Energy Services: Energy efficiency and embedded generation

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2016 Market Intelligence Report

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GreenCape

GreenCape

GreenCape is a non-profit organisation that supports and promotes the green economy - low carbon, resource efficient and socially inclusive - in the Western Cape, South Africa. We assist businesses and investors focusing on green technologies and services to remove barriers to their establishment and growth.

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Contents

List of acronyms

AfD	African Development Bank
CFL	Compact Fluorescent Lamp
CHP	Combined Heat and Power
CIP	Critical Infrastructure Programme
CMVP	Certified Measurement and Verification Personnel
CO2e	Carbon Dioxide equivalent
DBSA	Development Bank of South Africa
DFI	Development Finance Institution
DoE	Department of Energy
DPE	Department of Public Enterprise
EE	Energy Efficiency
EG	Embedded Generation
ESC	Energy Supply Contract
ESCO	Energy Service Company
EPC	Energy Performance Contract
EEDSM	Energy Efficiency Demand Side Management
EM&V	Evaluation, Measurement and Verification
GBCSA	Green Building Council of South Africa
IDC	Industrial Development Corporation
IPAP	Industrial Policy Action Plan
IPP	Independent Power Producer
KW	Kilo Watt
KWH	Kilo Watt Hour
IDM	Integrated Demand Management
LED	Light Emitting Diode
MCEP	Manufacturing Competitiveness Enhancement Programme
MTEF	Medium Term Expenditure Framework
M&V	Measurement and Verification
MW	Mega Watt
MWH	Mega Watt Hour
MWp	Mega Watt peak
MYPD	Multi-year Price Determination
NBI	National Business Initiative
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
PSEE	Private Sector Energy Efficiency
PV	Photovoltaic
NRS	National Rationalised Specification
RMR	Residential Mass Rollout
REEEP	Renewable Energy and Energy Efficiency Programme
SA	South Africa
SABS	South African Bureau of Standards
SACN	South African Cities Network
SANEDI	South African National Energy Development Institute
SANS	South African National Standard
SEAD	Super-efficient Equipment and Appliance Deployment initiative
SSEG	Small Scale Embedded Generation

SOP	Standard Offer Program
SWH	Solar Water Heater
TWH	Terawatt Hour
TJ	Tera Joule
VSD	Variable Speed Drive
WWTP	Wastewater Treatment Plant

List of figures

List of & tables

Executive summary

Globally, the demand for energy services (energy efficiency and embedded generation) is growing. Developments such as steam, embedded generation and battery storage options are emerging as the latest trends.

The global market is driven by growing awareness of the impact of carbon emissions, rising electricity costs, and increased financial returns arising from energy investments. The annual turnover for the global market is expected to reach $14.7 billion by 2024 (Navigant Research 2015).These trends are reflected in the South African energy services market, which is driven mainly by increasing electricity prices, energy security, and changes in policy and regulation.

The combination of high emissions and constrained supply has influenced the South African government to set stringent national targets to reduce energy demand. The National Energy Efficiency Strategy (NEES) 2005 set a target of reducing overall primary energy consumption by 12% by 2015. Presently, NEES is under review and extensive work is underway to introduce Small Scale Embedded Generation (SSEG) guidelines for South African municipalities. These targets, regulations and several investment-friendly policy initiatives are designed to promote energy efficiency and a sustainable, clean economy.

Collectively, the policy framework, above-inflation electricity price rises, and predicted power shortages for at least another five years have motivated many individuals, businesses, government and industry to shift towards alternative energy service options, namely embedded generation and energy efficiency.

There are four main groups of service providers that play a role in the South African energy services market: consultancy service providers, technology suppliers, energy service companies (ESCOs) and Engineering, Procurement Contractors (EPCs). Their work is influenced by the Department of Energy (DoE), the Department of Public Enterprises (DPE), the South African National Energy Development Institute (SANEDI), the National Energy Regulator of South Africa (NERSA) and Eskom. The service providers are governed by a regulatory environment that spans several different government departments, regulatory bodies and standardisation agencies.

While there is a lack of substantial data on the size of the national energy services market, the Private Sector Energy Efficiency (PSEE) project has estimated that over 17 000 GWh of lifetime energy savings can be achieved by businesses (medium and large). ESCOs are anticipated to play a key role in driving this market growth, with increasing demand for embedded generation - rooftop PV installation experienced a 330% growth in just under a year during 2015 to reach 83 MW. It is estimated that another 500 MW could be added annually.

Rooftop PV installation experienced a 330% increase in 2015 to reach 83 MW and another 500 MW is anticipated to be added by the end of 2016.

Other opportunities are emerging in the public sector, through municipalities and public buildings. In municipalities, water and wastewater infrastructure has been reported to account for between 20% and 70% of the total energy consumed by a municipal administration. It is estimated that wastewater treated at the country's 968 municipal treatment works could generate up to 780 MW of power. Similarly, public buildings account for a sizable portion of governmental energy use, and present several opportunities for energy services. This public sector demand also seeks to stimulate the growth of the energy services market and businesses should explore tendering opportunities in this space in 2016.

The public sector provides opportunities in energy savings and generation in water and waste water treatment, and in public buildings.

Although accessing funding can be a major challenge for service providers, an increasing number are beginning to unlock self-funding through innovative models being introduced by ESCOs and EPCs. Subsidies are available and funding can also be accessed from the private sector, quasi-governmental and government organisations.

1 – Introduction

This market intelligence report was compiled by GreenCape's energy team. It is aimed at investors and businesses who are currently active or interested in entering the South African energy services market.

Previously, energy efficiency (EE) and embedded generation (EG) have been viewed separately, but the market is consolidating with the same players looking at both sides of the energy coin. Therefore we can now define energy services as services that are delivering demand- and/or supply-side solutions to energy users.

This report provides an overview of this market in South Africa, including the value chain, key players, policies and regulation as well as key opportunities and barriers.

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2 – Industry overview

Rising electricity prices, energy security concerns, supportive energy policies and incentives are driving consumers to alternative energy options. Lower technology costs, coupled with this increased demand, form the major driver for the energy services market in South Africa, estimated to increase to 16.5 GW by 2020.

2.1. Context

South Africa is in the midst of an energy crisis that is resulting in rising energy prices, rolling blackouts (known as load shedding in South Africa) and changing energy policies and incentives. As a result, end users have begun exploring alternative means to ensure their energy security, leading to the rise of the energy services market. This market comprises energy efficiency and embedded generation services. These two types of energy services, efficiency and generation, share a similar market space, having been driven to grow by similar circumstances and are affected by very similar changes in policy and regulations.

Load shedding is used to immediately reduce national demand to ensure there is sufficient generation capacity. Implemented in incremental stages (1, 2, 3, or 4), load shedding in the first 4 months of 2015 was primarily used to reduce national demand by either five or ten percent, as can be seen in Figure 1 (Le Cordeur 2015). Since April 2015 there has been a marked decline in instances of load shedding, due to reduction in energy demand, more efficient maintenance of generators and (to a lesser extend) additional generation capacity brought online.

Load shedding comes with significant cost to businesses that are unable to operate during load shedding periods, and causes inconvenience to residents.

South African energy prices are rising, a trend caused by the requirement to build new generation capacity to deal with the country's energy shortage. The cost of new generation is significantly higher than what Eskom was able to produce power for using its amortized generation fleet. Electricity prices are expected to rise until they reflect the costs of this new generation, as is demonstrated in Figure 2 (Eskom 2015) below.

