Energy services

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2018
Market Intelligence Report

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GreenCape

GreenCape

GreenCape is a non-profit organisation that drives the widespread adoption of economically viable green economy solutions from the Western Cape. We work with businesses, investors, academia and government to help unlock the investment and employment potential of green technologies and services, and to support a transition to a resilient green economy.

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AD	Anaerobic digestion
AMEU	Association of Municipal Electricity Utilities
B-BBEE	Broad-Based Black Economic Empowerment
Capex	Capital expenditure
CCA	Customs-controlled area
$CO2_e$	Carbon Dioxide equivalent
CoCT	City of Cape Town
CSP	Concentrated solar power
CTP	Climate Technology Programme
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEDAT	Department of Economic Development and Tourism (Western Cape)
DFI	Development Finance Institution
DoE	Department of Energy (National)
dti	Department of Trade and Industry
EE	Energy Efficiency
EG	Embedded Generation
EPC	Engineering Procurement Construction
ERA	Electricity Regulation Act
ES	Energy Services
ESt	Energy Storage
ESC_O	Energy Services Company
FDI	Foreign Direct Investment
GFD	Green Finance Desk
GIB	Green Investment Bank
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Society for International Cooperation)
GOF	Green Outcomes Fund
GTIP	Green Tourism Incentive Programme
GW	Gigawatt
GWh	Gigawatt-hours
IDC	Industrial Development Corporation
IEA	International Energy Agency
IEP	Integrated Energy Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kW	kilowatt
kWh	kilowatt-hours
kW_p	kilowatt-peak
LCOE	Levelised Cost of Electricity
MIR	Market Intelligence Report

Mt	Megatonnes
MW	Megawatt
MWh	Megawatt-hours
MW_p	Megawatt-peak
NBI	National Business Initiative
NCPC-SA	National Cleaner Production Centre South Africa
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
PACE	Property Assessed Clean Energy
PAYS	Pay As You Save
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
REIPPPP	Renewable Energy Independent Power Producers Procurement Programme
ROI	Return on Investment
SANAS	South African National Accreditation System
SANS	South African National Standard
SAPVIA	South African Photovoltaic Industry Association
SAWEA	South African Wind Energy Association
SEZ	Special Economic Zone
SME	Small- and Medium-sized Enterprise
SSEG	Small-Scale Embedded Generation
Stats SA	Statistics South Africa
VAT	Value added tax
VCC	Venture Capital Company
WWF SA	World Wide Fund for Nature South Africa

Exchange rate used

1 USD = R13.63 (December 2017)

Executive summary

This market intelligence report is written for investors, equipment suppliers, project developers and technical advisors. It highlights opportunities in embedded generation and energy efficiency created by South Africa's diversifying energy services market.

The term 'energy services' (ES) is used to describe two key energy market segments in the South African energy space, namely (i) small-scale embedded generation (SSEG), which includes rooftop solar photovoltaic (PV) systems and energy storage, and (ii) energy efficiency. These market segments are increasingly bolstered by the offerings in the energy finance sector, which in and of themselves, also present opportunities to financial investors.

There are a number of factors driving growth in the SSEG and energy efficiency markets. Above-inflation electricity price rises, decreasing technology costs and supportive policies and regulations have motivated many individuals, businesses, industry and government to adopt alternative energy service options. These drivers are creating four notable opportunities:

The national embedded generation market for installations, operation and maintenance of rooftop solar PV has grown in the past 12 months. PQRS, a local solar PV data and quality assurance entity, has documented an installed capacity increase by as much as ~110MW_p throughout South Africa (possibly as high as 250MW_p). It is expected that the total annual available market could continue to grow at this rate to a saturation point of ~500MW_p installed per year on an ongoing basis. This market could reach a total of 7.5GW of installed capacity by 2035, creating ~14 jobs per MW_p installed. At a cost of R10/W_p this installed capacity growth represents a total available market of R5 billion a year and a total available market of R75 billion by 2035.

One growth driver is the falling price of technology – the average payback period for a 100kW_p system is 5-7 years, which is attractive and entirely affordable for the industrial and commercial (C&I) sector, a key market for systems of this size. In fact, the C&I sector has been leading investments, with ~70% of new rooftop solar PV installations nationally in this sector.

The rapid uptake of solar PV over the past three years has caught national regulators by surprise and has highlighted the need for new national policies and regulations to guide and regulate the solar PV market. At a local level, there will also be a need for policy and regulation to govern the safe uptake of solar PV. Municipalities will need the support of the national energy regulator and national and provincial government to do this. Progress has already been made at a municipal level, with 35 municipalities across South Africa having introduced rules and regulations to allow SSEG to connect to and feedback on the municipal electrical grid. Of these, 21 municipalities in the Western Cape are allowing SSEG, of which, 15 have National Energy Regulator of South Africa (NERSA) approved tariffs in place. These 'grass roots' developments have led to a national policy change that could point towards the start of a transformation to a more decentralised and liberalised power generation and distribution sector, which will empower investors and increase end-users' energy choices.

1 Covers the construction of green buildings (energy efficient buildings) and green construction (green materials and construction techniques)
2 Not included in EE numbers

With increasing demand in embedded generation, the SA **energy storage** market is expected to grow to R14.5 billion by 2035, becoming a keystone of the future energy services market. This will create opportunities for investors, manufacturers, suppliers and energy end-users in the energy storage value chain.

Energy efficiency presents a significant opportunity to investors and businesses in all sectors. The estimated annual total available market currently stands at R3 billion, reaching an estimated R21 billion by 2035.

Energy services companies (ESCos) are beginning to offer sector-specific solutions, which include technology changes and other, targeted energy efficiency offerings. This report highlights the green building construction[1] and manufacturing sectors (food and beverage processing, and clothing and textiles), two high GDP-contributing sectors within the country. The national energy efficiency market in the green building construction sector[2] is expected to be valued at R13.6 billion by 2020 (IFC 2017b).

Innovative energy finance is both an opportunity for financial investors and, together with incentives, a driver of other opportunities in energy services. Property Assessed Clean Energy (PACE) is one example of a financing mechanism that is being explored in South Africa, which presents a significant opportunity to ESCos, property owners, investors and municipalities.

What's new?

This MIR provides an update on the opportunities, barriers and regulations discussed in the 2017 Energy Services MIR. It also outlines new opportunities and barriers in small-scale embedded generation, energy efficiency and energy finance.

New or updated content covered in this MIR includes:

- **Licence requirements for embedded generation:** Changes to Schedule 2 of the Energy Regulation Act (ERA) were published in the Government Gazette in November 2017, which change the requirements for licences for different scales of generation. Section 3.1 discusses this amendment and explores its implications as an enabler / barrier to small-scale embedded generation (SSEG).
- **Financial viability of rooftop PV:** The cost of PV and availability of different kinds of finance affect the financial viability of rooftop solar PV. Section 4.1.2 examines the financial viability of rooftop PV and provides PV price benchmarks based on key industry expert engagements. The section also outlines options available to businesses to finance an installation.
- **Energy service companies (ESCos):** Opportunities for sector-specific ESCo specialisation in green building / construction and manufacturing are highlighted in Section 4.2.1.
- **Energy finance**, through its financing mechanisms and incentives, is presented in Section 4.3 as both an enabler of and opportunity in the energy services sector.

1 – Introduction and purpose

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

This MIR provides an update on opportunities identified in the 2017 MIR. It highlights new opportunities in embedded generation (rooftop solar PV and energy storage), energy efficiency and energy finance in South Africa.

The **sector overview** (Section 2) provides a national and provincial economic overview of the energy services market, including the growth drivers, key industry players and size of the market. This is followed by an overview and update of **legislation, regulations and policies** (Section 3) that guide and affect the ES market.

In Section 4, key investment **opportunities, 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: ES@greencape.co.za

2 – Sector overview

Rising electricity prices, dropping technology costs, numerous supportive energy policies and incentives are prompting consumers to explore alternative energy options. These factors form the major drivers of the energy services (ES) market in South Africa.

This section provides an overview of the national and provincial ES context, covering these primary growth drivers, key industry players and the size of the market.

As noted, the term 'energy services' is used to describe two interlinked energy market segments in the South African energy space, namely small-scale embedded generation (SSEG) (which includes rooftop solar photovoltaic (PV) systems and energy storage), and energy efficiency. Opportunities and offerings in the green finance sector are bolstering this combined market.

A framework for the ES sector is presented in Figure 1 below, together with reference to the sub-sections in this MIR where the opportunities are discussed in more detail.

