfolios and investments are evaluated on a case by case basis.
Investment period	5 to 10 years	Tenure up to 10 years per project.	Debt tenures can go up to 10 years currently, negotiated -but this is case-specific and not the norm.
Security/ collateral requirement for debt	■ Project specific and additional security might not be required. ■ Absa takes the cash flows of the installation into account. ■ The installation seen as part of the collateral.	Security can be taken against the asset but often is taken against the underlying balance sheet of the client. In the case of IPP's security is based on the underlying off-take agreements and balance sheet.	Collateral-based contractual agreement; however, the lending principles have been aligned to the solar PV sector.
Risk reduction	■ Guarantees on debt. ■ Insurance. ■ Second-hand market for solar assets.	At present, ■ The quality of the product (certified installer). ■ The workmanship. ■ O&M history. In the near future: ■ Wheeling. ■ Second-hand market for solar assets.	■ Healthy cash flow, including savings from installation. ■ Quality of the product. ■ Backed by adequate insurance. ■ Financial positions of principal borrower and offtaker. ■ Second-hand market for solar assets.
Average interest rate	Risk dependent	The interest rate is based on riskadjusted pricing principles and varies depending on the project and client, while striving to be competitive and market related.	Offer a competitive interest rate. The actual rate is impacted by many variables like the size of the deal, the amount, the debt tenure, the risk assessment etc. It therefore varies from transaction to transaction.
Typical payment structures in C&I sector	Amortising debt at up to 100% loan-to-cost.	IPP with Special Purpose Vehicle: 60% Debt/40% Equity. Asset Based Finance and Term Loans up to 100% of project cost.	Depending on the financial position of the borrower, Standard Bank can consider funding of up to 100% of the installation costs. The loan is normally amortized but stepped repayments, aligned to cash flow can also be considered.
Are you seeing more power purchase agreements being funded?	Absa have seen growth in commercial and industrial PPAs in recent years, and we expect significantly higher growth in 2019. We will continue to support the growth of this market segment as a funding partner.	Yes, 10% of deals are PP-funded; however, as the concept of PPA's grows, the number of deals will follow.	The PPA market is growing rapidly with many new entrants in the market. Currently, ~60% of our basket is funded under a PPA structure. Where repayment is dependent on a PPA, it is important to ensure: ■ Tier 1 equipment is installed. ■ Contracted revenue is sufficient for repayment. ■ Sustainability of the offtaker. The viability of a PPA is strongly impacted by the contracted tariff structure.
Other things to note?	■ Have had a team dedicated to Renewable Energy (with strong focus on C & I market for solar PV) for a couple years and this remains a key focus sector. ■ Focus on the sector is not only related to funding. Please email to attend any of our customer events or receive any of our industry research and quarterly newsletters.	■ No preferred supplier list for suppliers of equipment but each supplier/installer will be vetted individually. ■ Nedbank's clients typically have turnovers of R7m or more and have been in business for a number of years. Nedbank prefers to deal with the client when a renewable energy installation is being considered. Nedbank's relationship is with the client and is guided by confidentiality requirements. When a client has decided on a supplier and is ready to discuss financing, Nedbank will engage. ■ Rental discounting agreements are available for suppliers (subject to being approved by the Rental Discounting team and an agreement is in place).	Standard Bank has a focused strategy for renewable energy which enables them to provide tailored financial support to companies operating within the energy services value chain. These include, but are not limited to EPCs, developers, solar asset owners, or distibutors. Solutions go beyond loans and include solutions such as: ■ transactional support. ■ trade finance. Standard Bank tailors solutions specifically for each project rather than relying on a one-size-fits-all approach.
Contact details for more information	Justin Schmidt, Head: Renewable Energy (Retail and Business Bank): justin.schmidt@absa.co.za	Mark Boshoff, Head (Sustainable Development Goals): MarkBo@Nedbank.co.za	Deerosh Maharaj, Manager (Medical and natural resources): Deerosh. Maharaj@standardbank.co.za

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 renewable energy 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 South Africa.

2.3. Key players

Figure 7 shows the ES value chain and key players in the value chain, with the roles of specific actors outlined in Table 10.

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

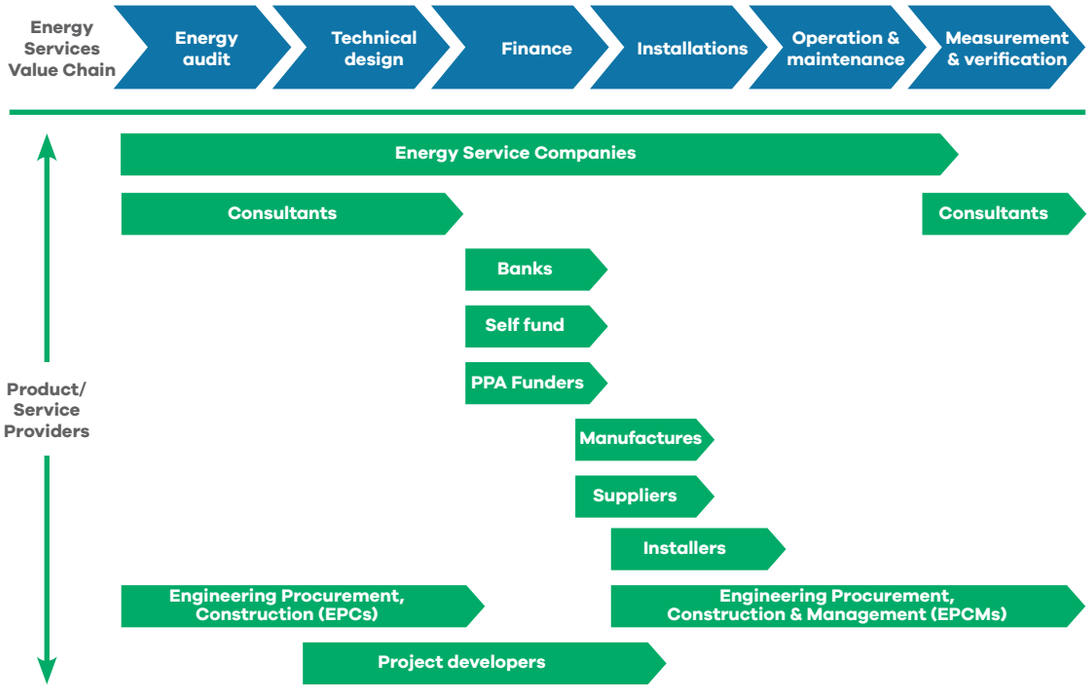


Figure 7: ES market value chain

Table 10: Roles of key players in the ES value chain

Key player	Role
Energy services companies (ESCos)	ESCos are active across the whole value chain, aside from measuring and validation, as independent consultants 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 personnel (CMVP), accountants, and lawyers.
Financiers	Financiers provide funding and financing mechanisms to realise projects. ■ **Project finance** – commercial banks (commercial and asset funding), self-funded individuals (with cash reserves) and PPA financiers (such as private equity funds, debt facilities). ■ **Funding for ESCos** (not detailed in 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 make use of specialised installers for both energy efficiency and SSEG (technology specific).
Engineering, procurement and construction (EPC) company	EPCs design interventions, procure and install tailored turnkey energy efficiency and/or renewable energy solutions.
EPCM (Engineering, Procurement, Construction Management)	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 South Africa's green economy, the ES value chain is dominated by small- and medium-sized enterprises (SMEs). Confidence in new leadership and the ensuing policy recommendations have inspired increased local and foreign investment into the market. As the market continues to develop, disruption will be a feature of this nascent economic sector. Adapting to this type of rapid growth is easier for SMEs as they are not hampered by pre-existing corporate structures and sunk investment. That said, their growth could be stifled by their inability to scale up or down fast enough to take advantage of opportunities.

