CEO's Guide to Going Solar July 2023







BETTER TOGETHER



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About Wesgro

Wesgro is the official tourism, trade and investment promotion agency for Cape Town and the Western Cape.

A leading regional economy, the Western Cape remains an investment destination of choice for global and local investors, a sought-after source market for goods and services, and a filmmaker's hub on the continent.

The Western Cape's tech and green value proposition is successfully driving the province's competitiveness to capture its share of global investment, awarding us the status of Africa's Tech Capital and a leading green economic hub on the continent. A region of unlimited potential, which translates into unlimited opportunity, we offer expertise and assistance to those looking to travel, invest, film or trade.

wesqro.co.za



cape town & western cape tourism, trade & investment





About GreenCape

GreenCape is a non-profit organisation that drives the widespread adoption of economically viable green economy solutions from South Africa.

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.

Since its inception in 2010, GreenCape has facilitated and supported over R42 billion of investments in renewable energy projects and manufacturing. From these investments, more than 19 000 jobs have been created.

greencape.co.za





This pack:

- is aimed at executive decision-makers.
- is designed to provide unbiased information to support investment decisions
- is focused on solar PV and energy storage.

We have had some success....

- > 150 engagements
- 2 in 3 engagements have resulted in new leads
- 1 in 5 new leads have resulted in installed systems
- ~20 MWs added to the South African grid

>150 PV Engagements with decision-makers



**Industry standard is less than 5% of leads resulting in new installations

1.2 Procurement roadmap

Support provided across the full process



Defining the problem

2.1 Declining Available Generation Capacity



Energy Availability Factor, actual vs. projections

1. Add notes

Source: Eskom data sourced from their 'Medium-term system adequacy outlook report', 30 October 2022 Historical EAF data sourced from CSIR's 'Statistics of utility-scale power generation in South Africa - 2022' report

- The Energy Availability Factor (EAF), is the percentage of the available energy generation to the maximum amount of energy which could be produced when not in planned or unplanned outages.
- EAF for Eskom's power plants are lower in 2nd quarter of 2023 than the projected trajectories in their Medium-Term System **Adequacy Outlook report for** 2023 - 2027.
 - The low EAF is mostly attributed to unplanned outages of the coal power plants.

2.2 Load shedding



Load Shedding Data & Scenarios

■ No new projects and high demand

■ Low EAF and low demand without IRP2019 implementation

Low EAF and low demand scenario with IRP 2019 implementation

Source: Eskom data sourced from their 'Medium-term system adequacy outlook report', 30 October 2022 Historical load shedding data sourced from CSIR's 'Statistics of unility-scale power generation in South Africa - 2022' report Eskom Se Push Data 2023

- Eskom's projections for load shedding, considering a low EAF and low demand scenario with the full implementation of IRP2019 allocations, will realize an end in load shedding by the end of 2027.
 - There is no indication that the IRP2019 is being implemented as envisioned
 - Unplanned outages causing lower than expected EAP
 - Large-scale private rollout of new generation projects are required to reach this optimistic outcome
- Eskom's projections for load shedding, considering a low EAF and low demand scenario without the implementation of IRP2019 allocations, will result in a continuation or worsening of load shedding for the foreseeable future.
- Load shedding drives a low demand outcome due to uncompetitive operating environment for industry, a high demand scenario will be disruptive, but unlikely.