2.1 International and local market drivers

Several factors are driving growth in the ES market in South Africa. These include:

- rising **energy prices**;
- falling **costs of renewable energy technologies** such as rooftop solar PV;
- supportive **energy policies and regulations** by local and national government;
- **tax incentives and innovative financing** programmes and
- accreditation bodies assuring the **technical competence of installers**.

This report focuses on the first three drivers.

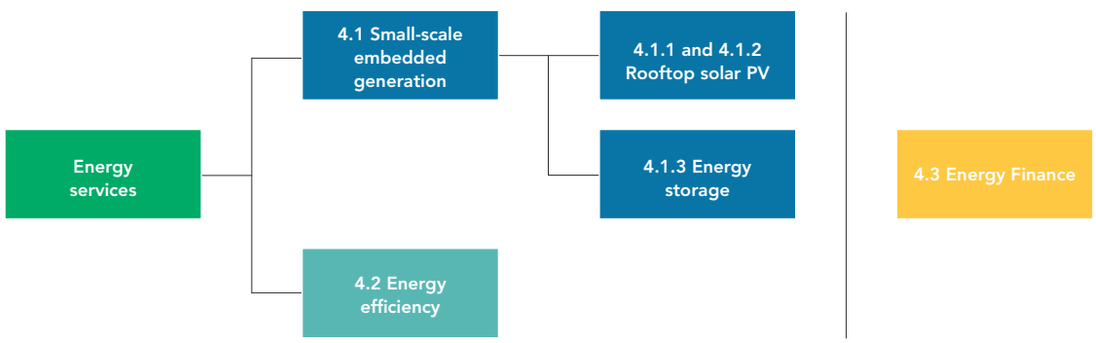


Figure 1: ES sector overview

[3] Eskom is the South African public utility for electricity, with divisions for generation, transmission and distribution. It generates ~95% of electricity used in the country.

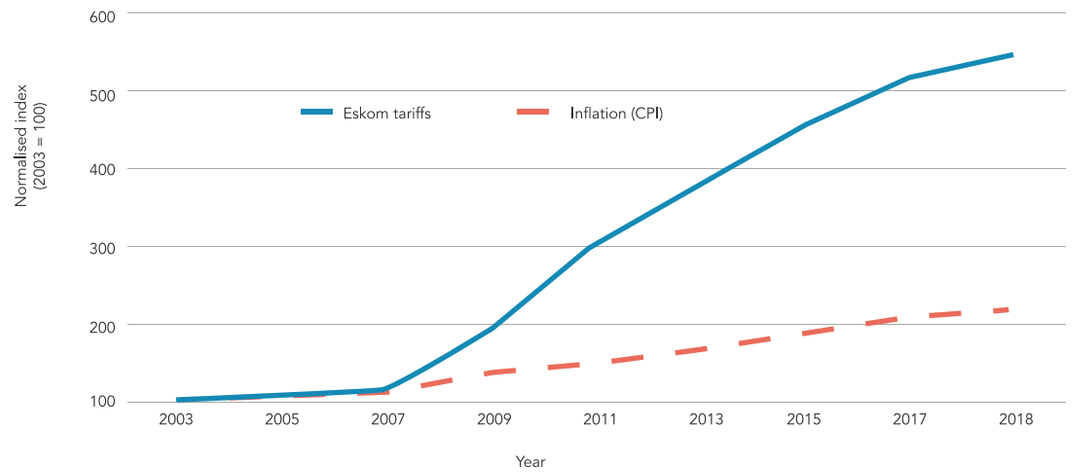


Figure 2: Average Eskom tariff versus inflation (CPI) projected to 2018
Sources: Statistics South Africa (Stats SA) and Eskom (2017)

2.1.1 Rising electricity costs

Rapidly rising Eskom[3] electricity prices have created a sizeable demand for viable alternative energy sources. Figure 2 compares Eskom price increases to the more conservative increase in South Africa's inflation (as reflected by the Consumer Price Index).

If Eskom's application to NERSA for a 19.9% electricity tariff hike in 2018/19 had been approved, this would have translated to an increase in Eskom tariffs of over 500% since 2003. However, as depicted in Figure 2, NERSA only granted Eskom an average tariff increase of 5.2% for 2018/19. Historical data from both Eskom (2017) and Stats SA (2017) show that while inflation has increased by just over 110% since 2003, Eskom prices have increased nearly four times as much as inflation over the past 15 years (also shown in Figure 2).

Rising energy prices, falling RE technology costs and supportive policies and regulations are key drivers of the South African ES market

2.1.2. Decreasing costs of renewable energy technologies

Renewable energy technology prices have been dropping steadily since 2010. Figure 3 shows the international levelised cost of electricity (LCOE) over a period of six years up until 2016 (International Renewable Energy Agency (IRENA) 2017). The dashes on each bar indicate the average cost of the technology in that year. For example, the global average price for solar PV in 2016 was R1.78/kWh, down from R4.74/kWh in 2010 (IRENA 2017), i.e. a 62.5% drop in six years. The most significant decreases in average cost have been in solar PV, solar thermal, and wind technologies (on- and offshore).

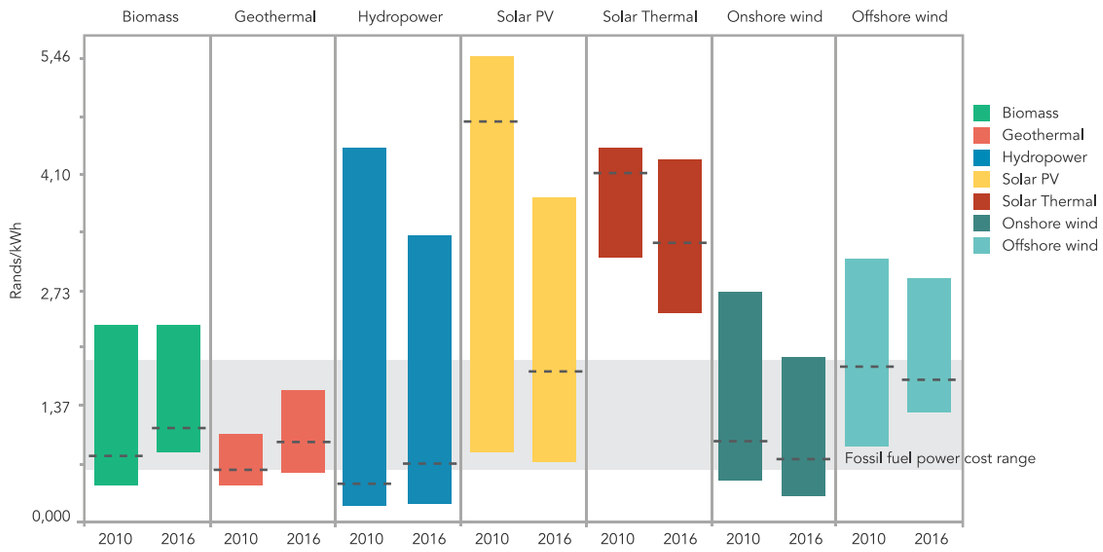


Figure 3: International levelised cost of electricity (LCOE) 2010-2016 (Rand/kWh)
Source: Adapted from IRENA (2017)[4]

In South Africa, this trend is also evident in the embedded generation sector, where the levelised cost of solar PV installations has decreased significantly, regardless of size, as depicted in Figure 4.

Eskom prices, on the other hand, have increased at similar rates, as illustrated in Figure 2 and Figure 4. As these costs drop across a variety of ES technologies, the financial case for investment into energy interventions improves.

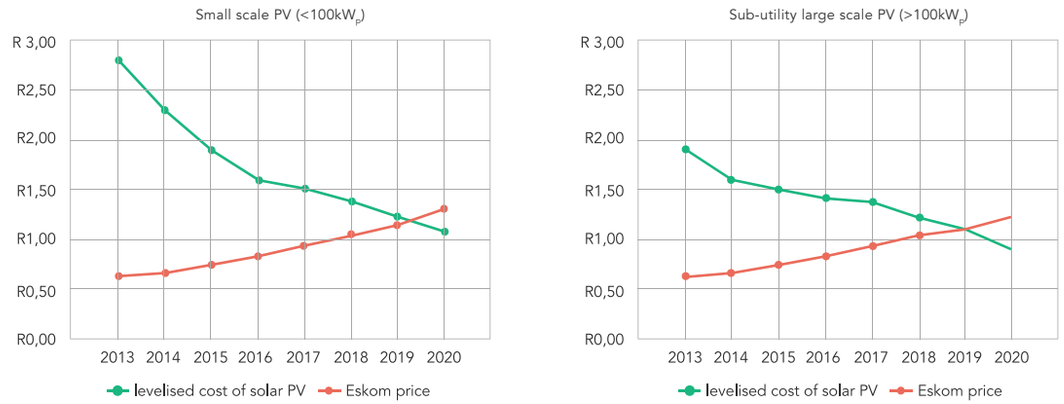


Figure 4: PV price curve for systems smaller than 100kW$_p$ (left) and larger than 100kW$_p$ (right), projected to 2020
Source: GreenCape Analysis

4 | Exchange rate: 1 US Dollar = R13.63 (December 2017)

2.1.3. Supportive policies and funding opportunities for ES

To lower demand on the national grid, and to reduce carbon emissions, several energy policies and incentives have been put in place to encourage energy efficiency interventions and alternative energy generation. Section 3 (legislation, regulation and policy), Section 4.3 (energy finance) and Section 5.1 (funding opportunities and incentives) discuss these in more detail.