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

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Collectively these factors (rising electricity prices, energy security, supportive energy policies and incentives) are causing consumers to look towards alternative energy options. Lower technology costs, coupled with this increased demand, form the major driver for the energy services market in South Africa.

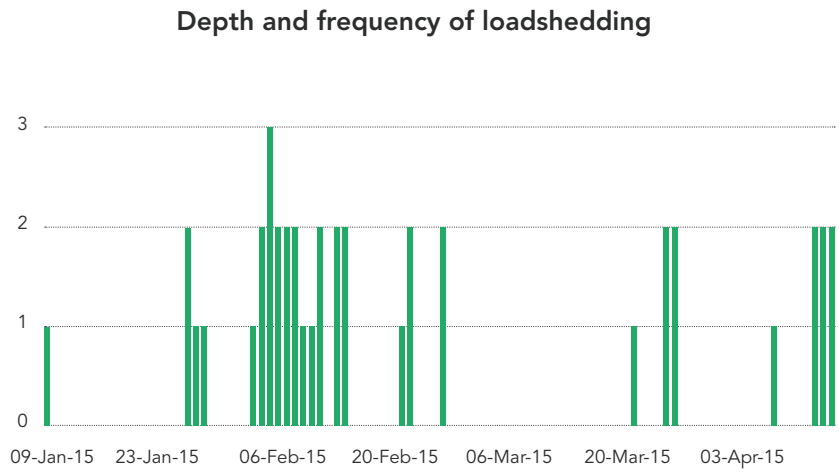

Figure 1: Depth and frequency of load shedding from Jan to April 2015

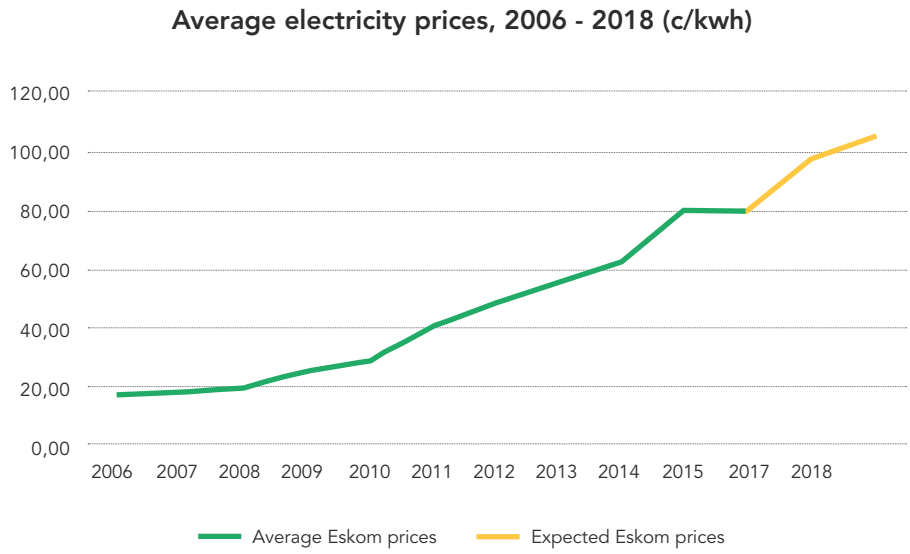

Figure 2: Eskom price trajectories[1]

[1] These prices were submitted to NERSA in MYPD 3

2.2. Key players

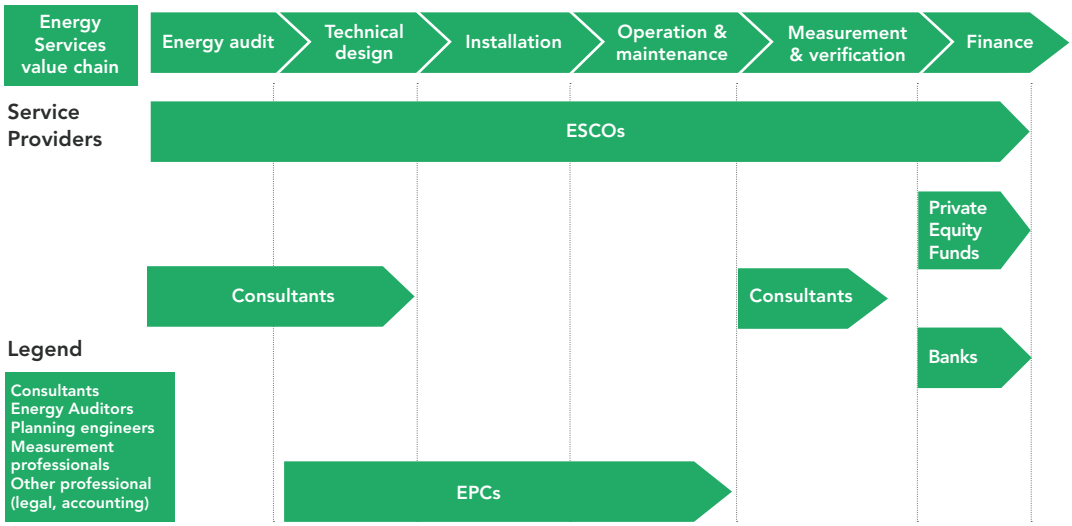

Figure 3: Energy services market value chain

The energy services market uses many different definitions to reflect the varying interests of the broad spectrum of stakeholders involved. The service providers that are highlighted in Figure 3 (above) (GreenCape Analysis) are key components in promoting energy services-related technologies and solutions. It is therefore helpful to classify different groups of service providers based on their services rendered over the course of project development and implementation. Four main groups of service providers play a role in the market:

- **Consultancy (service) providers** such as energy auditors, planning engineers, certified Measurement & Verification Personnel (CMVPs), accountants, lawyers and others who provide advice. The consultant risks are typically limited to professional indemnity insurance, while project performance risks remain with the client. Payments for consultancy services are commonly agreed upon based on their inputs (hourly rates or a lump sum).

  In some cases consultants also use performance-based components, also known as 'share of savings', to determine their remuneration.

- **Technology suppliers** provide hardware such as lighting, combined heat and power (CHP) and solar components, or systems; or software such as energy accounting or management packages; and related operation and maintenance services – such as servicing burners, technology maintenance services or software updates. They all supply individual components for energy services' projects and are paid for the supply and/or installation or maintenance of these components, though typically not for their performance or outputs. The supplier risks are typically limited to product warranties and vendor liabilities while project performance risks remain with the client.

- **Energy Service Companies (ESCOs)** typically provide performance-based energy contracting, also referred to as ESCO or energy efficiency services. The two basic business models are:
  - Energy Supply Contracting (ESC) which delivers units of used energy measured in Megawatt hours (MWh)
  - Energy Performance Contracting (EPC) which provides energy savings measured in comparison with a previous energy cost baseline.
- **Engineering Procurement Contractors (EPCs)** provide the detailed engineering design of the project, procure all the equipment and materials necessary, and then construct to deliver a functioning facility or asset to their clients.

All four groups of service providers are needed to develop an energy services market. At the same time, there is notable variation in their role in the value chain and scope of service, their degrees of risk acceptance, business models and remuneration schemes.

In addition to the service providers, the following stakeholders each play a role in influencing the investment in energy services on a national level, and further supporting the growth of South Africa's energy services market:

- The **Department of Energy (DoE)** 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.
- **Eskom** is the state-owned energy utility of the country and currently owns distribution infrastructure. Eskom also currently plays a facilitator role on various government-run incentives programmes (these will be highlighted under the section on Investment and Incentives programmes).