2.3 Increasing cost of electricity



Eskom's Megaflex + 30% Municipal Markup

Source: GreenCape Analysis 1. https://www.eskom.co.za/distribution/tariffs-and-charges/

- Low solar PV prices will drive down the rate of tariff increases for daytime tariffs in the long term
 - New projects should not assume above inflationary tariff increases, especially for standard Time of Use (TOU) tariffs
 - Solar PV impact will mostly be on low demand season tariffs for TOU (September – May)
- Non-energy charges and TOU tariffs outside of daylight hours will likely increase by above inflationary values to counter potential losses from low solar PV prices
- Municipalities are moving towards a tariff structure with greater emphasis on fixed tariffs. This is to protect against revenue losses as PV penetration increases and ensure the grid can be maintained.
- New projects should compare the cost of grid electricity relative to other sources that are now possible, such as self-generation and wheeling agreements

Why PV makes sense

3.1 Market size and growth 2023/2024

South Africa is undergoing a surge in PV installations



Market Size by Region (MWp) 3.2GWp total

- Western Cape
- Gauteng
- Rest of South Africa





3.2 PV price trend

PV rates are 40-60% of typical distribution grid tariffs



- Mass production of PV panels have driven manufacturing costs down 82% since 2010. Progress in inverter and ancillary component technology has had a further cost reduction effect
- Reduced perceived risk on commercial PV development allows for cheaper project finance
- In 2023, local supply chain shortages as well as the weakening of the Rand resulted in a 15-20% price increase variance in PV quotes.
- PV component manufacturers worldwide are ramping up production to meet increased demand, although globally this will cause further decrease in PV costs, due to the impact of shipping and logistics, costs, as well as massive demand surges, SA may struggle to see this declining effect.

Option	Description	Term Length
Outright Purchase	The solar PV system is funded by the customer, the cost is high but in return the client gets ownership and all of the savings benefit. The client takes responsibility for the performance risk which can be mitigated via an O&M contract.	N/A
Debt Finance	Similar to above, except the money is raised through a loan from a commercial bank. Instruments are secured against the value of either the asset or property and payments are amortized the term.	5 – 10 years
Lease agreement Rent-to-Own	The installation, maintenance and management of the solar panel and its components is paid for by the solar PV provider. The customer pays a fixed monthly lease payment for the duration of the lease term. At the end of the term, the customer gets ownership.	10 years
Power Purchase Agreement (PPA)	The installation, maintenance and management of the solar panel and its components is paid for by the solar PV provider. The customers pays for units of energy provided at a PPA tariff rate that is less than their distribution utility tariff. The provider is hence incentivised to ensure adequate system performance.	15 – 20 years



Option	Description
Outright Purchase	Want to maximize the benefit from the system. Capital outlay can be self-funded.
Debt Finance	Want to maximize benefit from the system. Capital needs to be raised.
Lease agreement Rent-to-Own	Cannot afford the previous two options, but want to own the system in the long term. Want to minimize system performance risk over the lease term.
Power Purchase Agreement (PPA)	Don't need or want to own the asset. Access utility bill savings from day 1 of operation with developer ensuring adequate system performance.

Procurement Options / System Size	<100 kWp	<500 kWp	>500 kWp	>1 MW
Balance Sheet (per Wp)	R 12.00 - 16.50	R 12.00 - 15.00	R 11.50 – 14.00	R 11.00 – 13.50
Debt Finance (5 - 10 years)	Above amortized plus risk dependent interest %, typically below prime			
Lease-to-Own (10 years) (per month excl. escalation pa)	R 7 000 - 30 000	R 25 000 - 120 000	R 100 000 - 200 000	>R 210 000
Power Purchase Agreement (PPA) (10-20 years) (per kWh)	R 1.10 - R 1.45	R 1.00 - R 1.30	95c – R 1.15	80c - 90c

Types of PV Systems	Estimated Cost- multiplier	Reason
Rooftop	1.00	Most common type of system due to availability of roof space. Typically can accomodate 2kWp per 10m2
Rooftop (with asbestos replacement)	1.30 - 1.50	Asbestos Abatement Regulations 2020 specifies the phasing out of this type of roofing and the DoEL has taken a stance to prohibit PV in this case hence a roof replacement will be required. Financiers and insurance providers also typically avoid asbestos roofs due to the long term risk.
Ground - mount	1.10 - 1.20	If you have the available land area. Cost premium is due to required mounting structure and civil works.
Floating	1.50 – 1.75	If you have a compatible body of water. Cost premium is due to the required floats which are price dependent on import/order volumes. Has an added benefit of decreasing evaporation losses.
Carport	1.25 – 2.00	Depends on parking area and influence of existing vs required parking infrastructure on mounting costs. Has added benefit of providing shade and visibility for sustainable brand promotion.