To lower demand on the national grid, and to reduce carbon emissions, several energy policies and incentives have been put in place to encourage energy efficiency interventions and alternative energy generation

2.2. Key players

Figure 5 highlights the ES value chain and key players in the value chain, with the roles of specific actors outlined in Table 1. 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 and, 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.

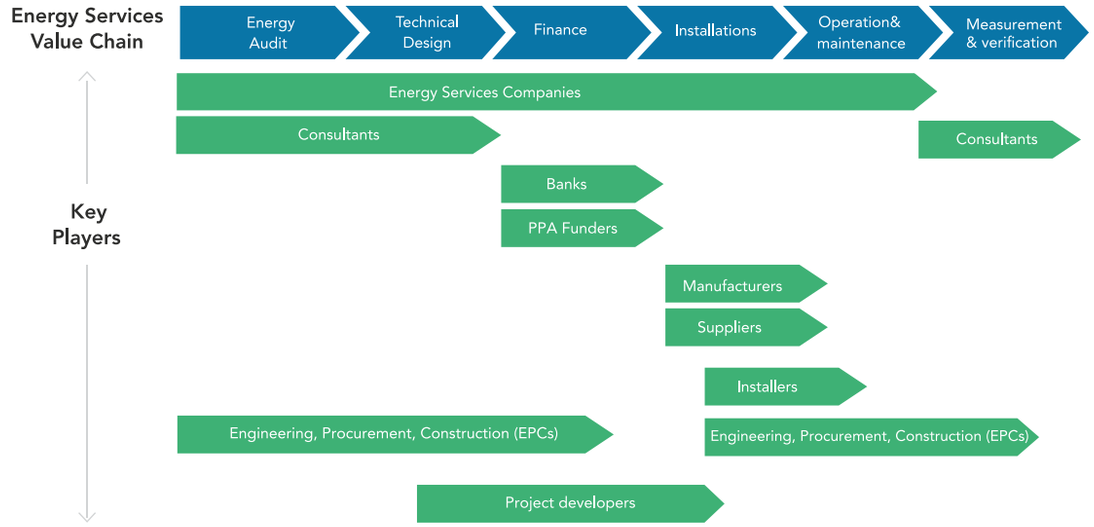


Figure 5: ES market value chain
Source: GreenCape Analysis

Table 1: 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 ESCos-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, lawyers and others.
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 & construction (EPC) company	EPCs design interventions, procure and install tailored turnkey energy efficiency and/or renewable energy solutions.
Project developers	Project developers handle tasks that focus on moving the project along toward a 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.

2.2.1. Nature of the value chain

As with much of South Africa's green economy, the ES value chain is dominated by small and medium enterprises (SMEs). According to a 2016 Moody's investors service report, South Africa had the world's fastest growing green economy in 2015. As the market continues to develop, disruption, more so than traditionalism, 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 existing opportunities.

2.2.2. Governance

National government

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

- **The Department of Energy (DoE)** is the custodian of all energy policies and energy security in South Africa.
- **The Department of Trade and Industry (dti)** is responsible for commercial policy and industrial policy.
- **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 DoE as the custodian department. NERSA's main energy services-related responsibilities are:
  - licensing and registrations;
  - pricing and tariffs;
  - promoting competition; and
  - compliance-monitoring & dispute resolution.

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.

2.3. Total available ES market

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 – energy efficiency, solar PV[5] and energy storage (the current market is negligible). 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 and diesel generators. Accordingly, the estimate is put forward to represent the ES market as a whole.

5 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

2.3.1. Size of the existing rooftop solar photovoltaic (PV) market

One of the major contributors to growth in the ES market has been the demand for rooftop solar PV. According to PQRS, a local solar PV data and quality assurance entity, by 2016/17 there was a total of 90 260 verified[6] (~180MW$_p$) installed solar PV rooftop systems throughout South Africa valued at R2.7 billion (PQRS 2017a). This number does not include the 48 067 systems which were identified, but not verified. Estimations based on actual solar PV panel sales figures suggest that installed capacity could be closer to ~430MW$_p$, based on the PQRS (2017b) methodology.

Between November 2016 and November 2017 PQRS documented an installed capacity increase of ~110MW$_p$ throughout South Africa. Scaling this capacity, as done above, would suggest that the actual installed capacity over the last year could be closer to 250MW$_p$.

The total annual available market could continue to grow at this rate to a saturation point of ~500MW$_p$ installed per year, reaching a total of 7.5GW of installed capacity by 2035. At a cost of R10/W$_p$, this installed capacity growth represents a total available market of R5 billion a year and a total available market of R75 billion by 2035.

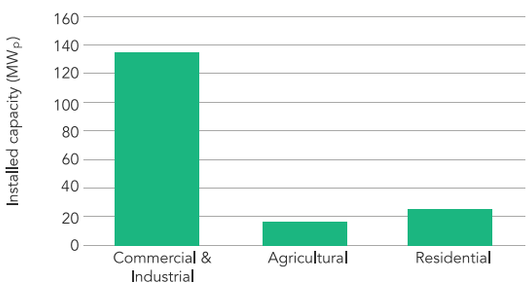


Figure 6: Distribution of solar PV installations across end-user segments in South Africa
Source: PQRS (2017a)

The total available market for solar PV is ~R5 billion a year and ~R75 billion by 2035

According to PQRS (2017a) the commercial and industrial (C&I) sector in South Africa presents the largest near-term opportunity for installations, with ~70% of the total verified systems (~180MW$_p$) installed in that sector (see Figure 6). 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, and therefore stands to gain considerably from installing rooftop solar PV through the various contracting models available to them. Businesses in this sector also often operate from large premises with large roof spaces, which are attractive from an installation point of view.

2.3.2. Size of the existing energy storage market

The South African market for energy storage is in its infancy. 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 customers.

The commercial and industrial sector presents the largest near-term opportunity for solar PV installations, with ~140 MWp installed to date

Therefore, the size of the existing energy storage market is negligible. However, energy storage is expected to become the keystone of the future SSEG market. Our forecast for potential market size is detailed in Section 4.1.3.

6 | Installations are considered 'verified' if an inspection has been done and a date of commission has been specified.

2.3.3. Size of the existing energy efficiency market

Energy efficiency measures can save companies significant amounts of money, while often costing very little. This is reflected in the findings of the National Business Initiative (NBI) through its now discontinued Private Sector Energy Efficiency (PSEE) programme. The 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 2 (NBI 2016).

Although the current market for energy storage is negligible, it will become a keystone of the future SSEG market.

The current 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 Table 2 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) (2017) calculates South Africa's annual energy use to be ~868 TWh, with electricity making up ~200TWh 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 7 (IEA 2017).

Table 2: 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)

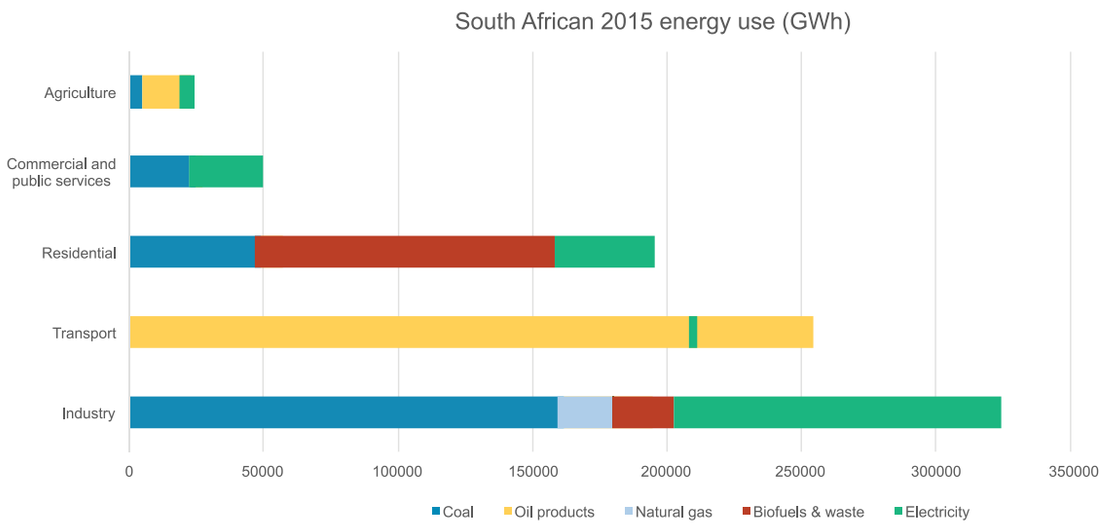


Figure 7: 2015 energy consumption in South Africa (GWh)
Source: International Energy Agency (2017)

If it is conservatively assumed that annual energy savings of 15% of total energy consumption is possible (the PSEE programme findings show 20-35%), then potential energy efficiency savings could be as much as 30 TWh.