The **South African National Energy Development Institute (SANEDI)** is responsible for achieving the objectives of the NEES.

- The **National Energy Regulator of South Africa (NERSA)** sets and approves the annual Eskom tariff increases.
- **Local government (municipalities)** is the third sphere of government, and is usually the arm of government closest to the end users. They are responsible for a large portion of electricity distribution in the country.

2.3. Market size

Globally, the market size for energy services is expanding rapidly – a trend which is reflected in the South African market. The turnover for the global market is expected to reach $14.7 billion (USD) annually in 2024 (Navigant Research 2015). The International Institute for Energy Conservation lists several key elements that support growth in the energy services market, all of which are evident in South Africa. They include:

- Upward trends in energy prices
- Enabling energy policies from local and national government
- Utility programmes and incentives
- Energy saving initiatives, such as tax incentives and financing programmes
- New regulations that support energy services
- Decreasing costs of renewable energy technologies such as rooftop photovoltaic (PV)

The global energy services market will be worth $14.7bn in 2024.

These drivers have presented more attractive financial returns for consumers of energy services. Rooftop PV generation is one of the energy service options that are starting to present feasible financial returns to customers. Figures 4 and 5 illustrate the marked drop in prices for embedded generation. At the time of writing this report there had been over 82000 PV installations across the various economic sectors in South Africa (PQRS 2015), namely residential, commercial, industrial sectors.

These installations translate to 83 MW, compared to just 19 MW in early 2015. The market grew by over 330% in less than a year. The expectation is that with increased demand, embedded generation installation could reach 500 MW a year (Steyn, 2015).

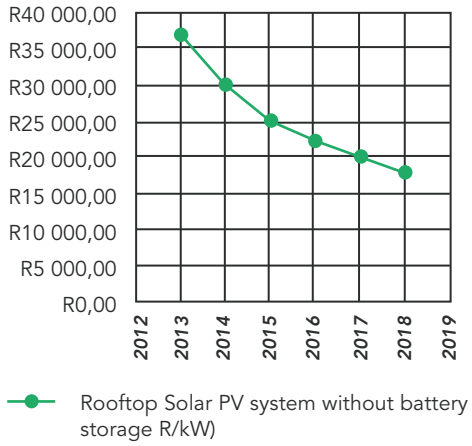

Figure 4: PV price curve for systems smaller than 10kwp (R/Wp)

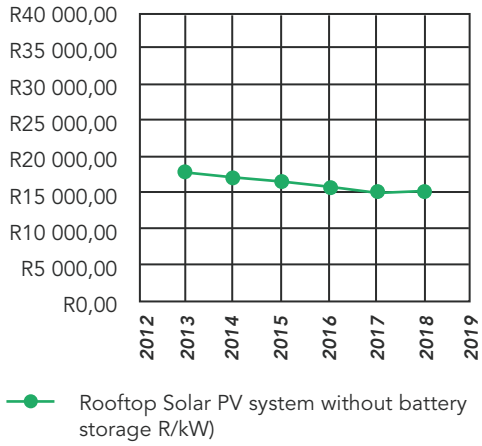

Figure 5: PV price curve for systems larger than 100kWp (R/Wp)

Very few studies have been commissioned to quantify the energy saving potential of energy services technologies in South Africa's economy. Without detailed modelling it is difficult to accurately estimate the market potential for energy services in South Africa. However, the Full Private Sector Energy Efficiency project has estimated over 17000 GWh of lifetime energy savings can be achieved by businesses (medium and large). This estimation has been demonstrated through the energy audits that were conducted for small to large South African businesses over the course of the programme (Gaegane 2015)[2]. The Full Private Sector Energy Efficiency programme reached closure at the end of November 2015.

[2] The National Business Initiative manages the Full Private Sector Energy Efficiency programme and released these figures at the Energy Efficiency forum in Cape Town on the 11th November 2015 (Gaegane 2015)

Table 1 (Gaegane 2015) shows the potential of energy saving opportunities as identified by the Full Private Sector Energy Efficiency programme (2015)

Table 1 Energy saving opportunities for small and large businesses

Type	Identified	Implemented	Remaining Market (%)
Number of Opportunities	5609	294	94%
Annual Energy Savings (GWh)	1593 GWh	124.4 GWh	92%
Lifetime Energy Savings (GWh)	17360 GWh	617 GWh	96%
Lifetime Carbon Savings (MtCO2e)	13.6 MtCO2e	424 748 tCO2e	97%
Capex leveraged (in Rands)	R2.6 billion	R68.8 million	-
Average payback of opportunities	2.3 years	1.4 years	-

During its inception the Full Private Sector Energy Efficiency had initially estimated a potential demand savings of over 11GW across the South African business sectors. Taking into account Eskom's long-term saving targets of 5.5 GW by 2020, the growth potential within the energy services market increases to over 16.5 GW by 2020. The Eskom target is in line with the NEES, albeit that the strategy is currently under review by the DoE.

Taking into account Eskom's long-term saving targets of 5.5 GW by 2020, the growth potential within the energy services market increases to over 16.5 GW by 2020.

Other factors influencing these market growth prospects are the pricing economics of peak load reduction for the utility. It still costs Eskom a significant amount of money (R3/kwh) to generate its own electricity for the peak load periods - hence its decision to retain the demand side incentive programme: the Integrated Demand Management (IDM) programme. Owing to financial constraints, the IDM[3] now focuses solely on the residential CFL mass rollout and the ESCO programmes respectively (Eskom 2015).

Market forces contributing to growth

- General market forces include the continued fear of rolling black outs, penalties, tax incentives, carbon tax requirements, commercial and residential building energy saving initiatives, process optimisation required to reduce costs, and a greater focus on green and sustainable initiatives within big business.

[3] The Integrated Demand Programme is being implement by Eskom as an financial incentive for companies to achieve energy savings (Eskom 2013)

- Other driving forces will come from state-owned funding institutions and Development Finance Institutions (DFIs) whose involvement can create an environment of low interest loans, other competitive finance options, grants to assist with feasibility studies, energy audits and technical assistance. More relaxed lending criteria are linked to cash flows, collateral-based lending or a combination of both.
- Better knowledge and greater skills development within financial institutions will help organisations to appraise energy services project proposals more efficiently.
- The price of electricity is expected to increase above inflation for the foreseeable future, and will further motivate many individuals, businesses, government and industry to implement energy services projects.

As was indicated earlier in the report, ESCOs play a key role in unlocking opportunities for the energy services market in South Africa. However, the available information is not sufficiently detailed nor comprehensive enough to make an accurate, scientifically-based estimate of the ESCO market potential in South Africa. For instance, in 2012, IDC (2013) conducted a study to confirm the widely-held belief that the ESCOs present significant growth and revenue generation opportunities. The report estimated that the ESCO market could be as large as R8 billion p.a. by 2022. Despite the lack of enough reliable information, potential energy demand savings could be achieved and there is significant potential in the ESCO market, and consequently the energy services market.

[3] The Integrated Demand Programme is being implement by Eskom as an financial incentive for companies to achieve energy savings (Eskom 2013)

3 – Policies and regulation

South Africa's electricity sector is regulated primarily by the National Energy Regulator of South Africa (NERSA), with the DoE as the custodian department. A number of acts and policies guide the development of the sector, with the main guiding policy being the integrated resource plan (IRP) 2010 – 2030, which outlines the planning, sourcing and quantities of electricity sources contributing to the country's generation mix.