2.4. Energy Services market size

Using the total available market for small-scale embedded generation (solar rooftop PV systems) installed in the country, energy storage, and capital leveraged in energy efficiency interventions implemented by South African energy users, **South Africa's total available ES market is valued at ~R125 billion by 2035.**

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[14]), energy storage, and energy efficiency. The estimate does not take into account 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.

2.4.1. Small-scale embedded generation – rooftop solar photovoltaic (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 a total of 387 MWp capacity of installed solar PV rooftop systems throughout South Africa (CSIR Estimate 2019). Estimations based on actual solar PV panel sales figures suggested that installed capacity in 2018 rose to ~600 MWp (GreenCape Analysis) .

In 2019, the market showed signs of growth, with the estimated total installed capacity having risen to between 850 MWp and 1 GW with between 250 MWp and 400 MWp of rooftop solar PV having been installed in South Africa in the last 12 months.

[14] Currently, the South African small-scale embedded generation (SSEG) market is dominated by rooftop solar PV, given the competitive price, technical maturity, and ease of implementation of this technology.

The total annual available market could continue to grow at this rate to a saturation point of ~500 MWp installed per year, reaching a total of 7.5 GW of installed capacity by 2035. **At 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.

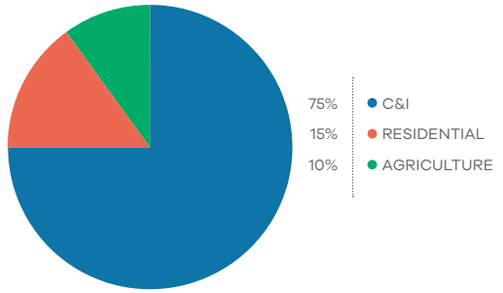


Figure 8: Distribution of solar PV installations across end-user segments in South Africa

Source: PQRS (2017a)

The commercial and industrial (C&I) sectors in South Africa continue to present the largest near-term opportunity for installations, with ~75% 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 the 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 2019, the average size of an installation in the C&I sector is ~300 kWp, which is almost triple the size of the average C&I rooftop PV system in 2016.

2.4.2. Energy storage market size

Developments such as battery storage options are emerging as the latest trends that will influence the energy services market. Similar to the growth in the renewable energy market, growth in this space is driven by rising electricity costs, increased financial returns from storage investments, and growing awareness of the impact of carbon emissions. The annual turnover for the global market is expected to reach R200 billion by 2024 (Navigant Research 2017).

These trends are reflected in the South African energy services market, but the applications and related value streams of storage are only just beginning to be understood locally. Beyond a handful of private customers that have invested in battery technology to ensure energy security for their operations, the price is not yet right for behind-the-meter application. However, energy storage is expected to become the keystone of the future SSEG market.

Eskom is installing a utility-scale 360MW/1440MWh battery energy storage system across 90 sites in four provinces of South Africa: Northern Cape, Western Cape, Eastern Cape and Kwa-Zulu Natal. This project replaces the originally planned concentrated solar power plant. The purpose of this battery storage system is to allow Eskom to more than triple its renewable energy capacity by 2030. It will also assist in peak shaving, frequency support and grid management support in Eskom's distribution network.

The potential market is mostly made up of grid management and resource adequacy applications:

- **R15 billion to R30 billion by 2030** (GreenCape estimates). This is based on replacement of at least 50% of South Africa's gas-fired power (~6 GW to 12 GW) as a resource adequacy application, and the Integrated Resource Plan 2019 allocation of 2 GW of new build energy storage by 2030.
- Additional daily balanced energy storage of 2 GW, private sector/customer side investment in demand-side management, and backup power with a market value of **R5 billion by 2035**.

2.4.3. Energy efficiency market size

Energy Services Companies (ESCos) are those companies that offer innovative financial models for energy efficiency projects based on the achievable energy savings. In South Africa, the industrial and commercial sectors are most attractive to ESCos, as can be seen in Figure 9.

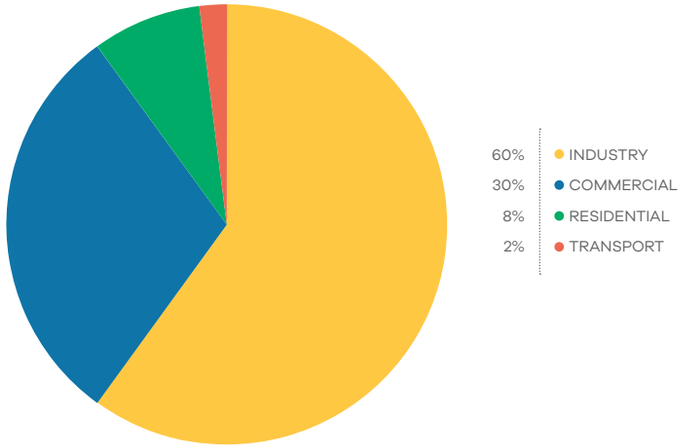


Figure 9: ESCos market for energy efficiency in South Africa

On average, energy efficiency projects in South Africa are relatively small. The average capital cost of a South African ESCo project is under R2 850 000. Based on the information provided in Section 2.2.4, 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 (see Section 4.1.1).

Although average project sizes in South Africa remain small, energy savings remain significant. This is reflected in the findings of the National Business Initiative (NBI) through its now discontinued Private Sector Energy Efficiency (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 11 (NBI 2016).

Table 11: Total energy savings opportunities and capital leveraged for small and large businesses identified by the PSEE programme

Type	Identified	Implemented	Remaining opportunity	Percentage still to be realised
Number of sites	1103	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	–	–

Source: Adapted from NBI (2016)

The capital leveraged in the PSEE program is R69.5 million, which has resulted in 646 GWh of lifetime energy savings (R0.10/kWh). Given that the data in Figure 9 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 a wider array of economic sectors and businesses – suggesting substantial market opportunities for ES market players.

Compared to the annual electricity consumption in South Africa, the 2 087 GWh savings identified through the PSEE represents only a small fraction of the possible energy efficiency market. The International Energy Agency (IEA) (2019) calculates South Africa's annual energy use to be ~789 TWh, with electricity making up ~200 TWh of this total. Industry is the largest consumer of energy, with direct use of coal and coal-based electricity being the major energy sources, as shown in Figure 9 (IEA 2019).