At a 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 R21 billion by 2035.

The estimated annual market for energy efficiency is ~R3 billion, and could reach ~R21 billion by 2035

3 – Legislation, regulation and policy

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) 2017.

3.1. Legislation and regulation

Electricity Regulation Act 4 of 2006 and 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 Act**, 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 Energy (DoE), through the ERA, requires that all generation must be registered with NERSA and that a generation licence must be obtained except in the following scenarios:

- Through exemptions, applicable in the following cases:
  - If the generation facility is < 1MW and connected to the national grid and supplies a single customer (irrespective of wheeling status); 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 Energy has not published a notice in the Government Gazette stating that the installed capacity (MW) allocated in the 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 and is off-grid and not having an interconnection agreement[7] 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 which 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 has declared non-compliance with the Schedule to NERSA and signed an agreement to comply within a time frame 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. 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): It is mandatory for all energy users consuming above 180 TJ per year to submit their energy consumption data to the DoE. 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 2017: In the first draft Carbon Tax Bill, it was envisaged that a carbon tax proposed by the National Treasury would be implemented, commencing in 2017 at a rate of R120 per ton of carbon dioxide equivalent (CO2e) on direct emissions, increasing by 10% per year until 2020. Tax-free allowances of between 60% and 95% would be provided, based on trade exposure, fugitive emissions, carbon budgets compliance and other factors (National Treasury 2016a).

With exemptions, it means that the actual payment would range between R6 and R48 per ton.

The National Treasury published the Second Draft Carbon Tax Bill in December 2017. It will be used for introduction in Parliament, as well as for public comment and convening of public hearings by Parliament early in 2018. Following this process, a revised Bill is expected to be formally tabled in Parliament by mid-20188. It is expected that the Carbon Tax Bill will be passed later in 2018 and that the tax will be implemented from 1 January 2019. This would especially affect businesses with high fuel and electricity consumption. The impact of this tax on the uptake of solar and other renewable forms of energy will be interesting to witness.

7 | An interconnection agreement is an agreement between the generator and the local electricity distribution licensee.

3.2. Policy

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 IRP framework. The white paper effectively supports the national Department of Energy's (DoE) mandate to ensure secure and sustainable provision of energy for socio-economic development by suggesting that it pursue energy efficiency programmes, which are one of the lowest cost options for reducing energy consumption.

Integrated Energy Plan (IEP) 2010: The IRP is developed in the context of the Integrated Energy Plan (IEP), which guides the country's broader energy needs. The IEP was also developed in terms of the National Energy Act of 2008. This 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. The primary difference between the IRP and IEP is that 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. It is expected that the updated IEP will be released at the end of March 2018.

Integrated Resource Plan (IRP) 2017: First promulgated in 2011, the IRP guides electricity provision in South Africa. Its custodian is the DoE. The IRP, a living document that the DoE is to update every two years, provides 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). The IRP provides guidance for future energy infrastructure investments and thus largely determines the country's generation mix.

Since publishing the Integrated Resource Plan for Electricity (IRP 2010-2030) in 2010, the DoE released a draft update in November 2016 by way of the Draft IRP 2016 for comment and input through a public participation process. Solar PV, wind and landfill gas are included as options for new-build RE in t his draft. Concentrated solar power (CSP) and Anaerobic Digestion (AD) have been excluded because they are not yet cost competitive enough to be considered in a least-cost base case at utility scale. However, this IRP has come under much criticism for its technology costs that are inconsistent with those on the ground, and arbitrary constraints. Currently, NERSA is not granting generation licences or providing letters of exemption from licensing until the IRP 2017 has been finalised. The IRP 2017 is expected to be published at the end of March 2018.

8 | For more information on national documents for public comment regarding carbon taxes: https://goo.gl/hqNuay

4 – Opportunities, drivers and barriers

The evolving South African energy landscape creates opportunities for investors, financiers, project developers, component manufacturers and suppliers in embedded generation (rooftop solar PV and energy storage), and energy efficiency markets. These opportunities are further supported by developments in the energy finance sector.

The following opportunities have been identified through engagement with an array of ES and green economy stakeholders:

Embedded generation:

- **Rooftop solar PV:** Total annual available market of R5 billion and a total available market of R75 billion by 2035 with opportunities for investors, project developers, equipment suppliers and technical advisors. Market drivers include a supportive municipal regulatory environment, innovative contracting models and competitive payback periods due to cheaper technology.
- **Energy storage:** R14.5 billion market, with opportunities for private sector (demand charge reduction and backup power), municipalities (frequency regulation and distribution deferral) and for Eskom (transmission and distribution deferral).

Energy efficiency:

- **Energy efficiency market:** Potential to grow to R21 billion by 2035 with resulting annual energy efficient savings of as much as 30TWh as sector-specific opportunities are unlocked.
- **Energy efficient green buildings market:** R13.6 billion market, with opportunities for investors in the construction sector and for ESCos that can specialise in offering services to this growing sector.
- **ESCo specialisation:** With lighting and other generic opportunities largely saturated, ESCos are beginning to offer solutions specific to the individual concerns of certain sectors. These specialisations include technology changes and other targeted energy efficiency offerings.

Energy finance:

- **Property Assessed Clean Energy (PACE)** is a municipal financing scheme that offers financing which is repaid as an assessment on the property's rates bill. This represents a key route to market and a means of "bundling" projects for energy investors.
- **Bank offerings** for financing ES investments from the various commercial South African banks.

Using the total available market for solar rooftop PV systems installed in the country, energy storage (detailed in Section 2.3.1 and 2.3.2), and capital leveraged in energy efficiency interventions implemented by South African energy users[9] (detailed in Section 2.3.3), the estimate for South Africa's total available ES market is valued at ~R110.5 billion by 2035.

9 | Excluding green construction

Before discussing these opportunities in more detail, it is important to consider some general barriers within the ES sector. These include:

- **A lack of knowledge about solar PV,** legal and regulatory requirements, and financing options available to companies, on the part of corporate decision makers.
- **A lack of information on available contracting models** provided by different types of investors.
- **Uncertainty** regarding the reputation of EPCs and ESCos in the ES sector, on the part of businesses, which leads to delays in appointment.

4.1. Embedded generation

Metropolitan municipalities are challenging the 'single buyer' model whereby Eskom is given exclusive rights to procure electricity from generators of electricity for resale, including electricity from renewable energy IPPs. A change in this model would give SSEG investors opportunity to sign alternative offtake agreements with municipalities, improve potential returns, and create new business cases.

As the verified installed market for rooftop solar PV (detailed in Section 2.3.1) is only a representation of installations that have been verified, the actual total installed capacity is considerably larger. A potential total market size for South Africa of R75 billion by 2035 may be achieved if a (conservative) installed capacity of ~500MWp / year is reached. The installation of an additional 500MWp in one year translates to the potential creation of ~7000 installation and maintenance jobs[10].

4.1.1. Municipal uptake of SSEG

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 DoE and NERSA, changes in municipal regulation of SSEG installations have contributed to increasingly conducive market conditions for investors, project developers, equipment suppliers and technical advisors. Two major changes are taking place on the local government level:

Small-scale wind generation

While the REIPPPP was temporarily stalled, project developers began to look for alternative markets for wind energy, with small-scale wind emerging as an opportunity in the embedded generation space. One of the factors driving the uptake of small-scale wind projects is the availability of refurbishable turbines from European markets. As these turbines reach the end of their useable life, a local refurbishment market opens up. This market can capitalise on the amendments to Schedule 2 of the Energy Regulation Act (detailed in Section 3.1.1) which exempt generators smaller than 1 MW in size from needing a licence.