3.1. Key changes to energy services policies in 2016

3.1.1. Mandatory reporting of energy

The DoE introduced a mandatory reporting regulation for large users for energy in 2015. It will be mandatory for all energy users consuming above 180 Tera Joules (TJs) per annum to submit their energy consumption data to the DoE. Companies using 400 TJ or more per annum will be required to submit a detailed energy management plan. The reporting requirement is applicable to all forms of energy. It is recommended that this data be collected by a trained energy professional and it may be required that data be verified by a trained energy auditor. This regulation is anticipated to affect mostly heavy industries such as mines and smelters, which are largely based in the Gauteng, North West and Mpumalanga provinces. It is anticipated that this new reporting requirement will create further opportunities to drive the uptake of energy services, particularly those for energy auditing.

3.1.2. Energy efficiency tax incentives regulation ("12L")[4]

The Department of Energy (DoE) with SANEDI as the implementing agency, has introduced the 12L Income Tax Allowance on Energy Efficiency Savings ("12L") in order to safeguard the country's energy security through energy efficiency mechanisms. The tax allowance makes it viable for businesses to offset against their annual corporate tax as a direct result of their energy savings in a given year. The offset is calculated against the 28% tax rate. Tax incentives are currently offered for one assessment year of kWh savings and are only applicable to registered businesses (SANEDI 2013).

During 2015, this allowance amount was increased to 95c/kWh by the Minister of Finance during the budget vote speech in March 2015, making it lucrative for large scale EE projects, i.e. those with a minimum of 1 MW savings in the calendar year.

3.1.3. Local municipal guidelines on embedded generation in 2016

Across South Africa, local and national government are working towards developing Small Scale Embedded Generation (SSEG) rules and regulations to support the growth of the EG market. The purpose of these rules and regulations is to give each stakeholder relevant guidance regarding the connection of SSEG installations smaller than 1 MWp to the municipal electrical grid.

[4] GreenCape published a practical interpretive guide in on the 12L that can be accessed on our website, www.greencape.co.za

In the Western Cape, ten municipalities allow embedded generation to feed electricity back onto their grid. Within these municipalities there are three experimental feed-in tariffs and one NERSA approved tariff. The national utility (Eskom) does not allow embedded generation on their low-voltage network but they do permit the connection of embedded generation to their medium-voltage and high-voltage (Genflex tariff) network.

The National Energy Regulator of South Africa (NERSA) was due to release a guideline on small scale embedded generation. In October 2015 the National Department of Energy began a formal review of the NERSA guidelines and will release these thereafter, allowing for their implementation.

3.2. Key standards

SANS 10400-XA:2011 with SANS 204. These construction standards require mandatory compliance on energy efficiency and energy use in the built environment, with all new buildings and extensions to buildings requiring energy efficiency initiatives before receiving municipal approval.

SANS 941 - Energy efficiency of electrical and electronic apparatus. This standard covers energy efficiency requirements, measurement methods and appropriate labelling of energy efficiency electrical and electronic apparatus. This standard therefore has implications for manufacturers and importers.

SANS 151 – Fixed electrical storage water heaters. This standard prescribes methods for testing durability, safety and performance of electrically heated hot water storage tanks. The latest revision was published in 2013. The standard currently contains a section that prescribes minimum standing heat loss for different geysers. In the next draft, this section will be moved from this standard to SANS 941 for energy performance. The minimum requirement for electrical geysers will be raised to that of the current solar water heater requirements.

SANS 941 – Energy performance and labelling of electrical and electronic apparatus. This standard was published in 2012 to ensure that at the time of purchase, buyers have all the relevant energy consumption information at their disposal.

SANS 1544 – Energy performance certificates for buildings. It specifies the methodology for calculating energy performance in existing buildings. This standard is mandatory for all public buildings and will be implemented in 2016.

SANS10106 – Installation of solar hot water systems. This standard was revised and the new version published in November of 2014. It updates the requirements for installation of domestic solar water heaters.

SANS 50010 – Measurement and verification of energy savings. Published in 2011, it specifies the methodology for calculating energy savings. This is a required tool for calculating savings for projects submitted on the 12L energy efficiency tax rebate programme.

SATS 1286 – Local goods, services and works: measurement and verification of local content. This technical standard has become highly relevant with the application for designation of solar water heaters.

VC9004 – Compulsory specification for integral and close-coupled domestic solar water heaters, and thermal collectors for domestic solar. This compulsory regulation intends to regulate the SANS 1307 as the current standard for solar hot water systems. The specification is currently on hold until a suitable component testing standard has been developed.

VC9006 – Compulsory specification for hot water storage tanks for domestic use. This compulsory specification was enacted in February 2014. All domestic hot water cylinders imported, manufactured, sold or installed in South Africa must now adhere to the SANS 151 standard and cross referenced sub-standards.

In addition, each product offered for sale must have a recent valid test report not older than one year. This is proving to be a challenge as the SABS does not issue full test reports for each model on the mark scheme.

VC9008 – Compulsory specification for energy efficiency and labelling of electrical and electronic apparatus. This specification was enacted in April 2014 and makes the SANS 941 a compulsory standard. It requires that a range of electrical and electronic apparatus adhere to certain minimum energy performance standards. It also requires that all appliances listed display the energy efficiency rating on the appliance.

3.2.1 Smart metering standard - NRS 049: Advanced metering infrastructure

The lack of a national specification for smart metering systems has prevented many municipalities from investing in smart metering roll-outs. The NRS 049 working group has developed a draft specification that is currently undergoing an industry review process to elicit comments and improve the specification. This process is due to be completed by the first quarter of 2016.

This specification will provide a standardized approach for smart metering systems for municipalities and Eskom to follow, and will serve to describe the "smart systems" which have been mandated for use by certain customers in the Electricity Regulation Act.

3.3. Key policies

Energy White Paper of 1998. This paper identifies the need for demand-side management and the development and promotion of energy efficiency in South Africa. It requires energy policies to consider energy efficiency and energy conservation within the framework of the Integrated Resource Plan (IRP), in meeting energy service needs from both the supply and demand side.

NEES 2005, (2008). NEES sets outs a national energy efficiency target of at least 12% by 2015. Sector targets range from 9% for transport, through to 15% for industry, commerce and the public sector. This strategy is currently being revised by the DoE.

IRP 2010. The IRP's revised balanced scenario sets out specific targets for renewable energy and energy efficiency. The IRP provides insight into the proposed new-build options including renewable options, as well as the energy savings expected from demand-side management programmes.

Industrial Policy Action Plan (IPAP) 2014/2015. IPAP 2014/2015 includes the MCEP that will provide enhanced manufacturing support. The Production Incentive (PI) programme will include a green technology upgrading grant of between 30-50% for investments in technology and processes that improve energy efficiency and greener production processes.

Carbon taxes-2013/2014. It is envisaged that a carbon tax, proposed by the National Treasury, will be implemented in 2016/17 at a rate of R120 per ton of carbon dioxide equivalent (CO_2e) on direct emissions, increasing by 10% per annum until 2020.

A list of policies related to embedded generation is available in Appendix A of this report.

3.4. Key regulation

Electricity Regulation Act, Act 4 of 2006 and Electricity Regulation Amendment Act, 28 of 2007 as amended. The Act states that no person may, without a license issued by the regulator (NERSA), operate any generation facility. The *Electricity Regulation Act, Act 4 of 2006* holds that exemption is held for non-grid-tied projects. Note that NERSA has issued a communication giving license exemption to SSEG installations in municipal areas under 100kW.