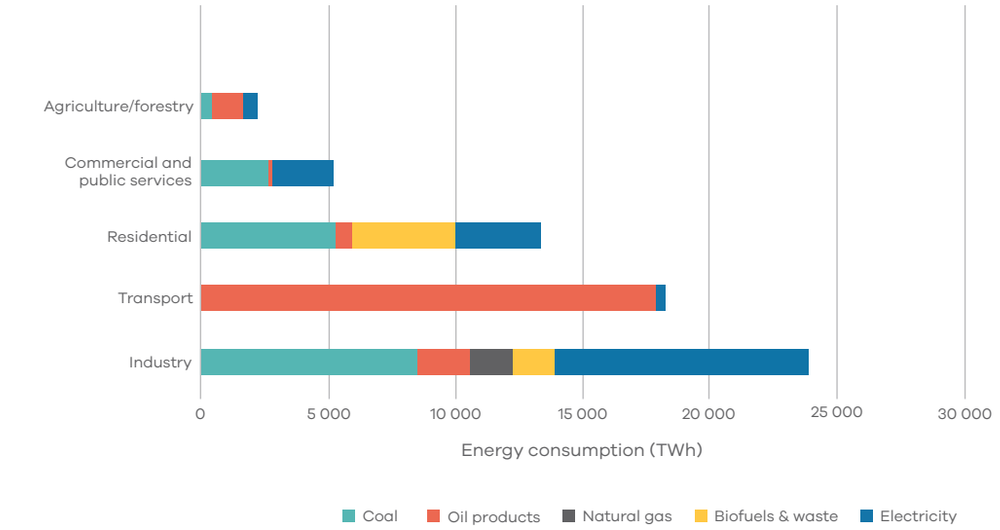


Figure 10: 2017 energy consumption in South Africa (TWh)

Source: International Energy Agency (2019)

If it is conservatively assumed that annual energy savings of 15% of total electricity consumption is possible (the PSEE programme findings show 20% to 35%), then 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.

3
Policy, legislation, and governance

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

3.1. Governance

National and local government partnering with a number of relevant industry bodies guide the development of the ES sector in South Africa.

3.1.1. National government

A number of government departments and institutions guide the development of the ES sector:

- **The Department of Mineral Resources and Energy (DMRE)** is the custodian of all energy policies and energy security in South Africa.
- **The Department of Public Enterprises (DPE)** is responsible for the country's energy infrastructure, primarily through its responsibility over state-owned entities such as Eskom.
- **Eskom** is the state-owned energy utility. It owns most of the electricity generation, transmission, and distribution infrastructure. As such, 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 objectives of the National Energy Efficiency Strategy (NEES), 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 has to undertake specific measures to promote the uptake of green energy and energy efficiency in South Africa.
- **The National Energy Regulator of South Africa (NERSA)** regulates the electricity sector, with the Department of Mineral Resources and Energy as the custodian department. NERSA's main energy services-related responsibilities are licensing and registrations; pricing and tariffs; promoting competition; and compliance monitoring and dispute resolution.

3.1.2. Local government

- **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.

3.1.3. Industry bodies

- **South African Photovoltaic Industry Association (SAPVIA)** is a not-for-profit organisation that represents the solar PV industry in South Africa. It aims to ensure that solar PV is the generation technology of choice in South Africa and the rest of Sub-Saharan Africa, in support of 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 South Africa.

3.2. Legislation and regulation

Electricity Regulation Act 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.

On 10 November 2017 amendments were made to Schedule 2 of the ERA, which regulates categories of generation facilities and resellers who would be exempt from the licensing requirement. For investors, this is a key step towards regulatory certainty. Effectively, the Department of Mineral Resources and Energy (DMRE), through the ERA, requires that all generation must be registered with NERSA and that a generation licence must be obtained, *except through exemptions,* in the following scenarios:

- If the generation facility is < 1 MW, is connected to the national grid and supplies a single customer (irrespective of wheeling status); the generator or single customer has entered into a connection agreement with, or obtained approval from, the relevant distribution licence holder; and at the date of this agreement, or approval, the Minister of Mineral Resources and Energy has not published a notice in the Government Gazette stating that the installed capacity (MW) allocated in the Integrated Resource Plan (IRP)for embedded generation (EG) of this nature has been reached.

- If the generation facility is < 1 MW and not grid-connected, and supplies a single customer who is the owner of the facility, a relative of the generator or owner of the facility, or a customer for consumption on the same property as the generation facility.

- If the generation facility is < 1 MW, is off-grid and does not have an interconnection agreement[15], and is operated solely to supply electricity to the owner, relatives of the owner or generator, or to a customer for consumption on the same property as the generation facility.

- If the generation facility is used for test or demonstration purposes only and this electricity is not sold, and the facility will not be in operation for more than 36 months.

- If the generation facility produces electricity from a co-product, by-product, waste product or residual product of an industrial process and supplies it to a single customer who is the owner of the facility, a relative of the generator or owner of the facility, or to a customer for consumption on the same property as the generation facility.

- Back-up or standby generation in the event of and for the duration of the electricity supply interruption.

- The continued operation of existing generation facilities that were exempt from requiring a licence prior to the amendment of Schedule 2 of the ERA, or were in operation before then, and within three months of the commencement of Schedule 2 have declared non-compliance with the Schedule to NERSA and signed an agreement to comply within a timeframe as specified by NERSA.

- Distribution facilities connected to generation facilities, which are used exclusively for the wheeling of electricity from the facility to the customer (off-grid) or to the point of connection (grid-connected).

- Electricity resellers where the tariff or price charged by the reseller to customers is not more than the price charged by a registered licensee; and there is a service delivery agreement with the relevant distribution licence holder; and NERSA has approved this service delivery agreement.

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 in support of economic growth and poverty alleviation. The Act takes into account environmental management requirements and interactions among economic sectors. It provides for the development of 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.

[15] An interconnection agreement is an agreement between the generator and the local electricity distribution licensee.

In 2008 and 2011, the NEES was reviewed to discuss its scope and elements. The post-2015 National Energy Efficiency Strategy will be based on 25 policy recommendations within seven priority areas developed by the International Energy Agency (IEA 2014):

- cross-sectoral;
- buildings;
- appliances and equipment;
- lighting;
- transport;
- industry; and
- energy utilities.

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.

Energy mandatory reporting 2015: As part of the DMRE's Energy Efficient Monitoring System (EEMS) to track efficient consumption of energy within South Africa and the trends involved, it is mandatory for all energy users consuming more than 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 is applicable to all forms of energy.

Carbon taxes 2019: The Carbon Tax Act No 15 of 2019 was gazetted in May 2019, and came into effect on 1 June 2019. The carbon tax will be applied over two phases: Phase 1 will be from 1 June 2019 to 31 December 2022; and phase 2 will be from 2023 to 2030. In Phase 1, it will not have an impact on electricity prices. The rate of carbon tax 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 is designed to incentivise large emitters to transit to a low carbon profile before Phase 2.

Once the results of the tax 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.