- Metropolitan municipalities around the country (specifically City of Cape Town 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 IPPs, and plan to allow feed-in from generation systems, some of which are less than 1 MW. The municipalities have also committed to purchasing hundreds of megawatts of renewable energy by 2020, presenting a significant opportunity for ES investors. Beyond direct sales from IPPs to municipalities, there are two other options for local generators to increase their access to off-take agreements, thus creating new business cases and greater returns.

  – Electricity wheeling will allow IPPs to wheel their energy to a willing buyer anywhere in the municipality or country.

  – The release of regulations allowing private sector energy trading has also opened the market to private sector power purchase agreements and on-sales to private consumers using the national and local distribution networks.

- By the end of the 2017/18 financial year, 35 municipalities in South Africa have published SSEG regulations[11], including five of the eight metropolitan municipalities (as seen in Table 3). 21 of these municipalities also have NERSA-approved SSEG tariffs for one or more customer groups – these 21 represent approximately 10% of all the municipalities that have electricity distribution licences[12].

These changes at municipal level complement other regulatory changes (e.g. changes in Schedule 21 of the Electricity Regulation Act) and together herald a freer, more 'liberalised' electricity market, in which municipalities and end users will be more empowered in their energy choices.

Table 3: Small-scale embedded generation in the metropolitan municipalities of South Africa

Metropolitan municipality	Province	Allow SSEG
Buffalo City	Eastern Cape	No
City of Johannesburg	Gauteng	Yes
City of Cape Town	Western Cape	Yes
City of Tshwane	Gauteng	Yes
Ekurhuleni	Gauteng	No
eThekwini	KwaZulu-Natal	Yes
Mangaung	Free State	No
Nelson Mandela Bay	Eastern Cape	Yes

Certification programmes likely to stimulate demand for embedded generation

With growth in the SSEG solar PV market, the industry has been formalising with a view to becoming more sustainable and robust. However, even though there is demand for solar PV from the C&I sector, companies are not always certain with which EPCs to work, which often leads to unnecessary procurement delays. Programmes that ensure the safety and technical compliance of SSEG installers and installations present investors with a reduced risk profile when investing in SSEG. Two such programmes are the SAPVIA PV GreenCard and PQRS's P4 Platform.

PV GreenCard

The South African Photovoltaic Industry Association (SAPVIA) launched the PV GreenCard accreditation programme in 2017 to promote high-quality solar PV installations (PV GreenCard 2017). Essentially, it is an as-built report for the system owner, and a safety certification, quality assurance standard and training programme for the installer. The database lists EPCs registered with the Department of Labour that have safely completed installations at well-known, reputable companies that have complied with all municipal requirements. To be issued with a PV GreenCard, the installer must comply with all the applicable standards and safety guidelines 'from the system design, to the choice of components, to installation and grid connection and final commissioning' (PV GreenCard 2017). It is expected that this accreditation will inspire investor confidence and put the solar PV system owner and potential owners at ease.

P4 Platform

PQRS developed the PQRS PV Performer Platform (P4 Platform), a quality assurance platform, to score PV contractors on performance, knowledge and best practice. This is done by measuring five performance metrics in as many steps, after which a performance certificate is awarded. These steps are:

10 Based on Alternative Information & Development Centre's job calculator, which was developed after a 2016 review of the REIPPPP and using methodology followed in the DoE's localisation study. This translates to ~14fte jobs/MW installed.

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

12 To see a list of municipalities that allow SSEG, please visit: https://goo.gl/GDNQkS

- Agreeing to the platform's Terms and Conditions;
- Taking the online P4 PV theoretical test;
- Evaluating random installations using a visual evaluation form;
- Listing solar PV installations done by the organisation on the PQRS directory; and
- Having the end-users' review published on the P4 Platform.

4.1.2. The solar PV business case

Energy services interventions provide notable opportunities for further savings in a number of economic sectors and businesses, which in turn could open up significant opportunities for players in this space. However, based on insights from GreenCape's engagements with PV project developers and installers, less than 5% of engagements between EPCs/ESCOs and decision makers in industry result in deals being concluded. Reasons for this include a lack of general knowledge by decision makers about solar PV, the legal and regulatory landscape, and the financing options available to them.

The financial viability of solar PV depends on a number of factors in the South African context:

- **Installation size** with larger projects producing cheaper electricity as fixed costs such as design and specification are spread over more panels.
- **Modularity: the option to start with a smaller system** and then scale it up later, while still benefiting from it.
- **Technology choice and exchange rate,** as prices still vary and some components have to be imported.
- **Location, roof type and roof direction,** which all influence the amount of sun that reaches the solar PV panels.
- **Financing model selected,** which depends on the client's risk profile or financial standing.
- **Client's present electricity tariff** with higher tariffs increasing solar PV's viability.
- **Client's consumption patterns,** with the more energy used during the day (when the sun shines) the better, particularly if the highest energy use is during this time as Eskom typically charges industrial users a peak or maximum use charge. A peak charge depends on the highest energy use.

Table 4 shows that larger systems are comparatively more financially viable. This suggests that investors should target projects in the C&I sector that have greater power requirements, as the capital cost for the system, PPA tariffs and payback periods make SSEG offerings more competitive.

Table 4: Solar PV price benchmarks (average Eskom/Municipal end user tariff R1-R1.20)

System size	Capital cost of system (cost per kW_p)	ESCo Power Purchase Agreement tariff (price per kWh)
< $100kW_p$	R 13 500 – R 16 000	R 1.20 – R 1.45
> $100kW_p$ and < $500kW_p$	R 11 500 – R 14 000	R 1.05 – R 1.25
> $500kW^p$	R 10 500 – R 13 000	R 0.90 – R 1.15

Source: GreenCape analysis

Investors should target SSEG projects in the C&I sector that have greater power requirements, as the capital cost of the system, PPA tariffs and payback periods make SSEG offerings more competitive

4.1.3. Energy storage

Battery storage is expected to become the keystone of the future ES market (IFC 2017a). The energy storage market could potentially grow to R14.5 billion by 2035 (GreenCape estimates). This is based on replacement of some of South Africa's gas fired power (3.5 GW), Eskom's need for almost 2 GW of additional daily balanced energy storage and private sector/customer side investment in demand-side management and backup power.

The biggest opportunities for the private sector (funded by public investment) are in:

- demand charge reduction and backup power for municipalities,
- frequency regulation and distribution deferral, to an extent, and for the network operator, transmission and distribution deferral.

In the medium and long term there are two drivers for energy storage opportunities in South Africa, namely decreasing technology costs and Eskom's interest in using energy storage to stabilise its grid for RE integration.

These drivers create opportunities for distribution service providers (i.e. municipalities) and end-users to explore the available options for storage, which in turn create opportunities for investors, manufacturers, suppliers and energy users.

Technology costs for energy storage are falling and are nearing the tipping point required for viability in some of the applications shown in Figure 8. It is expected that this will happen within the next 12-18 months. These price reductions are driven primarily by technology developments such as the decreasing price of lithium-ion batteries (IRENA 2015). According to D'Aprile et al. (2016), the average optimal battery size is ~31kWh for it to be considered profitable.

Figure 8 shows various storage applications (RMI 2015), with the five highlighted blue blocks presenting applications with short- to medium-term application potential in South Africa. The diagram presents a variety of storage applications for different categories of the electricity sector, namely:

- **Customer services**, which pertain to electricity end-users;
- **Distribution services,** which involve medium voltage distribution networks (mainly municipalities); and
- **Utility services,** which include electricity transmission (mainly Eskom), but also distribution (both Eskom and municipalities).