National Energy Act (Act 34 of 2008). The National Energy Act was legislated 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 SANEDI.

Municipal electricity supply by-law. This document provides the general conditions of supply of electricity, outlines the responsibility of the customers, systems of supply, measurement of electricity and electrical contractors' responsibilities.

Mandatory energy reporting (2015). It is mandatory for all energy users consuming above 180 TJs per annum to submit their energy consumption data to the DoE. Companies using 400 TJ or more per annum are required to submit a detailed energy management plan. The reporting requirement is applicable to all forms of energy.

Income Tax Act: regulations on tax allowances for energy efficiency savings. S12I allows for additional depreciation allowances of up to 55% for greenfield projects over R200 million, with energy efficiency savings being one of the rating criteria. S12L provides a tax deduction to a taxpayer who is energy efficient, with a focus on renewable energy. S12C, S11E and S13 stipulate tax allowances for ESCOs and other compliant businesses that provide for general depreciation of asset allowances.

4 – Opportunities and barriers

This section of the report provides an overview of emerging opportunities within the South African energy services market. These include an ESCO PV market of c.R1.3bn by 2019, opportunities in energy efficiency in Municipal waste water treatment, tendering opportunities through the Western Cape Government's Energy Security Game Changer targets, and the wide scope for energy efficiency in public buildings.

4.1. Rooftop PV market opportunity

The energy crisis has created a high demand for rooftop PV systems, despite current barriers such as high financial costs, a lack of policy and unregulated tariff structures. ESCOs are in a good position to capitalise on this opportunity and many have already added rooftop PV and other SSEG options to their suite of solutions. As a result, the Western Cape ESCO market is estimated to be worth R1.3bn by 2019, with ±1000 job opportunities being created in ESCOs, equipment manufacturers and installation and maintenance contractors.

The successful implementation of SSEG rules, regulations and tariffs by municipalities will be one of the most influential driving mechanisms supporting the growth of this market opportunity. Within the Western Cape there are already an estimated ten municipalities that have adopted SSEG rules and regulations with many of them also exploring beneficial feed-in tariffs. This represents a significant indicator of the potential future of SSEG in the Western Cape province. This trend is likely to be followed in the rest of the country.

Given these emerging opportunities and the growth of the ESCO market there is anticipation that commercial finance institutions will start to introduce specific solutions for residential, commercial and industrial PV. Banks such as Nedbank and ABSA have already started offering such solutions for their industrial business customers (Groenewald 2015).

GreenCape is also leading the development of a smart meter standard for the country which will be introduced in 2016 (see 3.2.1). Once this process is completed, the market for smart meters will be unlocked thus enabling:

- financially feasible rollout of installations
- time-of-use billing
- improved municipal grid management

4.2. Increasing opportunities for energy efficiency in municipal waste water treatment

There is an opportunity for EE in South African municipalities' water and wastewater infrastructure through the installation of energy efficient motors and variable speed drives (VSDs). Currently, it is estimated that wastewater treated at the country's 968 municipal treatment works could generate up to 780 MW of power.

In South African municipalities, water and wastewater infrastructure has been reported to account for between 20% and 70% of the total energy consumed by a municipal administration.

Preliminary estimates from Europe and the United Kingdom indicate that energy savings of between 5% and 30% can readily be achieved through investments in energy services at water supply and wastewater treatment facilities. Information from a recent South African Cities Network (SACN) study indicates that treatment works can reduce energy consumption by 5% through installing energy efficient motors and by a further 15% through installing VSDs (South African Local Government Association (SALGA) 2014).

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Energy savings of between 5% and 30% can be readily achieved through investments in energy services at water supply and wastewater treatment facilities.

There are three other areas that have been identified with energy saving potential: pumps of most types and functions, aerobic wastewater treatment systems and cogeneration.

Potential energy savings include:

- Pumps and pumping (common potential ranges: 5% to 30%)
- Waste water treatment (production of compressed air and biological treatment up to 50%)
- Energy and heat generation on waste water treatment through CHP/Cogeneration; Wind, PV, Mini gas turbine up to (55% – 100%)

Historically there has been concern that EE technologies could compromise water quality standards and EE has traditionally not been the core mandate of water and wastewater utilities.

However, with rising electricity prices and the need to provide services to ever-increasing municipal populations, municipalities have to focus on all possible measures to improve the cost efficiency of service delivery in order to be financially sustainable.

4.3. Western Cape Energy Security Game Changer

The Western Cape Government together with the City of Cape Town has committed to playing its part in helping alleviate the national energy crisis, through the introduction of the Energy Security Game Changer. This strategy is a response to the ongoing energy security challenges through the introduction of targets for reducing energy demand in the Western Cape.

Some of the targets that have been set include:

- 10% reduction in current Western Cape energy demand
- 400 000 SWHs uptake by residential customers in the Western Cape (by replacing electric geysers)
- Increased uptake of rooftop PV in Western Cape – target of 120 MW
- Increased uptake of EE in government-owned buildings

These targets demonstrate the active willingness of the Western Cape Government to respond to the country's energy security challenges and are likely to increase the opportunities for the energy services market in the Western Cape (Wicht 2015). To register for tendering opportunities, service providers need to register on the government supplier database. Service providers can access these opportunities on the various government department websites, vendor database websites and local print media.

4.4. Energy services in public buildings

As a political response to the country's energy shortages we are increasingly seeing government, both local and provincial, looking to run projects to reduce their own energy consumption. Public buildings account for a sizable portion of governmental energy use, and are being targeted for energy efficiency by the Western Cape government as an opportunity to lead by example. This public sector demand also seeks to stimulate the growth of the energy services market. Businesses should explore tendering opportunities in this space in 2016.

Another example of this trend can be seen in the Gauteng province, where provincial government has committed to install PV on public-owned buildings (Makhura 2015). Similarly, the Western Cape Department of Public Works has started implementing energy services in government hospitals throughout the province, mainly through energy efficiency interventions and rooftop PV installation. The City of Cape Town is also planning to roll out meters within the City's operations to ensure the accuracy of energy data collection. This will be coupled with a skills development programme to capacitate building managers to improve their interpretation of energy management data, namely metering data (City of Cape Town 2015).

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5 – Funding and incentives

There is a range of funding solutions, either focused on or available to greentech manufacturers and service companies, as well as those who use such services. These cover Development Finance Institutions, local public and private sector financiers and investors, and a considerable range of tax incentives.

According to the KPMG Green Tax Index, South Africa ranks 13th out of 21 countries to use tax as an incentive to drive the green growth agenda (ahead of Australia, Singapore and Finland). As well as understanding the various incentive and funding options available to them, investors and suppliers of greentech can also benefit from understanding those available to their customers or clients, as these can influence the viability and attractiveness of their products and projects.

The table below demonstrates a wide variety of these funding solutions. It is not exhaustive, but intends to be indicative of some of the more green-focused funds or incentives available, and provide potential leads or starting points to exploring various options. Further to those below, the full range of government investment incentives can be found at www.investmentincentives.co.za/.