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 South Africa. Appropriate and supportive energy policies are required to attain the energy efficiency and conservation targets embodied in the Integrated Resource Plan (IRP) framework, detailed on page 36. The white paper effectively supports the national Department of Mineral Resources and Energy's (DMRE) mandate to ensure secure and sustainable provision of energy for socio-economic development by suggesting that it pursue energy efficiency programmes as one of the lowest cost options for reducing energy consumption.

Integrated Energy Plan (IEP) 2010: 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 as well as security by combining the objectives of the country's climate change, energy supply, and energy demand plans and aspirations. The IEP was released for public comment between November 2016 and March 2017, and an updated energy plan is yet to be published at the time of writing. The primary difference between the IEP and the Integrated Resource Plan (IRP) is that the IRP's focus is on electricity, its supply, and NERSA's ability to grant licences, while 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 South Africa. 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 a long wait, the IRP 2019 was gazetted in October 2019.

For the period ending 2030, a number of policy adjustments are proposed to ensure a practical plan that will be flexible to accommodate new, innovative technologies that are not currently cost competitive, minimisation of the impact of decommissioning of coal power plants, and the changing demand profile.

Some of these adjustments include increased build limits to correct the rollout of RE, which will help sustain the industry. Inclusion of 1 000 MW of coal-to-power has the aim of minimising the impact of job losses resulting from the decommissioning. These policy adjustments will be retained, pending a report on the just transition strategy expected in 2020/21.

Provision has been made for the following new additional capacity by 2030:

- 1 500 MW of coal;
- 2 500 MW of hydro;
- 6 000 MW of solar PV;
- 14 400 MW of wind;
- 1 860 MW of nuclear;
- 2 088 MW for storage;
- 3 000 MW of gas/diesel; and
- 4 000 MW from other distributed generation, co-generation, biomass, and landfill technologies.

The 2019 IRP increased the RE capacity to 33% by 2030, not including distributed generation, and also makes a strong statement towards encouraging local manufacturing. The IRP 2019 has also included an open cap for distributed generation between 2019 and 2022, and a 500 MW annual cap from 2022 to 2030. This allocation now allows the National Energy Regulator to release rules for SSEG based on the Electricity Regulation Act Schedule 2 Amendment 2017, which should allow Eskom and local municipalities to move forward with grid connected SSEG in a unified and transparent manner.

	Coal	Coal (decommissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37 149	–	1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2 373	–	–	–	–	244	300	–	**Allocation to the extent of the short term capacity and energy gap.**
2020	1 433	-557	–	–	–	114	300	–	–	
2021	1 433	-1 403	–	–	–	300	818	–	–	
2022	711	-844	–	–	513	400 / 1 000	1 600	–	–	
2023	750	-555	–	–	–	1 000	1 600	–	–	500
2024	–	–	1 860	–	–		1 600	–	1 000	500
2025	–	–	–	–	–	1 000	1 600	–	–	500
2026	–	-1 219	–	–	–	–	1 600	–	–	500
2027	750	-847	–	–	–	–	1 600	–	2 000	500
2028	–	-475	–	–	–	1 000	1 600	–	–	500
2029	–	-1 694	–	–	1 575	1 000	1 600	–	–	500
2030	–	-1 050	–	2 500	–	1 000	1 600	–	–	500
TOTAL INSTALLED CAPACITY by 2030 (MW)	–	**33 364**	**1 860**	**4 600**	**5 000**	**8 288**	**17 742**	**600**	**6 830**	–
% Total Installed Capacity (% of MW)	–	**43**	**2.36**	**584**	**6.35**	**10.52**	**22.5**	**0.76**	**8.1**	–
% Annual Energy Contribution (% of MWh)	–	**58.8**	**4.5**	**8.4**	**1.2**	**6.3**	**17.8**	**0.6**	**1.3**	–

Installed Capacity
Committed / Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

Figure 11: Policy-adjusted IRP 2019 allocations

Source: Adapted from DoE (2019)

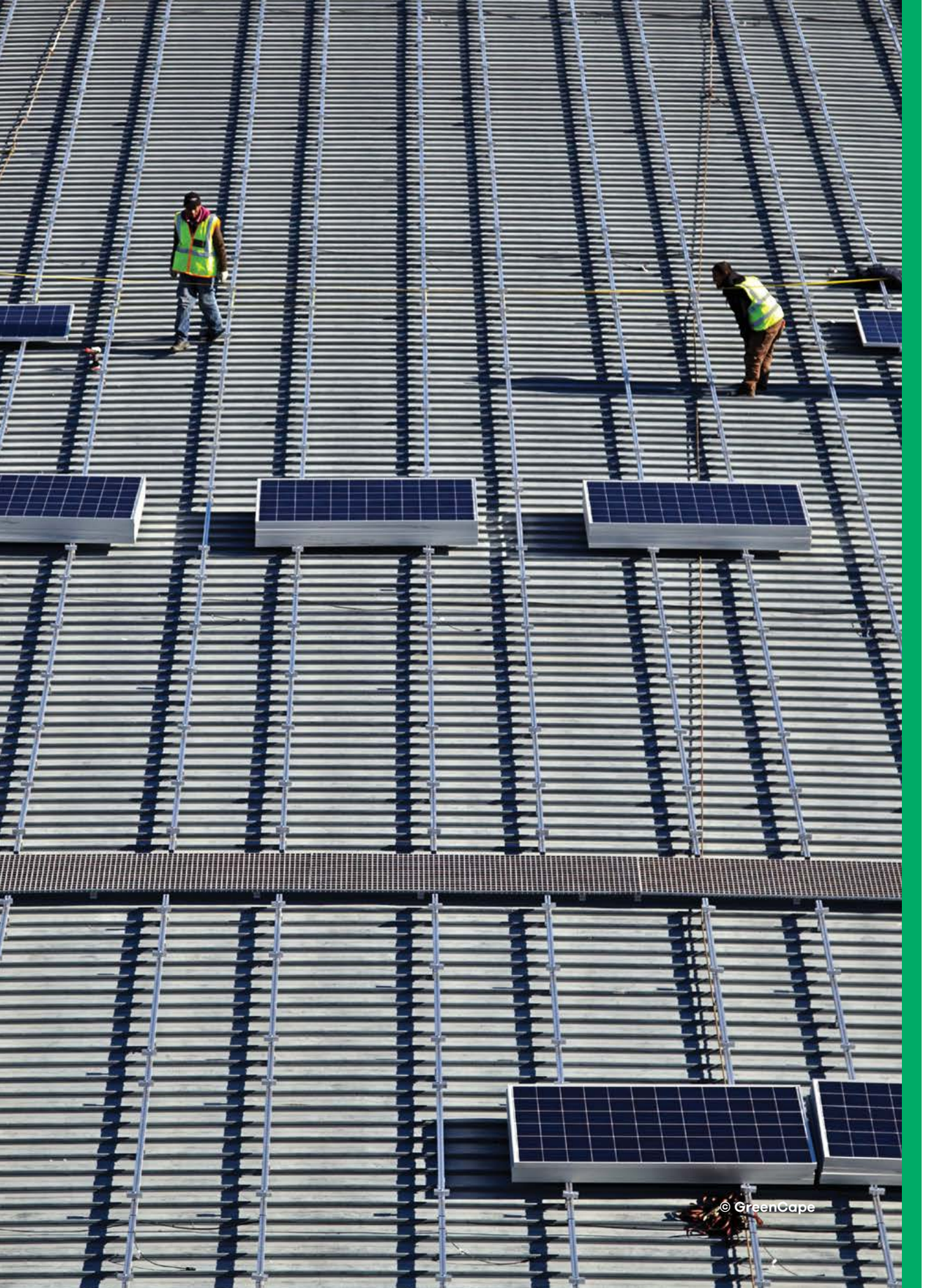
4
Emerging opportunities, drivers and barriers

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

The following emerging 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 below. A brief overview is provided in Table 12.