Source: GreenCape Analysis





3.8 Case study - debt finance

Business Name: Location: **Developer:** Loan provider:

System size:

Electricity generated in a year: Yearly electricity consumption: % of generation for own use:

Municipal Tariff: Feed-in Tariff (FIT): **Monthly Electricity without PV:** Monthly Savings: **Revenue from FIT:**

Inframax Holdings Kenridge Centre, Cape Town AW Power (2020) Nedbank

156 kWp 268 500 kWh 564 000 kWh 89%

R 1.61 per kWh R77 000

Commercial debt interest rate: Monthly loan Payments: Payment escalation per annum: **Contract Term Length:**

R 0.74 per kWh R 35 000 (45%)

7% R 29 400 5% 7 years



Project Description (The Why):

The solar PV system installed at Kenridge Centre is a Grid-Tied PV System configured to generate electricity for self-consumption, with excess generated electricity being exported back into the electricity grid.

Being grid-tied, this system does not produce energy during load-shedding periods, but is able to when extended through a battery-tied system that provides power to essential loads or an appropriately sized generator.

System size (kW):	80 kW _p
Electricity generated in a year:	~ 180 100kWh
Yearly electricity consumption:	180 100kWh+
% of generation for own use:	100%
Monthly Payments:	R21 000
Payment escalation per annum:	3%
Contract Term Length:	10 years

Installer benefits from 12B Installer carries O&M costs Performance guaranteed for lease period

Full ownership of system post-lease period Mid-lease buyout options as stipulated in contract



Projected Value

Business Name: Location: Developer: Lease provider:

System size: Electricity generated in a year: Yearly electricity consumption: % of generation for own use:

Municipal Tariff: Feed-in Tariff (FIT): Monthly Savings:

Monthly lease Payments: Payment escalation per annum: Contract Term Length: Creation Wines Hermanus, Western Cape Soly Soly

90 kWp 99 138.25 kWh 216 961.37kWh 38%

R 1.24 per kWh R 0.90 per kWh R 15 000 – 20 000

R 29 164,13 CPI% 10 years



Project Description (The Why):



Grid-tied PV System. Wanted to reduce costs and carbon emissions. Both are beneficial. System feeds excess energy back into the grid. There is also currently no backup on this system. They make use of a generator for load shedding which is not part of the solar system installation of Soly. (They can be provided with a battery on this system).

System size (kW):

 80 kW_{p}

100%

R1.20

15 years

3%

~180 100kWh

180 100kWh+

Electricity generated in a year: Yearly electricity consumption: % of generation for own use:

Starting PPA Rate: PPA Escalation per annum: Contract Term Length:

Installer may benefit from 12B Installer carries O&M costs Performance guaranteed

Extension, buyout or removal options as stipulated in contract



■ PPA Cost (full year) ■ Equivalent Municipal Tariff Cost (full year) ■ NPV - Cumulative Savings

Business Name: Location: Developer: PPA provider:

System size (kW):

Electricity generated in a year: Yearly electricity consumption: % of generation for own use:

Municipal Tariff:

Feed-in Tariff (FIT):

Monthly Electricity without PV: Monthly Savings:

Starting PPA Rate: PPA Escalation per annum: Contract Term Length: Helderberg College Somerset West, Cape Town Sosimple Energy Sosimple Energy

 233 kW_{p}

373 300kWh 373 300kWh 100%

R 1.35 / R 2.15 per kWh (Summer / Winter) R 1.0398 / kWh (incl. COCT incentive) R 250 000 R 0.31 / R 1.11 per kWh (23%S, 50%W) R 0.86 / kWh CPI (~5%) 15 years



Project Description (The Why):

Helderberg College of Higher Education is a private higher education institution. Helderberg College opted for a grid-tied solar system in a bid to 1) reduce the monthly energy costs for the school and 2) contribute to a sustainable environment for it's scholars to grow up in.