Table 2: List of funding solutions

Funding solution	Funding instrument	Details
Development Finance		
International Finance Corporation (IFC)	Loan, Equity	www.ifc.org
European Investment Bank (EIB)	Loan	Greater than R0.25 million
SouthSouthNorth / DBSA: Sustainable Settlements Facility (SSF)	Grant, Subsidy, Rebate	www.southsouthnorth.org/sustainable-settlements-facility-ssf/
African Development Bank: Sustainable Energy Fund for Africa	Grant, Technical assistance, Equity	Grant for projects with total capital investments in the range of USD 30-200m. Equity for IPPs with an ideal size of between 5 and 50 MW and a commitment per project of between USD 10-30m.
United Nations Development Programme (UNDP): Global Environmental Facility (GEF)	Grant	Up to USD 50 000
Renewable Energy and Energy Efficiency Partnership (REEEP)	Grant	www.reeep.org/

UK Prosperity Fund Programme	Grant	www.gov.uk/guidance/prosperity-fund-programme
German Federal Ministry of Environment: International Climate Initiative (IKI)	Grant	www.bmub.bund.de/en/topics/climate-energy/climate-initiative/general-information/
German International Cooperation Agency (GIZ)	Feasibility studies	Bioenergy
Public Sector Funding	Grant, Technical assistance, Equity	Grant for projects with total capital investments in the range of USD 30-200m. Equity for IPPs with an ideal size of between 5 and 50 MW and a commitment per project of between USD 10-30m.
Western Cape Government: Cape Capital Fund	Grant	50% of approved intervention
Eskom: Integrated Demand Management	Rebate	www.eskom.co.za/sites/idm/Pages/Home.aspx
Industrial Development Corporation: Green Energy Efficiency Fund	Loan, Technical support	R 1-50 million
Development Bank of South Africa: Green Fund	Grant, Loan	Green Cities and Towns; Low Carbon Economy; Environmental & Natural Resource Management.
dti: Critical Infrastructure Programme (CIP)	Grant	10% to 30% of the total qualifying infrastructural development costs, up to a maximum of R50 million
dti: MCEP - industrial financing*	Loan	Pre-and post-dispatch working capital facility of up to R50m at a fixed interest rate of 4% over a four-year term
dti: MCEP - production incentive*	Grant	Up to 25% of the manufacturing value added
dti: Manufacturing Investment Programme (MIP)	Grant	Investment grant of 30% of the investment cost of qualifying assets for new or expansion projects below R5 million. Investment grant of between 15% to 30% of the investment cost of qualifying assets for new or expansion projects above R5 million.
Department of Small Business Development (DSBD: Co-operative incentive scheme (CIS)	Grant	R0.35 million
Municipal Infrastructure Grant (MIG)	Grant	www.westerncape.gov.za/general-publication/municipal-infrastructure-grant
Recycling and Economic Development Initiative of South Africa (REDISA)	Grant	Infrastructure and set-up costs for tyre recycling
South African National Biodiversity Institute: Global Adaptation Fund	Grant	www.sanbi.org/biodiversity-science/state-biodiversity/climate-change-and-bio-adaptation-division

Private Sector Funding		
ABSA	Loan, Rebate	15% of project
Nedbank	Loan	www.wwf.org.za/what_we_do/wwf_nedbank_green_trust/
FNB	Loan	www.fnb.co.za/home-loans/getting-a-building-loan.html
Standard Bank	Loan	www.standardbank.co.za/standardbank/
Old Mutual Infrastructural, Developmental and Environmental Assets Managed Fund (IDEAS)	Loan, Equity	ww2.oldmutual.co.za/old-mutual-investment-group/boutiques/alternative-investments/our-capabilities1/infrastructure/our-products/ideas-managed-fund
Business Partners	Equity, Loan	R0.5-30 million
Edge Growth	Equity, Loan	R1-20 million
Inspired Evolution: Evolution One Fund	Loan	>R10 million
Atlantic Asset Management	Loan	>R15 million
POLYCO	Loan	Infrastructure for plastics: high-density polyethylene (PE-HD), linear/low-density polyethylene PE-LD/LLLD) and polypropylene (PP)
PETCO	Subsidy, Awareness & Training, Equipment	Infrastructure for polyethylene terephthalate (PET). Category A: R30m-R40m per annum, Category B: R4m per annum.
Tax Rebates		
12B accelerate depreciation incentive	Tax rebate	Accelerated depreciation of renewable energy investments at a rate of 50:30:20, as well as certain machinery, plants, implements, utensils and articles used in farming or production of renewable energy[13].
12L energy efficiency incentive	Tax rebate	95c/kwh deduction on energy saved
12I tax allowance incentive for manufacturing investments	Tax rebate	35-55% or R550-R900m for greenfield projects 35-55% or R350--R550m for brownfield projects
Capital development expenditure	Tax rebate	Tax deduction for capital expenses incurred for farming operations (including game farming) which focus on sustainable agriculture.

37B environmental expenditure	Tax rebate	Deduction in respect of environmental expenditure for assets related to environmental treatment and recycling, waste disposal, and post-trade environmental expenses.
37C environmental maintenance expenditure	Tax rebate	Deduction in respect of environmental conservation and maintenance.

*Over R5 Billion was originally set aside for this programme and is now fully committed. A new application window will be opened in April 2016 pending availability of funds. All other incentives of the department will continue as normal.

5.1. Manufacturing incentives

The dti's special economic zone (SEZ) programme aims to increase industrialisation, economic development and job creation around the country. More specifically, the proposed Upington Solar Corridor SEZ (Northern Cape) and Atlantis Greentech SEZ (Western Cape) focus on solar energy generation and greentech manufacturing respectively. They provide significant incentives to manufacturers, IPPs, and other players in the relevant value chains.

These development zones make ideal locations for the manufacturing of components that contribute towards local content. An example of this is the Gestamp Renewable Industry (GRI) wind tower manufacturing facility set up in Atlantis, Cape Town. Atlantis has also seen companies such as Skyward Windows and Kaytech expand to include green product lines, and local manufacturing of wind tower internals is expected soon.

The dti has proposed a number of incentives to attract investors into the proposed SEZs, which include:

- **Reduced Corporate Income Tax Rate:** qualifying companies will receive a reduced corporate tax 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. It will reduce the cost to employers of hiring young people 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% per annum 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, 2015c).

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

- 12I Tax Allowance Incentive
- One-stop-shop facility within designated SEZ area
- SEZ fund for infrastructure development within the designated area.

Within Atlantis, the City of Cape Town has made vast tracts of land available at low cost for purchase or lease by greentech companies through an accelerated land disposal process. An application has now also been submitted by the Western Cape Provincial Government for the entire Atlantis Industrial area to be declared a Greentech SEZ, a decision on which is expected in the first quarter of 2016. GreenCape's Atlantis SEZ team can assist with information, and facilitate access to permits, licenses, 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.

[5] EDGE defines a green building as one that is projected to reduce the consumption of energy and water by at least 20 percent, and reduce the energy used to make the construction materials. A 20% performance improvement must be achieved in each of the 3 categories (Energy, Water, Materials) to qualify for EDGE certification

EDGE Green certification

The International Finance Corporation (IFC) has developed the Excellence in Design for Greater Efficiencies (EDGE) tool, an online platform that allows design teams to estimate the efficiency of a 'green building[5]' by using practical solutions and alternative materials. The EDGE green building certification system will be implemented in South Africa by the Green Building Council of South Africa (GBCSA) and is aimed at new building projects and retrofits. EDGE certification requires a performance improvement over and above regulatory compliance. For example, the energy section requires a 20% performance improvement over and above SANS 10400 XA compliance in three categories (Energy, Water and Materials). The tool will initially be used for new residential buildings.