Table 12: Emerging energy services opportunities

Energy services sector	Emerging opportunities in 2020
Small-scale embedded generation	**Rooftop PV system bundling with standardised contracting models:** This opportunity involves aggregating smaller rooftop PV projects to reach a scale where they become attractive to larger investors by reducing transaction costs and spreading the risk across the new bundle. Once this bundle reaches scale, they can be designed using standard contracting models (such as Power Purchase Agreements) which can be easily compared and combined. This opportunity is for investors and project developers. **Solar PV for energy resellers:** Property development owners (residential estates or shopping malls, for example) can install solar PV on their premises, as well as 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. This differential creates an opportunity for investors and energy resellers (such as larger EPCs and property developers). **Operations and maintenance-only contracts:** This opportunity is two-fold. It serves to create entrance to market for foreign EPCs or investors; and invites smaller EPCs and ESCos to specialise and take over contracts at renewal periods.
Energy storage	**Behind-the-meter battery storage:** The key value proposition of behind-the-meter systems is security of supply and the provision of backup power during blackouts, which is paramount to the growth of any economy. This opportunity is for investors, battery companies, and EPCs. **Utility support:** Increased resource adequacy, grid management (voltage and frequency), and capital expense deferral for utilities.
Energy efficiency	**Energy efficiency as a service:** The growth and development of the ESCO market. **Modernisation:** The retrofitting of South Africa's large stock of existing buildings is expected to become the largest sector within the green building industry by 2020. This opportunity is for ESCos specialising in energy efficiency measures like lighting, HVAC, and smart metering.



4.1. Small-scale embedded generation

The following section details emerging opportunities in the small-scale embedded generation market, the drivers of these opportunities, and the relevant barriers.

4.1.1. Rooftop PV system bundling with standardised contracting models

The lack of availability of affordable finance represents a barrier for rooftop PV investments/projects in the South African market. The cost of capital[16] for the customer, and the off-taker risk and linked transactional costs for the project developer, are key considerations in a solar PV business case.

At present, given the high cost of capital, project risks and transactional costs, many established EPCs are unlikely to sign projects smaller than 150 kW_p. In fact, the average size of C&I projects is in the range of 300 to 600 kW_p (GreenCape Analysis). There remains an untapped market niche focused on smaller system sizes. Through standardised contracting models and off-the-shelf system design, smaller rooftop PV projects can be bundled together to reach a scale where they become attractive to investors. This "bundling" can either take place before projects are built as a pipeline strategy, or be a refinancing driver post construction.

The standardised contracting of projects in the portfolio, as well as the use of commercially available off-the-shelf (COTS)[17] 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 will unlock improved market lending rates for the end consumer and stimulate an untapped section of the market. Table 13 below details the relevant barriers and drivers for this opportunity.

Table 13: Barriers and drivers of the rooftop PV system bundling opportunity

Drivers	Barriers
Aggregation of systems improves the business case for larger investors. By bundling and standardising contracts, overall system costs are reduced because transaction costs per system are avoided.	**Lack of standardised PPA contracts** means that projects are not easily bundled. An approach to simplifying current PPA contracts is needed.
Reduced off-taker, technology, and commercial risks. Holding a variety of non-correlated assets can nearly eliminate unsystematic risks.	**Lack of commercially available off-the-shelf (COTS) systems.** Bespoke installations currently dominate the market. System design is done on a case by case basis. These are not easily bundled as each project needs to be investigated individually.
Reduced cost of capital. Unlocking a larger and standardised portfolio with reduced risk will unlock cheaper capital, which will drive down the price of installations.	The differential between feed-in and self-consumed energy makes creating a standard PPA contract for bundling very difficult.

[16] Before banks began to develop tailored rooftop PV products, most systems where financed using vehicle finance models for PV; thus rates are often significantly above market lending rates (13-18%).

[17] Commercially available off-the-shelf (COTS) systems are pre-packaged solutions, which are then adapted to satisfy the needs of the customer, rather than the commissioning of custom-made, or bespoke, solutions.

4.1.2. Solar PV for energy resellers

Residential, commercial, and industrial property development owners can function as energy resellers. The development pays a bulk electricity supply rate to the municipality, and 'on sells' the electricity to tenants at a higher rate (either residential or commercial, depending on the development)[18].

According to The NERSA Guidelines on Electricity Resale ("the Reseller Guidelines") that were published in 2016 in terms of the Electricity Regulation Act 4 of 2006, the reseller is only permitted to recover the difference between the reseller's tariff and the applicable "end user" tariff.

With the Eskom electricity price continuing to increase (see Section 2.2.1) and the price of renewable energy decreasing (see Section 2.2.2), a point of grid parity[19] has been reached. This has created a new opportunity for energy resellers to explore large-scale solar PV developments.

A similar model, as described above for traditional energy resale, can be used for the deployment of a communal rooftop solar PV system to service tenants within a development. The property developer installs a larger commercial-sized solar PV system benefiting from a reduced power purchase agreement rate (± R0.90), given the scale of the installation (see Section 2.2.2). The property developer can then 'on sell' the electricity generated by the PV system to tenants at a rate equivalent to either the local residential (± R2) or commercial (± R1.20) tariff depending on the development. The difference between the reseller PPA rate and the tenant tariff presents an opportunity for EPCs and property developers, as well as investors.

South Africa's building and construction industry has grown exponentially in the last ten years and is still increasing rapidly. Larger EPCs received on average one to two property tenders per month in the past year, which presents a significant opportunity for the on-sale of electricity to the property's tenants. Table 14 below details the relevant barriers and drivers for this opportunity.

[18] The NERSA Guidelines on Electricity Resale ("the Reseller Guidelines") were published in 2016 in terms of the Electricity Regulation Act 4 of 2006. It empowers and obliges NERSA (as the authorised regulatory authority for the generation, distribution, and trading of electricity) to regulate the buying and selling of electricity as a commercial activity.

[19] Grid parity occurs when an alternative energy source can generate power at a levelised cost of electricity that is less than or equal to the price of power from the electricity grid.