Back-up considerations

4.1 Load shedding resilience FAQs

Grid-tied PV cannot in isolation protect against load shedding – a form of independent back-up is required to maintain energy during outages.

Thought process	Decision
Do I need a generator when I have solar and batteries?	Installing a backup generator can be advantageous during power outages and unfavourable weather conditions when solar energy may be limited and the battery storage is insufficiently charged.
How does one size a battery pack or generator size?	Consider the power requirements and desired backup for the intended load. Factors like peak power demands, energy consumption, and expected runtime are crucial in determining the appropriate size of the battery pack or generator. When sizing a battery bank, take into account the charging source, whether it's solar or utility power. Charging from solar allows the battery to supplement the solar PV system as a hybrid, reducing the required battery capacity and overall cost. Similarly, a smaller generator may be sufficient if the battery bank is properly sized and utilized in conjunction with the solar system.
Reliability and Redundancy	Consider the reliability of the solar and battery system in your specific location and circumstances. Consider factors such as the frequency of grid outages, the consistency of solar resources, and the reliability of the battery technology chosen
Scalability and Future Expansion	Assess your organization's future growth plans and energy needs with your energy services provider. They can help you evaluate whether the chosen solution, whether it be a battery pack or a generator, can be easily expanded or upgraded in the future to accommodate increased energy demands. Scalability is important to ensure that the backup power solution remains suitable and cost-effective in the long term.

4.2 Backup technologies

Technology	The Why and When	Investment Cost R/kWh capacity	LCOS R/kWh Units
Diesel Generator	Traditional means of providing continuous power supply. Although they are efficient and relatively cheap, rising diesel prices and demands of load shedding is making it less cost competitive than storage technologies. Emissions intensive which may have carbon tax implications.	2 000 – 4 000	5.00 – 10.00
Advanced Lead Acid	Improved cycle life and depth of discharge over traditional lead acid. Good for small scale, ad-hoc applications over a short period of time. Relatively low cycle life of 1-2 years depending on use.	1 500 – 2 000	
Lithium-Ion	Has quickly become the industry standard for battery storage due to a high energy density, high efficiency, fast flexible discharge/recharge, low maintenance and competitive costs. Will last 10 years depending on use.	4 000 – 10 000	4.50 - 6.00*
Vanadium Redox Flow	Emerging technology for applications starting at 400kWh. Can be cost competitive with Li-ion where >=4 hours of back up required.	8000 - 14 000	

4.3 Importance of levelised cost





4.4 Battery use cases

Li-ion storage can be a savings generating asset regardless of load shedding

Businesses will need to mitigate peak tariff costs on Time of Use tariffs (TOUs)



Applicable tariff – Eskom high demand season TOU (VAT incl.) 2022/23: Peak: R5.61 Standard: R1.70

Off-Peak:

92c

Typical system operation during day of stage 4 load shedding:

06:00 - 09:00 Morning peak, batteries are discharges to utilize cheap stored electricity (peak shaving)

09:00 – 17:00 Standard time, solar supplements and charges batteries allowing for a 60:40 energy split of PV: storage over 3 cycles for 3 periods of stage 4 load shedding

17:00 – 19:00 Evening peak, batteries are discharges to utilize cheap stored electricity (peak shaving)

4.5 Example of li-ion case



1500 kWh 2 x 4 hrs per day

% Investment with Storage [R 13 Mil]

PV Modules 21.4% Metering 0,4% Protection & Switches 3,0% Storage 52,8% Inverter 7,0% Mounting, Structures & Other 8.5% Engineering & Construction 7,0% **Source:** GreenCape Analysis

Equivalent Diesel Genset cost?