The concessionary funding for this initiative has been made available through Nedbank and the Development Bank of Southern Africa's (DBSA's) Green Fund. These banks have jointly agreed to provide R120 million in funding for the development of around 400 affordable green housing units in the Western Cape and Gauteng, respectively. The GBCSA oversees the EDGE certification whilst the funding can be accessed directly through the banks.

5.2. Solar water heating programme

In December 2015, The Department of Energy (DoE) issued the long-awaited request for bids (RFB) for the manufacture, supply, delivery and warehousing of solar water heater (SWH) systems to be procured, in phases, as part of a national solar geyser roll-out. The plan envisages the procurement of 1.25-million systems by 2019, raising the total installed base to 1.75-million, with a number of systems having been installed under a rebate scheme previously administered by Eskom.

The DoE is targeting the installation of 50 000 systems by October 1, 2016, and a further 50 000 by September 1, 2017. The systems are to be installed under the 'social programme' component of a bigger programme, which also includes an 'insurance' programme and a 'voluntary' scheme. Under the insurance component, a subsidy will be provided to enable insurers to promote the replacement of conventional electric geysers with compliant SWH systems, while South Africans who wish to participate under the voluntary arrangement will be able to contact a national call centre for a similarly subsidised installation (Creamer 2015).

6 –
The Western Cape: Africa's growing greentech hub

The Western Cape is a world-class investment destination offering prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life. It is also a prime location for green business.

The Cape Town area has emerged in the last five years as South Africa's renewable energy and cleantech hub, with a critical mass of the leading local and global companies already present, including numerous original equipment manufacturers. The province has a strong local presence of major professional services firms and financiers, as well as a supportive government that has made ease of doing business and the green economy key priorities. Coupled with these is a strong and rapidly growing market for green technology and services in South Africa and the region.

Some of the major market opportunity areas in the next five years are outlined in the graphic below. Notably, on utility scale wind and solar projects there is robust South African and African demand, with ±R200bn/US$20bn invested since 2011 and >1GW capacity procured per annum.

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

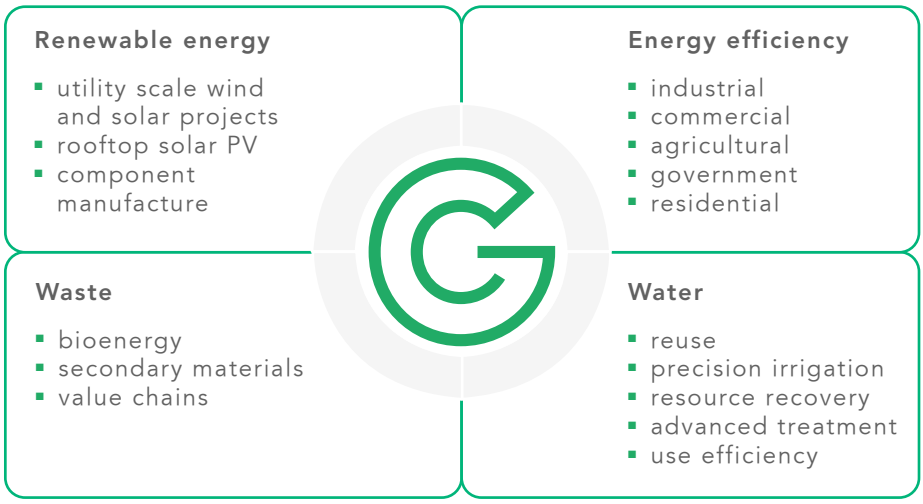

Figure 6: Major Western Cape market opportunity areas (2015 – 2020)

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

- GreenCape, providing dedicated support and market intelligence to green economy sectors
- Wesgro, the Investment and Trade promotion agency for the Western Cape
- SAREBI, a business incubator providing non-financial support to green entrepreneurs
- SARETEC, offering specialised industry-related and accredited training for the wind and solar industries.

The region's four universities - University of Cape Town, Stellenbosch University, University of the Western Cape, and the Cape Peninsula University of Technology - underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.

A promising range of investment incentives are available in the proposed Atlantis Greentech Special Economic Zone (SEZ). 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 vast tracts of land available at low cost for purchase or 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.

Finally, as discussed in Section 5, 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). A promising range of investment incentives are available in the proposed Atlantis Greentech SEZ, including numerous financial and non-financial incentives, discounted electricity and rapid turnaround on development applications (see Section 5).

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7 – GreenCape's support to businesses and investors

GreenCape is a non-profit organisation that was established by the Western Cape Government and City of Cape Town to support the accelerated development of the local green economy – low carbon, resource efficient and socially inclusive – and help position the Western Cape as the green economic hub of Africa.

We assist businesses in this space to remove barriers to their establishment and growth by providing 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

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, covering finance, engineering, environmental science and economics. We have facilitated and supported R13.7bn of investments in renewable energy projects and manufacturing. From these investments, more than 10 000 jobs have been created.

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

GreenCape's work in the Energy sector

The focus of the Energy team at GreenCape is to encourage economic development and job creation through the transformation of the energy market in South Africa and in the Western Cape province – both by increasing energy services and increasing the supply of cleaner energy.

These two paths towards a lower carbon energy economy form the basis of GreenCape's work in this space.

The focus of our energy services work includes supporting service providers remove the barriers to growth to their projects within the province. These projects focus mainly on the implementation of energy saving interventions across the various economic sectors in the province, mainly through energy efficiency and renewable energy solutions.

GreenCape's support for increasing the supply of cleaner energy comes through renewable energy work – both in the large-scale utility and small-scale (embedded generation) renewable energy sectors. We work with project developers and investors on the promotion of large-scale renewable energy projects within the province, and to position the Western Cape as a preferred location for the manufacturing of renewable energy components.

We are also actively driving and enabling the uptake of small scale embedded generation by helping address the barriers to market growth. Over the past year we have worked to put rules and regulations in place while advising municipalities on recommended policies and tariffs. Linked to this, GreenCape is involved in developing a national prepaid split smart metering standard.

This will drive down the cost of the metering equipment required on embedded generation connections and ensure that South African metering keeps pace with the rest of the world, entering an era of smart and automated billing. This will help enable both demand reduction and the connection of embedded generation.

Benefits of becoming a GreenCape member

We currently have over 600 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.

To register as a member, please visit our website, www.greencape.co.za

1 Renewable Energy

Utility-scale projects, small-scale embedded generation, and localisation of component manufacture.

2 Energy Efficiency

Energy efficient buildings and equipment, demand side management and financing contracting models.

3 Alternative Waste Treatment

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

4 Western Cape Industrial Symbiosis Programme (WISP)

Free facilitation service that networks companies to exchange under-utilised resources (materials, energy, assets, logistics and expertise).

5 Water

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

6 Agriculture and Bio-Based Value Chains

Sustainable agriculture, valorisation of wastes to high value bio-products, including bio-energy.

Figure 7: GreenCape's focus areas

8– References

City of Cape Town 2015. Cape Town Energy 2040 Vision and Action Plan presentation. [Accessed 01 November 2015]. E-mail from S. Mohamed (sumaya.mahomed@capetown.gov.za) to S. Didiza (songo@greencape.co.za)

Creamer, Terence 2015. Movement at last on solar-geyser procurement Available from: http://www.engineeringnews.co.za/article/movement-at-last-on-solar-geyser-procurement-2015-12-08 [Accessed on 8 December 2015].