Table 14: Barriers and drivers of the solar PV for energy resellers opportunity

Drivers	Barriers
Rising electricity tariffs (See Section 2.2.1). Rapidly rising Eskom electricity prices have created a sizeable demand for viable alternative energy sources.	**Regulatory certainty.** The NERSA Guidelines on Electricity Resale ("the Reseller Guidelines") were published in 2016 in terms of the Electricity Regulation Act 4 of 2006. It empowers and obliges NERSA (as the authorised regulatory authority for the generation, distribution, and trading of electricity) to regulate the buying and selling of electricity as a commercial activity.
Energy security is becoming increasingly important for property developers to offer their tenants. It is also becoming a key selling point for tenants.	Any residential-level electricity on-sale agreement is subject to **home-owners association approval.**
Wheeling of energy (See Section 2.2.3). The wheeling of energy is an exciting driver for the uptake of energy services, specifically SSEG, in South Africa. Wheeling is the transportation of electrical energy from a generator to a separate electrical load, by making use of municipal or Eskom grid infrastructure and Power Purchase Agreements.	–
Affordable finance for PV systems (See Section 2.2.4). The growth of the South African energy services market is aided by 'green' energy finance offerings that facilitate the tailored finance solutions for the energy sector.	–

4.1.3. Operations and maintenance-only contracts

There have been a number of shifting trends in the energy services market over the past three years. Two of these trends have created an emerging opportunity for a number of stakeholders:

- While REIPPPP was stalled, utility-scale project developers turned their attention to South Africa's fledgling SSEG market. This period of intense competition unfortunately resulted in many systems being installed with limited o&m contracts.
- The current competition in this market remains high, and margins relatively small. Many SMEs, EPCs and ESCos are starting to specialise, and focus solely on niche sections of the energy service value chain (see Section 2.3).

These two trends present an opportunity for local EPCs and ESCos to partner with or take over the O&M contracts of EPCs who prefer to finance and focus on the earlier stages of the project. This also creates an opportunity for foreign EPCs who want to establish a footprint in South Africa, but do not have a local office or labour force. These EPCs can partner with local EPCs post installation to continue doing the O&M in their name and carry their brand. Already, EPCs and ESCos are forming strategic joint venture agreements to best grow their businesses, both within the country and internationally. Considering that O&M contracts typically get renewed every two to five years (dependent on the project), this creates considerable opportunities for the next 5 to 10 years. Table 15 below details the relevant barriers and drivers for this opportunity.

Table 15: Barriers and drivers of the operations and maintenance-only opportunity

Drivers	Barriers
While REIPPPP was stalled, utility scale project developers turned their attention to South Africa's fledgling SSEG market, driving rapid growth in the market.	Currently, only cash or bank-financed projects would be eligible for a transfer in O&M contracts. This is unlikely to be possible for PPA projects, as a different O&M provider would have to be factored in. This could affect the PPA-providing EPC's cash-flow and investment.
Renewal of O&M contracts after two to five years (project-dependent).	O&M providers are fixed to the contract[20].
Many SMEs, EPCs and ESCos are starting to specialise, and focus solely on niche sections of the energy service value chain.	–
Foreign investors and EPCs are increasingly interested in exploring South Africa's SSEG market for various reasons, as detailed in Section 2.2.	–

4.2. Energy storage

The energy storage market opportunity in South Africa is split into three distinct categories based on the user of the storage. They are behind-the-meter or customer services, distribution/ancillary services, and utility services. There are eight storage applications most likely to gain traction in South Africa before 2035, as highlighted in green in Figure 12. Although this market intelligence report is focused on behind-the-meter services, the inclusion of distribution/ancillary services and utility services in this analysis is key to understanding the market potential as a whole.

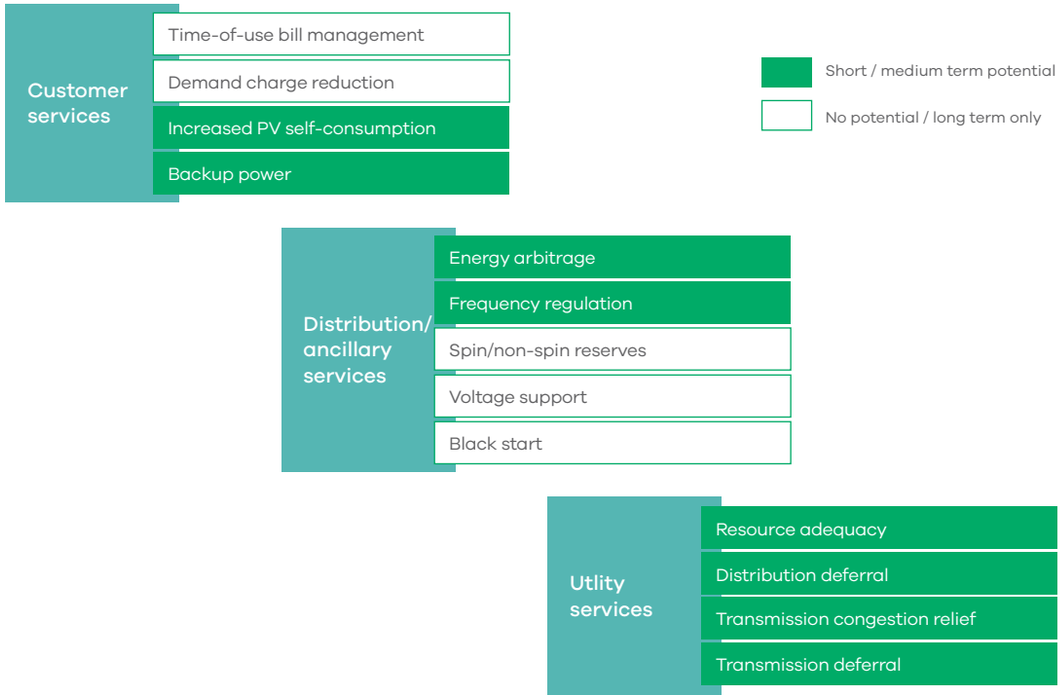


Figure 12: Eight services are applicable in the South African energy storage context

[20] There should **be an option in the original contract for the O&M provider** to be changed if necessary.

4.2.1. Customer services

While many commercial and industrial (C&I) enterprises are drawn to the sustainability and resilience advantages of energy storage, the technology is becoming increasingly valuable for its ability to support multiple demand-side management strategies.

Behind-the-meter battery storage (private customer use). As the price of energy storage behind-the-meter continues to drop, the business case for end-use customers will improve. The further down the value chain storage is located; the more value is likely to be extracted from the full range of 'value stacking' applications. Value stacking in this context refers to the ability to leverage the same equipment, system, or process to deliver multiple benefits that maximise the financial impact.

For behind-the-meter battery storage it can include:

- Load shedding avoidance / back-up power (short term opportunity)
- Increased PV self-consumption (short-term opportunity)
- Contracted demand response and curtailment (long-term opportunity)
- Time-of-use charge management (long-term opportunity)
- Demand charge management (long-term opportunity)

In the short term, behind-the-meter/customer-located storage is best suited to provide the most important service for South Africa: backup power. In particular, behind-the-meter battery storage enables South Africans to adapt to load shedding and offset its costs based on security of supply. Behind-the-meter (BTM) battery storage systems are typically between 3 kW and 5 MW in size. The declining price is detailed in Figure 13 below.