1MVa 3-phase CAPEX: R 2.5 Mil OPEX: ~R 300 000 per month Payback: 2 years with existing diesel genset; or 1 year & 3 months with new genset **Takeaway:** Storage is a significant portion. Consider underlying opportunity costs and fuel costs

% Investment without Storage [R3.9 Mil]



Finance and incentives

5.1 Financing renewable energy

- There are numerous financial mechanisms for commercial and industrial businesses.
- <u>Commercial banks offer</u> <u>financial</u> instruments designed specifically for rooftop solar PV.
- Innovative finance mechanisms are filling the gaps.



Solar PV in the C&I Sector: Chatting to the banks	ABSA	FNB	Nedbank	Standard bank
Main Investment Instrument(s) for PV	 Term Loans Asset & Property Finance Central Provident fund (CPF) / Mortgage Backed Business Loan (MBBL). 	 Term Loans Asset & Property Finance Instalment Sales Agreements 	Term loansAsset FinanceNedbank	 Term Loans Personal Loans Asset & Property Finance Access Bonds
Investment Size Requirements	None – do not set lower or upper limits, but return profile must be feasible.	R150 000 – R50 000 000	None	Dependant on the merits of the installation/project being considered.
Investment Period	Provide scope for both shorter and longer terms than typical PV finance options.	5 – 10 years	Up to 10 years dependent on the cash flaw models	Traditionally up to 10 years on commercial opportunities but dependent on considerations related to each installation/project being considered.
Security/Collateral Requirement for Debt	Dependent on funding structure, but often taken against either the underlying property or asset.	Dependent on funding structure, but often taken against either the underlying property or asset. Unsecured funding may also be available.	Usually in the form of of assets or sureties as well as the PPA in the case of IPPs.	Underlying Property/ Asset Guarantees Cessions
Inputs on further Risk Reduction	 Regulatory certainty A2_{nd} hand market for Solar PV assets Wheeling 	 Regulatory certainty A2_{nd} hand market for Solar PV assets Wheeling 	 Regulatory certainty A2_{nd} hand market for Solar PV assets Wheeling 	 An improvement in market dynamics brought about by regulatory environment Standardization
Average Interest Rate	Risk dependent	Risk and structure dependent	Risk dependent	Risk dependent

5.1 Financing renewable energy

- The <u>database</u> covers more than 150 finance opportunities across ~125 unique stakeholders.
- ZAR 25 billion is currently available across the financing solutions covered in the database.

Easy five-step process:

- 1. Select the relevant source of the finance
- 2. Sort sheet by sector
- **3.** Sort sheet by investment instrument
- **4.** Check alignment (size, terms, etc.)

5. Contact financier



5.2 Six renewable energy incentives to take advantage of



Regulations and tariffs

6.1 National

Regulations are adapting to the needs of the energy sector

- The amendment of Schedule 2 of the Electricity Regulation Act and the subsequent lifting and eventual removal the licensing threshold for embedded generation has significantly reduced the red tape to installing PV systems >1MW in size.
- The National Energy Regulators of South Africa (NERSA) has published Net Billing <u>guidelines</u> which provides a standardized framework for distributors to compensate customers for excess energy exported back to the grid. This enables the potential for FITs across the country.
- There is no longer a limit on the generating (PV modules) and inverter size of installations, but the AC / grid-connected side needs to be limited in accordance with the <u>NMD Rules</u> which protects the capacity of the local distribution infrastructure.

The province is leading the way in promoting enabling policy

Feed-in tariffs (FITs) allow customers to be compensated for excess energy that they export back into the grid.