The energy storage market could grow to ~R14.5 billion by 2035, driven by the need to replace 3.5 GW of gas fired power, and the need for 2 GW daily balanced energy storage

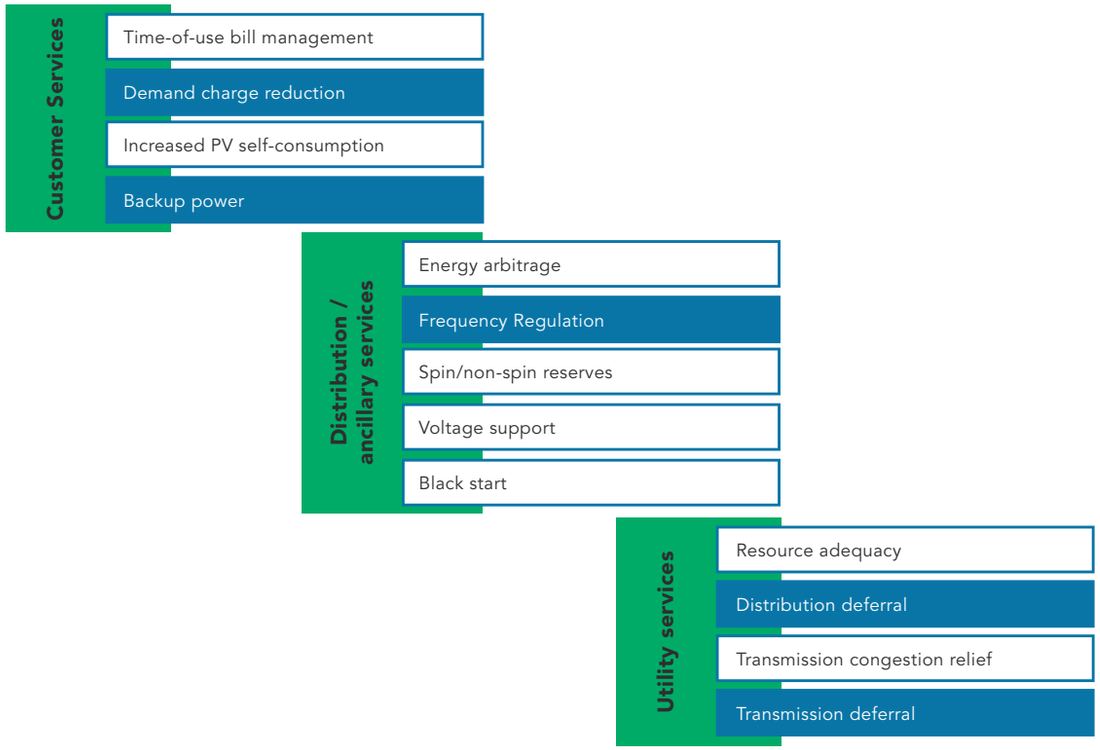


Figure 8: Short- to medium-term battery storage potential applications
Source: Adapted from RMI (2015)

Eskom needs almost 2 000 MW of *additional* daily balanced energy storage within the existing grid to help integrate the renewable energy supplied by IPPs. It is commonly understood that energy storage assists in smoothening the output of wind and solar farms, as well as providing voltage and frequency support to strengthen IPPs' infrastructure. In light of this, Eskom has set up a new battery test and demonstration facility in Johannesburg to identify the right product for its needs. With Eskom working to maintain grid stability and managing 'intermittent' surplus supply due to most of the new coal-based fleet (i.e. Ingula, Kusile and Medupi plants) having achieved commercial operation, energy storage will be a promising solution to managing the fluctuating and intermittent surplus.

Because of Eskom having to manage its surplus capacity and thus having to invest in new infrastructure and intensive maintenance, electricity costs continue to rise. This suggests that while municipalities can explore distribution deferral benefits, the most significant opportunities will come from the 'customer services' block (demand management and backup), which will be exploited by customers looking to optimise energy services available to them.

4.2. Energy efficiency

Energy efficiency presents a significant opportunity to investors across the economy. The commercial sector is showing growing interest in engaging with energy services companies (ESCos) about reducing energy demand and making businesses more efficient.

Policy and regulatory changes, and lower prices, are also driving growth in the green building market. In fact, the national green building market is expected to reach R13.6 billion by 2020 (IFC 2017b). As indicated, the market has the potential to continue to grow, as sector-specific opportunities are unlocked (see Section 4.2.1). The market has the potential to grow to R21 billion by 2035 with resulting annual energy efficient savings of as much as 30TWh as sector-specific opportunities are unlocked.

4.2.1. ESCo specialisation

With lighting and other generic opportunities becoming saturated, ESCos are beginning to offer solutions specific to the individual concerns of certain sectors. These specialisations include technology changes and other targeted energy efficiency offerings. The following are examples of high GDP-contributing sectors within the country for which ESCo specialisation is expected to make sense, and for which markets are beginning to develop.

Green building and construction

The South African green building and construction sector presents an exciting opportunity for ESCo specialisation. As indicated above, the **'green building'** market has grown exponentially since 2010, and is expected to be valued at R13.6 billion by 2020 (IFC 2017b). Primary drivers include the need of the green / energy efficient building industry to 'embrace sustainable practices' (Groves 2017), legislative and regulatory changes, and rising energy prices in South Africa. Another driver is the improved economics of energy efficient building technologies – to date, more than 250 buildings have been certified by the Green Building Council in South Africa, saving 380 million kWh of energy per year (eProperty News 2017).

Untapped opportunities remain for investors in the rest of the **construction** sector, with buildings globally making up the largest portion of the energy efficiency market. The South African construction sector grew by an annual average of 5.3% from 2005 to 2015 compared to the Western Cape GDP, which expanded by 3% over the same period.

Markets are starting to develop for ESCo specialisations in green building and construction, and in manufacturing

Manufacturing

The **food and beverages processing industry** presents a tangible opportunity for uptake of energy efficient processes and solar thermal technologies, as 79% of energy in this sector is used for heat (Lampreia 2014).

There are opportunities for the development of local technologies and manufacturing processes, as well as installation and servicing of installations. The food and beverages industry is largely mechanised, which means that it does not have an extensive workforce. As such, there is more value in process changes than in easily achievable targets and goals such as behavioural change campaigns for employees or changing to efficient lighting. Often the factory, or at least a portion of it, runs for the entire day, which contributes significantly to the energy bill. The biggest energy users are usually the machinery used for refrigeration and heating, and air compressors. Companies that have high heating and cooling requirements present a significant opportunity to ESCos, as the companies may find great value in energy efficiency interventions and solar thermal solutions.

The **clothing and textiles manufacturing industry** is currently undergoing a recovery after rapid destruction of the local value chain more than a decade ago due to cheap and illegal imports. The industry is largely located in the Western Cape and KwaZulu-Natal, and in Gauteng to a lesser extent. Various energy intensive technologies are used in the industry, such as air compressors and boilers. However, some companies claim that air conditioning makes up the biggest portion of their energy bill. High-energy users in this industry present a demand for energy efficiency technologies that can help them reduce their energy consumption.

As an indication of market size for clothing and textile manufacturing companies, the Industrial Development Corporation's (IDC) net funding approved specifically for driving the growth of new and existing companies in the clothing and textiles industries is currently ~R433.5 million. The IDC intends to increase this investment to ~R700 million in the next year alone to develop the sector further (IDC 2017a). This growing market, being stimulated by investments like the ones made by the IDC, represents a largely untapped opportunity for energy ESCos.

4.3. Energy finance

Innovative financial mechanisms and incentives have the potential to unlock substantial demand for the ES market in South Africa and allow investors to become providers of energy finance. Essentially, energy finance is an opportunity in and of itself, but it is also a driver of opportunities in this sector. The following financial mechanisms indicate some exciting changes in the market.

4.3.1. International financing mechanisms and products gaining traction in South Africa

There are a number of exciting and innovative finance mechanisms gaining prominence worldwide, which represent de-risked innovative routes to market for local and international investors. Some of these include the Pay As You Save® solution, green investment banks and Property Assessed Clean Energy (PACE); however, only PACE is currently being tested in the South African market.

Property Assessed Clean Energy (PACE)

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 their respective municipalities. There are numerous benefits to investors:

- ESCos are able to offer **capital-free fluid investments**[13] to property owners by way of a fully financed project;
- property owners receive the benefits of **a resource efficient property** that requires no capital outlay and for which they are not liable to pay beyond their ownership of the property; and
- **returns are secured** for the PACE entity that finances the project. This is done through the property account, with a credible rate collector such as a municipality. In turn, municipalities receive additional benefits through administration fees for the service that they render.

As explained in Figure 9, the PACE entity provides financing to ESCos or installers who want to install resource efficient technology on property that meets criteria set out by the PACE entity, i.e. an evaluation of the property will be done to determine whether it is feasible to employ the PACE mechanism.

13 | Fluid in the sense that property owners are only liable to pay for the system for as long as they own the building.

The successful project is then financed entirely by the PACE entity. For a small administration fee, municipalities perform their rate collection services, which include a 'special assessment' on the property's rates bill, which is used to re-pay the PACE entity for the installation. This 'special assessment' is linked to the property (irrespective of its owner).

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 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 is approached by the ESCO that installs the service. Future potential owners must agree to the 'special assessment' on the rates bill and agree to continue to pay this before they may own the building.