Second-life battery storage:
Most storage systems in South Africa are deployed for one of three single applications: demand charge reduction, backup power or, increasingly, self-consumption of solar PV power. These systems are often used for less than half their useful lifetime. Dispatching batteries for a primary application and then re-dispatching them for a "second life" to provide multiple, stacked services creates additional value for all electricity system stakeholders. Creating the right electricity market structure and conditions is crucial to enable this approach; thereby unlocking the energy storage market while creating viable and sustainable business cases.

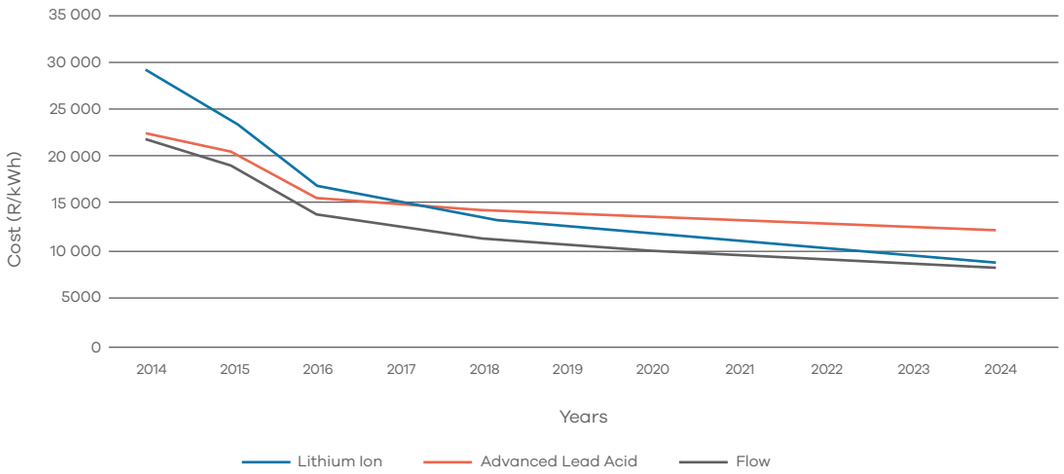


Figure 13: Behind-the-meter energy storage cost trajectory per technology 2014-24

Source: Adapted from IFC (2017a)

4.2.2. Distribution/ancillary services

Grid management: Municipalities may also be interested in storage as a means to take advantage of electricity price arbitrage[21] in the peak vs off-peak tariffs offered to them by Eskom. This could represent a need of almost 2 GW of additional daily balanced energy storage, and private sector/customer side investment in demand-side management and backup power with a market value of R5 billion by 2035.

4.2.3. Utility services

Replacing gas with energy storage: From a storage perspective, Eskom has a monopoly on the value chain up to behind-the-meter applications. In late 2018, Eskom revealed that it would put on hold the development of its 100 MW Kiwano CSP project in the Northern Cape in favour of a battery storage development project. This occurred at the same time that the Minister of Mineral Resources and Energy indicated that IRP 2018 allocation for gas could be replaced with any form of energy storage that could provide similar services. As noted, this could represent a market of between R15 billion and R30 billion by 2030 (GreenCape estimates), based on the replacement of at least 50% of South Africa's gas-fired power (± 6 GW) as a resource adequacy application.

[21] Arbitrage refers to the use of stored capacity (stored during periods of low electricity tariffs) and then used during peak tariff times (thereby avoiding some of the high peak tariffs)

Table 16: Barriers and drivers of the energy storage opportunity

Drivers	Barriers
Load shedding has created the need for the provision of backup power to ensure security and resilience of the power supply. This is the key value proposition of a behind-the-meter (BTM) battery system.	**Battery specific PPA or lease agreement.** While the BTM battery storage market is on the rise, and its system costs are continually in decline, it could be further accelerated by focused financing mechanisms, e.g. tariff structures, incentives or battery-specific lease agreements (PPAs), to reduce the still high upfront costs.
BTM battery prices have declined considerably and consistently since 2016 (as depicted in Figure 13).	**Lack of rules and regulations** that would place behind-the-meter energy storage on an equal playing field with large central generators.
Increase in renewable energy uptake. As more and more wind and solar systems come online, battery storage will be important in unlocking the integration of these renewables in the grid. Moreover, as rooftop solar adoption increases, batteries will be needed to provide energy when the sun does not shine.	**Wholesale and retail electricity tariffs are not cost reflective.** Not all customers are on time-of-use tariffs, and the peak/off-peak differential for those who are, does not accurately reflect the cost of generation, transmission, and distribution.
Electric mobility is gaining momentum, and with it the demand for lithium ion batteries (LIBs). In fact, batteries currently make up 40% to 50% of the total cost of an electric vehicle. As these technologies and sectors evolve, the demand for batteries will too.	There are **no regulations defining the role played by storage** at any point in the value chain. However, the IRP 2019 makes provision for the development of new storage technologies.

4.3. Energy efficiency

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

The South African market is currently dominated (more than 60%) by commercial and agriculture projects, with larger industrial scale projects covering 30% of the market as seen in Figure 14.

According to the Alliance for an Energy Efficient Economy (AEEE) and Bureau of Energy Efficiency (BEE) In South Africa, the average project size is relatively small. Commercial financing is not suited for small projects. Large ESCos have difficulty justifying transaction costs for smaller projects. Figure 15 below details the average capital cost of energy efficiency projects in South Africa.

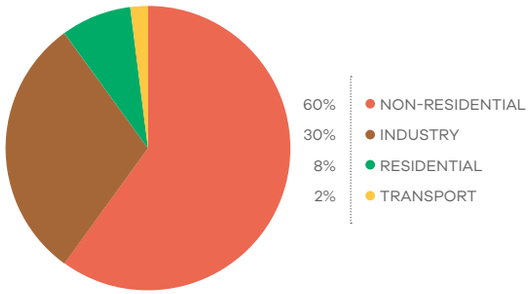


Figure 14: Number of energy efficiency projects by sector in South Africa

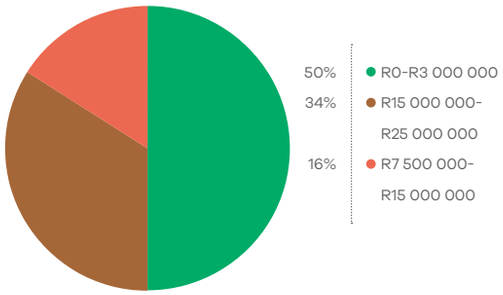


Figure 15: Average capital cost of energy efficiency projects in South Africa

Without the capability to bundle projects, or the creation of financing options for standalone ESCos to undertake projects of less than R3 million, the ESCo market will struggle to develop further. Additionally, there is a perception among lenders of non-standard projects being high risk, which has resulted in preference for shorter guaranteed savings type contracts (one to two years) as opposed to longer term shared savings models.