Eskom 2015. MYPD 3: Regulatory Clearing Account Submission to NERSA Available from http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Consultation/Documents/MYPD3%20(Year%202013-14)%20Regulatory%20Clearing%20Account%20-%20Submission%20to%20NERSA.pdf

Gaegane, Lesego 2015. Progress Update of the PSEE Programme presentation. E-mail from L. Gaegane (Gaegane.Lesego@nbi.org.za) to S. Didiza (songo@greencape.co.za), 20 November 2015

GreenCape 2015. 2015 Energy Efficiency Market Intelligence Report

Groenewald, Yolani 2015. Solar power: Limited options for South Africans. June 2015. Available from http://www.fin24.com/Economy/Eskom/Solar-power-Limited-options-for-South-Africans-20150628 [Accessed 15 October 2015]

IDC 2013. Developing a vibrant ESCO Market - Prospects for South Africa's energy efficiency future [accessed via mail]. E-mail from A. Payne (andrew@greencape.co.za) to S.Didiza(songo@greencape.co.za), 25 May 2015. Available from: http://www.idc.co.za/images/geef-market-studies/ESCO_Market_Study_Report-Developing_a_vibrant_ESCO_Market.pdf

Le Cordeur, Matthew 2015. INFOGRAPHIC: Eskom's 26 days of load shedding in 100 days. 14 April 2015. Available from http://www.fin24.com/Economy/INFOGRAPHIC-Eskoms-load-shedding-balancing-act-20150413 [Accessed 10 November 2015]

Makhura, David 2015. Full text of Gauteng premier David Makhura's State of the Province speech 2015, 23 February, 2015. Available from http://www.timeslive.co.za/politics/2015/02/23/full-text-of-gauteng-premier-david-makhura-s-state-of-the-province-speech-2015 [Accessed 20 October 2015]

Navigant Research 2015. Revenue for the Global Energy Service Company Market Is Expected to Reach $14.7 Billion Annually by 2024. https://www.navigantresearch.com/newsroom/revenue-for-the-global-energy-service-company-market-is-expected-to-reach-14-7-billion-annually-by-2024 [Accessed 31 October 2015]

PQRS 2015. More than a 1000 PV installations in South Africa. Available from http://pqrs.co.za/more-than-1000-pv-installations-in-south-africa-april-2015/ [Accessed 15 October 2015]

South African National Energy Development Institute (SANEDI) 2013. 12L EE TAX Incentive. Available from: http://www.sanedi.org.za/12l-ee-tax-incentive/ [Accessed on 2 September 2015].

SALGA 2014. Guideline on Energy Efficiency and Renewable Energy in Municipal Water and Wastewater Infrastructure (SALGA Guideline). Available form http://www.researchgate.net/publication/267152090_Guideline_on_Energy_Efficiency_and_Renewable_Energy_in_Municipal_Water_and_Wastewater_Infrastructure_(SALGA_Guideline) [Accessed 31 October 2015]

Steyn, Lisa 2015. Eskom hands over the reins of solar power geyser initiative. Mail and Guardian. 19 January 2015. Available from http://mg.co.za/article/2015-01-19-eskom-hands-over-the-reins-of-solar-power-geyser-initiative

Steyn, Lisa 2015. Solar power to reach its zenith. Mail and Guardian. 16 January 2015. Available from http://mg.co.za/article/2015-01-15-sun-power-to-reach-its-zenith [Accessed 24 September 2015]

Wicht, C. 2015. Energy Security Game Changer presentation E-mail from C. Wicht (Cabral.Wicht@westerncape.gov.za) to S. Didiza (songo@greencape.co.za), 22 October 2015

Appendix A: List of relevant policies in embedded generation

Electricity Regulation Act, Act 4 of 2006 and Electricity Regulation Amendment Act, Act 28 of 2007 as amended - The act states that no person may, without a license issued by the regulator (NERSA), operate any generation facility. The Electricity Regulation Act, Act 4 of 2006 holds that exemption is held for non-grid-tied projects. Note that NERSA has issued a communication giving license exemption to SSEG installations in municipal areas under 100kW.

South African Distribution Code (all parts) - The South African Distribution Code applies to all entities connected to the distribution network, including embedded generators. It sets the basic rules for connecting to the distribution network, ensures non-discrimination to all users connected to the distribution network and specifies the technical requirements to ensure the safety and reliability of the distribution network.

South African Grid Code (all parts) - The South African Grid Code contains the connection conditions that are required by all generators, distributors and end-users (customers) connected to the municipal electrical grid, as well as the standards used to plan and develop the transmission system.

South African Renewable Power Plants Grid Code - This document sets out the technical and design grid connection requirements for renewable power plants (0-1MVA LV[6]) to connect to the transmission or distribution network in South Africa.

Occupational Health and Safety Act 1993 as amended - The Occupational Health and Safety Act provides for the health and safety of the people by ensuring that all undertakings are conducted in such a manner so that those who are, or who may

[6] Voltage levels up to and including 1 kV. (1kV= 1000 Volts).

be, directly affected by such an activity are not negatively harmed as far as possible and are not exposed to dangers to their health and safety.

Municipal Electricity Supply By-Law - This document provides the general conditions of supply of electricity, outlines the responsibility of the customers, systems of supply, measurement of electricity and the electrical contractors responsibilities.

SANS 10142- Parts 1 to 4: The Wiring of Premises - This document serves as the South African national standard for the wiring of premises in low and medium voltage networks (AC/DC). The aim of the document is to ensure that people, animals and property are protected from dangers that arise during normal as well as fault conditions, due to the operation of an electrical installation. Compliance to the standards and regulations as laid out in SANS 10142-1 is required and proof should be provided via an electrical installation certificate of compliance. The implication is that a registered professional is required to sign the installation.

SANS 474/ NRS 057 Code of Practice for Electricity Metering - SANS 474 specifies the metering procedures, standards and other such requirements that must be adhered to by electricity licensees and their agents.

NRS 048: Electricity Supply – Quality of Supply – The NRS 048 series covers the quality of supply parameters, specifications and practices that must be undertaken to ensure correct and safe operation. The NRS 048-2 and NRS 048-4 have the most relevance to the operation and connection of SSEG's to the municipal electrical grid: NRS 048-2: 'Voltage characteristics, compatibility levels, limits and assessment methods' sets the standards and compatibility levels for the quality of supply for utility connections as well as for stand-alone systems. It is intended that generation licensees ensure compliance with the compatibility levels set in this document under normal operating conditions. NRS 048-4: 'Application guidelines for utilities' sets the technical standards and guidelines for the connection of new customers. It also sets the technical procedures for the evaluation of existing customers with regards to harmonics, voltage unbalance and voltage flicker.

NRS 097-1: Code of Practice for the interconnection of embedded generation to electricity distribution networks - Part 1 MV and HV (Eskom 240-61268576 / DST 34-1765: Standard for the interconnection of embedded generation, is applicable until published)

NRS 097-2: Grid interconnection of embedded generation: Part 2 Small Scale Embedded Generation – NRS 097-2-1 (Part 2: Small Scale Embedded Generation, Section 1) this document serves as the standard for the interconnection of SSEG's to the municipal electrical grid and applies to embedded generators smaller than 1000kVA connected to LV networks of type single, dual or three-phase.

NRS 097-2-3 (Part 2: Small Scale Embedded Generation, Section 3) - this document provides simplified utility connection criteria for low-voltage connected generators.


GreenCape