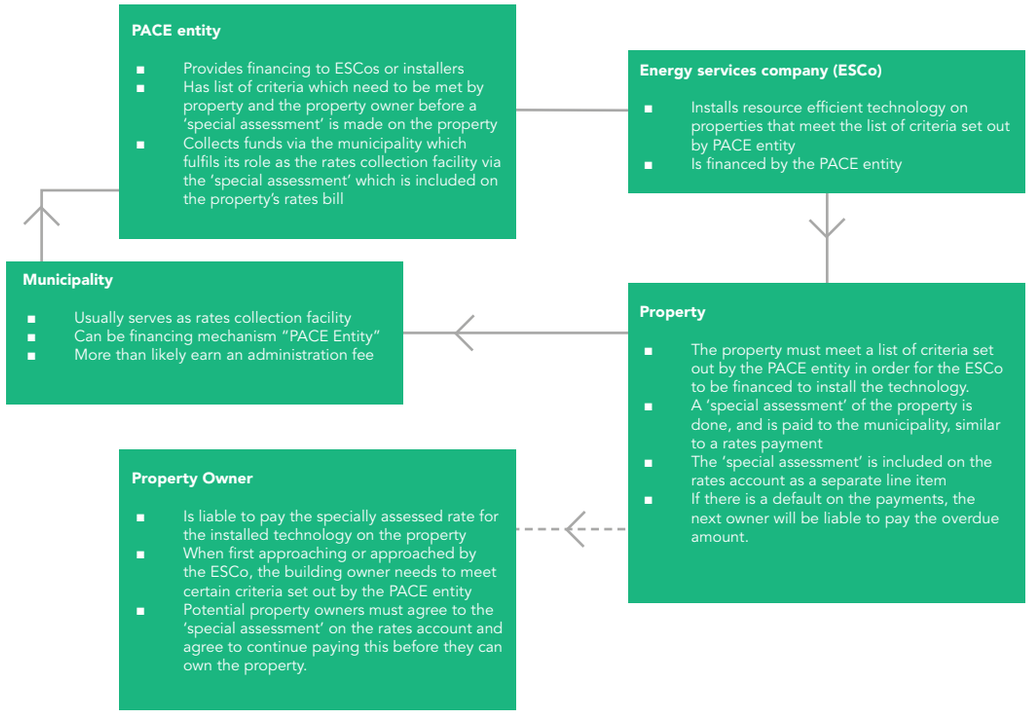


Figure 9: PACE financing mechanism

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. PACE:

- is voluntary for all parties involved.
- can cover 100% of a project's hard and soft costs[14].
- provides long financing terms of up to 20 years, which makes it especially viable for the commercial sector.
- can be combined with utility-scale, municipal and government incentive programs.
- is permanently affixed to a property.
- can be repaid through the "special assessment" on the rates account and collected by the municipality of the PACE entity (but the municipality could also be the PACE entity).

Property owners have reacted favourably to PACE internationally because investors can fund projects with no out-of-pocket costs. 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 we are only beginning to investigate this model in South Africa. The only numbers available are from an international context, different to our own.

4.3.2 Banks extending finance to SSEG market

Financing for SSEG, specifically rooftop solar PV, is underpinned by thousands of small contracts with consumers. Traditionally, commercial banks who are notoriously selective about their investments, have favoured big solar / wind farms because they are generally based on contracts with investment-grade utilities and international companies.

Commercial and residential debt largely remain closely tied to strong individual credit scores and existing bank-customer relations. However, in 2017, the big five banks in South Africa started to focus on rooftop PV's unique financing needs, providing more targeted, patient, and affordable finance packages for commercial and residential solar PV. The inclusion of the commercial banking sector may reduce some opportunities for less traditional investors such as equity funds; however, it will unlock the SSEG opportunity for some end users and installers, EPCs and ESCos by providing accessible and affordable financing[15].

Banks' offerings include mechanisms that cover 70-100% of capital costs with a five- to ten-year loan repayment. However, by making use of pre-selected engineering, procurement and construction contractors (EPC) and meritorious 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 impact.

Commercial banks are notoriously risk adverse and seek much higher returns than some other investors seek. 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.

14 Hard costs are infrastructure construction costs. Soft costs are all other costs, which are not directly related to infrastructure and construction costs, such as services, legal and administration costs.
15 Most commercial banks do not offer standalone services.

5 – Funding and incentives

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

5.1. Energy Services (ES) sector funding opportunities

5.1.1 Section 12 tax incentives

The South African Income Tax Act offers numerous energy-efficiency related incentives. The ones most relevant to the ES market are tabulated below.

Table 5: Section 12 tax incentives

Section 12 tax incentive	Name of incentive	Description
Section 12B	Deduction in respect of certain machinery, plant, implements, utensils and articles used in farming or production of renewable energy	Allows taxpayers to claim a capital allowance for qualifying movable assets, owned by the taxpayer and brought into use for the first time for trade purposes in the production of electricity from renewable energy. The rate of the allowance was amended on 1 January 2016 from 50/30/20 basis over three years, to one year (100%).
Section 12I	Additional investment and training allowances in respect of industrial policy projects	As of 1 January 2015, greenfield 'industrial policy project' projects above R50 million may deduct an additional investment allowance equal to 55% of the cost of its manufacturing asset, or up to R900 million up until 31 December 2017. However, it has been proposed to extend this to 31 March 2020.
Section 12J	Deductions in respect of expenditure incurred in exchange for issue of venture capital company shares	Allows investors to get a tax rebate to the value of their investment in the year that it is made, if they invest in a qualifying venture capital company (VCC) that in turn invests in qualifying SMEs. This investment will then remain tax-free, as long as it is held for five years.
Section 12L	Deduction in respect of energy efficiency savings	As of 1 November 2013, taxpayers are allowed to claim a deduction for most forms of energy-efficiency savings that result from activities performed in continuing any trade and in producing income. For assessments between 1 November 2013 and 28 February 2015, the deduction is calculated at 45 cents per kWh; for assessments commencing on or after 1 March 2015, the deduction is calculated at 95 cents per kWh.

Source: http://sars.mylexisnexis.co.za/

5.1.2 Green Tourism Incentive Programme

The Green Tourism Incentive Programme (GTIP) was introduced by the Department of Tourism in 2017. The objective of this incentive is to encourage private enterprises operating in the tourism industry to move towards more efficient and cleaner energy sources.

The core focus of the GTIP is the installation of renewable energy and energy-efficiency solutions to avoid rising electricity costs, to reduce input costs and drive increased competitive advantage and sustainability.

The GTIP broadly offers the following to qualifying tourism enterprises:

- 90% of the cost for a new energy-efficiency audit or the full cost for reviewing an existing energy-efficiency audit.
- Grant funding to qualifying small and micro enterprises on a sliding scale from 30% to 90% – capped at R1 million.

Note: The balance will be covered by the applicant and all grant funding will be paid directly to service providers.

The extent of the grant is determined using a weighted scoring matrix against the three key aspects seen in Table 6.

Table 6: GTIP weighted scoring matrix

Key aspects	Description
Impact on energy saving	Enterprises with high-projected energy savings (above 80%) in relation to the baseline consumption achieve the highest score, with scores progressively decreasing as the percentage of projected energy savings decrease.
Transformation and ownership	Enterprises with high levels of compliance against the Tourism B-BBEE Scorecard (Level 1) achieve the highest score, with scores progressively decreasing as compliance levels decrease.
Financial strength and size of the enterprise	Enterprises with lower annual turnover (below R5 million) achieve a higher score, with a lower score given for higher turnover (between R5 million and R45 million).

Source: Department of Tourism (2017)

To be eligible for grant funding, all applicants should meet the following criteria:

- Be an existing or a new privately owned tourism-specific establishment (accommodation, facilities and attractions) that provides services to tourists as its direct clients. Suppliers and intermediaries are not eligible.
- In the case of accommodation and conference venues, an official star grading by the Tourism Grading Council of South Africa is required.
- Be an Exempt Micro Enterprise or a Qualifying Small Enterprise in line with the size categorisation of the Tourism Broad-Based Black Economic Empowerment Scorecard.
- Must commit to an energy-efficiency audit or review of an existing audit by NCPC-SA
- Must be able to fund the balance of the total funding required, which should be injected first unless such funding has been secured from a reputable financial institution.

5.1.3 Value added tax (VAT) deductions

Solar PV is VAT deductible. VAT registered entities can deduct the VAT portion of the solar PV system. South Africa's Nation al Treasury (in January 2016) has stated that this is part of the allowance and initiative to encourage investment in cleaner energy forms, to reduce greenhouse gas emissions and to broaden the country's energy sources.

5.2. General funding opportunities

5.2.1 Green Finance Database

The GreenCape Finance Desk, in conjunction with the South African National Energy Development Institute (SANEDI), maintains a database of funding sources and primarily dti-driven incentives that may be relevant to green economy investors.

The database contains information on nearly 100 funding opportunities, including an overview of the opportunity and the 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[16].