In 2023, City of Cape Town was granted ground-breaking approval to pay customer cash for excess energy exported to the grid. It also supplements its feed-in tariff such reaching a total of R1.03 / kWh which is higher than any other municipality in the country The Western Cape has the highest % of municipalities with SSEG policies

It also has FITs that are higher than the national average of 80c/kWh

Overview of National SSEG Processes

- COMPREHENSIVE SSEG PROCESS
- BASIC SSEG PROCESS / MAKING PROGRESS
- NO PROCESS
- NOT A DISTRIBUTOR (USUALLY ESKOM)
- MUNICIPAL SSEG SUPPORT PROGRAMME PARTNERS



6.3 Local: City of Cape Town

- As part of the Mayor's Energy Priority Programme, CoCT is undertaking a number of activities to combat the impact of load shedding on it's constituents. These include:
- Tenders to procure from Independent Power Producers (IPPs):

Phase 1 of the 200 MW renewable energy. Contracts for this phase remain on track for final awarding within 2023. 500MW of dispatchable technologies including battery storage and gas-to-power.

- The Power Heroes demand-response programme that targets a 60MW reduction of usage via third party aggregators
- A first-of-its-kind Cash for Power feed-in tariff increased by 10.15% for 2023/24.



6.4 Wheeling and energy trading

Seeing the potential beyond generation for on-site own use

Wheeling is the financial transactions representing the transportation of third party electrical energy (kWh) over the distribution network which allows for the third party supplier to sell this electrical energy to a customer at that customer's point of supply.

- Eskom generators to Eskom customers wheeling is working.
- Eskom Generators to Municipal Customers; and Municipal generators to municipal customers is constrained but is showing great progress

Western Cape municipalities are pioneering wheeling implementation in South Africa. Both <u>City of Cape Town</u> & <u>George</u> are currently running pilots and engaging with projects.



George Municipality's wheeling framework

6.4 Wheeling and energy trading

Seeing the potential beyond generation for on-site own use

The National Energy Crisis Committee (NECCOM) is supporting collaborative engagements to ensure the **short-term bankability of wheeling** via the:

- Development of a national wheeling framework to be adopted by NERSA
- Standardisation of municipal wheeling guidelines
- Standardisation of the use of systems contracts for all municipalities

From a tariff perspective, **if you can offer energy on a PPA at a lower rate than Eskom Megaflex**, all parties participating in the transactions will benefit from a wheeling arrangement. Currently, the average daytime charge from Eskom is ~ R1.60.

Licensed energy traders can also be a key intermediary to wheeling as they take away the off-take risk for the producer. They have the ability to purchase power from multiple energy producers across the country and supply it to various end customers nationally, through the use of Eskom and municipal networks.

6.5 Quality assurance

South Africa is undergoing a surge in PV installations

- The South African Photovoltaic Industry Association (SAPVIA) is at the forefront of development, regulation and promotion of safe, compliant and quality solar PV installations. You can find installers accredited on by their GreenCard programme <u>here</u>.
- Insurance providers will either allow the PV asset to be included in the existing home insurance or on the basis of a performance warranty.
- Your installer must register your system with the local municipality/Eskom. This includes compliances requirements such as sign offs by professional engineers on structural integrity and the electrical work. A Certificate of Compliance (CoC) must then be provided to you.
- In the event of a grievance, a customer may contact SAPVIA. An Approved Inspection Authority (AIA) will then do an independent investigation, you can find contact details <u>here</u>.







Useful links

 Wesgro website: <u>https://www.wesgro.co.za/corporate/home</u>

- Western Cape Gov energy resilience programme: <u>https://www.westerncape.gov.za/110green/energy/western-cape-energy-resilience-programme</u>
- Western Cape Gov FAQs on Energy: <u>https://www.westerncape.gov.za/110green/energy/faqs-frequently-asked-questions</u>
- City of Cape Town energy resources:
 <u>https://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-electricity-services/energy</u>
- GreenCape website:
 https://green-cape.co.za/
- GreenCape energy services market Intelligence report: <u>https://green-cape.co.za/market-intelligence/</u>



Stay in touch as you navigate the next steps

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