On the back of these market conditions, many energy service companies have undertaken a specialisation approach focusing on specific niche markets. One of these markets is the modernisation of buildings in the public and private sector. Modernisation is more than building and system upgrades It focuses on maximising the assets that are already operational in terms of functionality, energy performance, and aesthetics.

4.3.1. ESCo specialisation – modernisation of buildings for energy efficiency

The South African resource efficient (green) building and construction sector presents an exciting opportunity for ESCo specialisation. The national market for resource efficient green buildings has grown exponentially since 2010, and is expected to be valued at R13.6 billion by 2020 (IFC 2017b). To date, more than 400 buildings have been certified by the Green Building Council in South Africa across its various categories, saving ~600 million kWh of energy per year (GBCSA 2019).

New buildings only make up ~5% of total buildings in South Africa, and retrofitting of existing buildings is expected to become the largest sector within the green building industry by 2020. In the public and private sector, there are opportunities for ESCos to provide energy efficiency retrofits, such as LED lighting, HVAC optimisation, and smart metering. Shifting from new green buildings to resource efficiency retrofitting is expected because demolition and rebuilding is not a financially viable option for most owners. Besides, buildings have long lifespans. They require upgrades to keep up with changing business needs, and to avoid the depletion of natural resources. Table 15 below details the relevant barriers and drivers for this opportunity.

Table 17: Barriers and drivers of the ESCo specialisation opportunity

Drivers	Barriers
Legislative and regulatory changes make the built environment more conducive to investment for resource efficiency. The Post-2015 National Energy Efficiency Strategy aims for South Africa to have energy-efficient buildings by 2030. The Plan requires a 50% reduction in energy consumption for public buildings, and a 37% reduction for the commercial sector from 2015 to 2030.	**Many buildings are rented.** Tenants may not have the authority or finances to make capital charged improvements to the building. Owners may also be reluctant to make large investments for energy retrofits because they fear that they may not be able to recoup the investment.
Rising energy prices (See Section 2.2.1)	**Economic downturn** may mean that it is not affordable, merely for the sake of upgrading, to change aspects of a building that are not necessarily broken.
Falling cost of energy efficient building technologies (See Section 2.2.1)	**Lack of local manufacturing industry for energy efficient technologies.** For public sector tenders or clients who have to procure locally, the cost of procurement is high because there are very few local manufacturers of energy efficient technologies.

© GreenCape

5
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.

For general funding opportunities visit:
www.greencape.co.za/content/financing-solar-pv/

5.1. General database web page

The GreenCape Finance Desk hosts a web page[22] with a number of Green Finance resources that cover funding and incentives available to companies in the green economy. A few of the available database are highlighted below.

5.1.1. Green Finance Database

In conjunction with the South African National Energy Development Institute (SANEDI), GreenCape maintains a database of funding sources and primarily dti-driven incentives that may be relevant to green economy investors. The database contains information on more than 100 funding opportunities, including an overview of the opportunity and its 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[23].

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[24].

5.1.3. Finfind database

Finfind[25] is an innovative online finance solution that brings together SME 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.

5.1.4. AlliedCrowds database

AlliedCrowds[26] 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.
- You can also contact Allied Crowds to create a customised funding database for you.

This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

22 https://www.greencape.co.za/content/focusarea/green-finance-databases
23 https://www.greencape.co.za/assets/Uploads/GreenCape-Finance-Database-v6.xlsx
24 https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf
25 www.finfindeasy.co.za
26 https://alliedcrowds.com/

© City of Cape Town

6
The Western Cape: Africa's green economy hub

The Western Cape is a world-class investment destination.

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 (RE) 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:

InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

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 non-financial 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 SADC market.

Atlantis is a great location and development ready. 93 hectares of zoned City of Cape Town land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links and fibre connectivity. 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 information, contact the SEZ's:
interim Chief Executive Officer, Pierre Voges
pierre@wesgro.co.za

7
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.

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.

We have facilitated and supported R17bn of investments in renewable energy projects and manufacturing. From these investments, more than 10 000 jobs have been created. Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under- used resources, we have to date diverted nearly 63,000 tonnes of waste from landfill.

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, waste and resources.

Figure 16 below shows the different focus areas within each of our programmes.

Benefits of becoming a GreenCape member

We currently have over 1 100 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.

① Renewable Energy
Utility-scale projects, localisation of component manufacturing, incentives & financing options, wheeling & energy trading.

② Energy Services
Energy efficiency & embedded generation, alternative basic electrification, incentives & financing options.

③ Electric Mobility
Electric vehicles and financing options.

④ Alternative Waste Treatment
Municipal decision-making & policy & legislative tools on alternative waste treatment options; small-scale biogas, recycling & reuse (dry recyclables, construction & demolition waste).

Figure 16: GreenCape's focus areas

Support through the International Cleantech Network
GreenCape's membership of the International Cleantech Network (ICN) gives our members access to international business opportunities in countries where other cleantech clusters are based (mainly Europe and North America).

⑤ Western Cape Industrial Symbiosis Programme (WISP)
The team matches businesses to share unused resources, cut costs & create value. They also support entrepreneurs to identify & realise new business opportunities in the waste industry.

⑥ Water
Water provision & economic development; greentech opportunities for water use efficiency, treatment & reuse, business water resilience.

⑦ Sustainable Agriculture
Precision-, conservation- and controlled environment- agriculture; valorisation of wastes to high value bio- products, including bio-energy.

To become a member or to get your ICN passport, please contact GreenCape or visit our website: www.greencape.co.za


© GreenCape

8
References

Alliance for an Energy Efficient Economy (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 01 November 2017.

Department of Tourism. 2017. The Green Tourism Incentive Programme. Available from: <https://goo.gl/XkWBkK> Accessed 01 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 01 November 2019.

Eskom. 2017. Historical average price increase. Available from: <https://goo.gl/eaAC9W> Accessed 08 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 12 October 2018.

Green Building Council of South Africa (GBCSA). 2019. 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 14 January 2020.

Energy Market Trends 2019. 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 12 October 2019.

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 07 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 30 October 2019.

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

International Finance Corporation. 2017b. Green buildings market intelligence: South Africa company profile. Available from: <https://goo.gl/ciscic> Accessed 04 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 25 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 19 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 06 November 2017.

National Cleaner Production Centre South Africa (NCPC-SA). 2017. Annual Highlights 2016/17. Available from: <https://goo.gl/HtnkQR> Accessed 02 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 03 November 2017.

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 29 November 2017.

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

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

SALGA. 2018. 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-October-2018.pdf> Accessed 30 October 2019.

SALGA. 2018. 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 27 November 2017.

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

SAWEA. 2018. Vision and Purpose. Available from: <https://sawea.org.za/about/> Accessed 16 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. 2017. CPI History. Available from: <http://www.statssa.gov.za/publications/P0141/CPIHistory.pdf?> Accessed 08 November 2017.

Western Cape Government
Economic Development and Tourism
BETTER TOGETHER.

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