5.2.2 Other databases

Finfind Database

Finfind (www.finfindeasy.co.za) is an innovative online finance solution that brings together SME finance providers and those seeking finance. With a focus on finance readiness, Finfind has over 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, or those who aim to improve their understanding of finance matters.

AlliedCrowds Database

AlliedCrowds[17] 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). The Entrepreneur Hub provides significant tools and assistance for start-ups, including assistance on writing business plans and financial resources. This database is ideal for any entity seeking a broad range of financial solutions.

Further funding sources

Two more South African funding directories can be downloaded in PDF format from the GreenCape Green Finance Database webpage[18].

5.2.3 Ecosystem observations

Funding gaps of note

Excellent work has been done to fund large-scale projects such as the utility-scale Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). However, because of the relatively smaller pool of domestic funding and capital-intensive nature of the cleantech industry, a number of funding gaps remain for SMEs in particular.

- The amount of money available for pilot projects is limited. This is partly because clean technologies (hardware) must compete against software technologies, which can be 10 times cheaper to fund at any given stage of development.
- Small-scale project finance (up to R50 m) is difficult to acquire, as funders of projects are looking for projects worth at least R50 m (usually R100 m) to make their involvement profitable. Rand Merchant Bank's FIRST initiative has begun to address this issue in the renewable energy space.

Skill gaps

Funders often experience a shortage of in-house technical expertise to understand the business case and models of cleantech ventures.

SME founders, particularly on the start-up side, show an aversion to financial matters. The promotion of financial literacy and fluency by initiatives such as Finfind has gone a long way in encouraging businesses to recognise the importance of financial matters and take responsibility for understanding the finance in their organisation.

16 www.greencape.co.za/assets/Uploads/GreenCape-Finance-Database-v4.xlsx
17 www. alliedcrowds.com
18 www.greencape.co.za/content/focusarea/green-finance-databases

5.2.4 How the GreenCape Green Finance Desk assists investors

The Green Finance Desk (GFD) primarily acts as data source, working across all sector desks at GreenCape. Its objectives are to:

- develop a network of financial institutions (private and public) with green finance interests;
- develop an understanding of the main green projects requiring investment / financing;
- break down any barriers that exist between green finance and green projects;
- facilitate the implementation / adoption of innovative financing solutions for green economy business models; and
- provide ad hoc support to programmes and initiatives requiring a financial / investment viewpoint.

5.3. Manufacturing incentives

A proposal has been submitted for the Atlantis Industrial Area to be declared a Greentech Special Economic Zone. The dti's SEZ programme aims to increase industrialisation, economic development and job creation around the country. The dti has proposed a number of incentives to attract investors to the proposed SEZs, which include:

- **Reduced Corporate Income Tax Rate:** qualifying companies will receive a reduced corporate tax rate of 15%, instead of the current 28% headline rate.
- **Employment Tax Incentive (ETI):** aimed at encouraging employers to hire young and less-experienced work seekers. Hiring young people will reduce the cost to employers through a cost-sharing mechanism with government.
- **Building Allowance:** qualifying companies will be eligible for an accelerated depreciation allowance on capital structures (buildings). This rate will equal 10% a year over 10 years.
- **VAT and Customs Relief:** companies located within a customs-controlled area (CCA) will be eligible for VAT and customs relief as per the relevant legislation (dti 2015).

Other incentives available to investments in a designated SEZ will include:

- a 12I Tax Allowance Incentive.
- a SEZ fund for infrastructure development within the designated area.

In Atlantis, the City of Cape Town has made vast tracts of land available at low cost for lease by greentech companies through an accelerated land disposal process. GreenCape's Atlantis SEZ team and the InvestSA One Stop Shop can assist with information, and facilitate access to permits, licences, planning and development approvals, incentives and finance. It is also worth noting that the dti has been willing to assure investors that investing prior to SEZ designation will not disqualify them from receiving benefits once the zone is designated.

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. Cape Town has been 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 proposed Atlantis Greentech Special Economic Zone (SEZ).

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.

Major market opportunities: Western Cape and South Africa

Agriculture

Precision agriculture
Tools, data analysis, local manufacturing & financing to support precision farming & resource efficiency (SA)

Solar energy for agriculture
Minimum markets of R120m (WC) & R420m (SA) for solar PV in agri & agri-processing

Controlled environment agriculture
R128m invested in 2017 (WC); R600m potential market (WC), 15% growth p.a. (WC)

Energy services (SA-wide)

Solar PV systems & components
500MWp installed capacity; R1.2bn additional investment in 2018 (R7.2bn to date)

Local manufacturing & assembly
Solar PV systems and components – systems require compliance with local content regulations

Energy storage
Keystone of future energy services market; ~R80m market by 2023

Utility scale renewable energy (SA-wide)

Independent power production
Ministerial determination for 6.3 GWp more RE generation capacity: 1.1 GW (670 MW wind, 450 MW solar) p.a.

Rest of Africa
RE deployment in the rest of Africa, some programmes mirroring REIPPPP

Local manufacturing
Through REIPPPP local content requirements

Waste

Municipal PPP
Public-private partnership projects of R1.3bn (WC)

Organic waste treatment
Providers planning capacity growth from 381 000 t/a to 1 million t/a

Alternative waste treatment
R421/t landfill cost in CT (highest in SA); organic waste landfill ban by 2027 (5 year 50% diversion target by 2022)

Water

Metering & monitoring
30-50% smart metering sales growth (Q1 2018 compared to Q1 2017)

Water efficiency & reuse
R900m p.a. potential market for new commercial and residential developments (WC)

Alternative water
R5.8bn potential residential market (WC); 14%-18% returns on large-scale desalination investments

Bioeconomy & resource efficiency

Food value retention
R600m value through improved cold chain management & waste reduction (WC)

Solar thermal
R33m already installed (WC), R135m (SA); R3.7bn potential agri-processing market

Biogas
For electricity, heating & transport; R100m installations expected by 2023

Atlantis Greentech Special Economic Zone (SEZ): investment incentives

The City of Cape Town established a greentech manufacturing hub in Atlantis in 2011 in response to the government's focus on localisation of manufacturing as part of the Department of Energy's Renewable Energy Independent Power Producer Programme (REIPPPP).

The City has made tracts of land available at low cost for lease by greentech companies through an accelerated land disposal process. A number of other financial and non-financial incentives are also on offer, including discounted electricity and rapid turnaround on development applications.

An application has now been submitted by the Western Cape Provincial Government for the Atlantis Industrial area to be declared a Greentech SEZ, a decision on which is expected in 2018. GreenCape's Atlantis SEZ team can assist with information, and facilitate access to permits, licenses, planning and development approvals, incentives and finance.

7 – GreenCape's support to businesses and investors

GreenCape is a non-profit organisation that drives the widespread adoption of economically viable green economy solutions from the Western Cape. Our vision is for South Africa to be the green economic hub of Africa.

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.

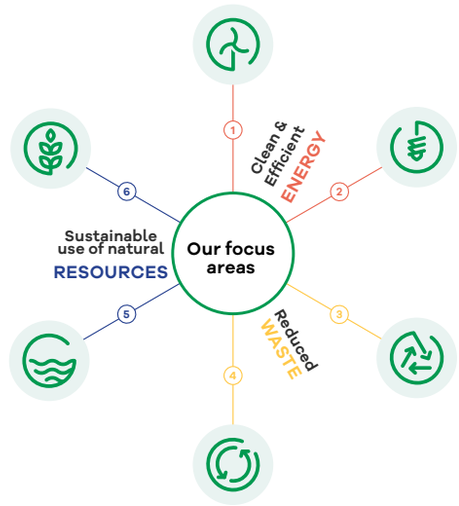
From these investments, more than 10 000 jobs have been created. Through our WISP (Industrial symbiosis) programme, by connecting businesses with waste / under-used resources, we have to date diverted over 27 200 tonnes of waste from landfill.

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 over 4360 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 10 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, electric vehicles & alternative basic electrification

2 Energy Services

Commercial, industrial & agricultural energy efficiency & embedded generation; incentives & financing options.

3 Alternative Waste Treatment

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

4 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.

5 Water

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

6 Sustainable Agriculture

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

Figure 10: GreenCape's focus areas

Cross-border matchmaking 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).

For investors looking for opportunities in South Africa, GreenCape's Cross-border Matchmaking Facility offers a business matchmaking facility for green firms and entrepreneurs.

The matchmaking team helps international inbound firms and entrepreneurs looking for South African partners in the green economy. The team assists with contacts, introductions and matches to South African businesses.

They also offer matchmaking activities for trade offices, missions and other inbound interests. These services can be accessed via the ICN passport or directly with GreenCape.

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

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Economic Development and Tourism
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