

CredibleCarbon

PROJECT IDEA NOTE

PROJECT NAME:
Sun Exchange (Pty) Ltd

PROJECT DEVELOPER:

Sun Exchange
2015/142280/07

PROJECT PROPONENT:

Dr John Thorne

CARBON REGISTRY AND STANDARD:

Credible Carbon (Pty) Ltd
Registration number: 2016/027710/07

PIN PREPARED BY:

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Document Change Control

Date	Change Made	Comments
03/10/23 Document file name changed accordingly.	Carpe Deum removed from project list. Reduces available tCO ₂ for sale during the trading period of this PIN by 64	Carpe Deum emissions are owned by Allotrope. Credible Carbon have removed the associated credits from the registry.

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1. Description of Project

Sun Exchange is a privately owned innovative and fast growing South African microscale solar PV project developer that has been in operation since 2015 and has developed in excess of 60 projects, totalling 7.3 MW of installed capacity. The company fulfils an important niche in the energy sector by providing financing to smaller organizations that would otherwise be unable to afford clean energy technology.

The company is an example of a small technology-enabled green economy business that occupies a leadership position in the sector through its innovative business model. It is expected that carbon revenue as a result of this project will contribute to Sun Exchange reaching financial sustainability and support faster growth resulting in more rapid uptake of clean energy for its target customers. In the current context of the climate crisis, and the instability and carbon intensity of the South African electricity grid, this is an important mission that deserves support.

Business Model

Sun Exchange supports the financing of rooftop solar PV projects for smaller organizations across Southern Africa by matching international investors with small-scale solar projects across the region. High upfront capital costs of rooftop solar puts it out of reach for many small businesses. Sun Exchange's Energy as a Service funding model allows off takers to pay for the clean energy as an operational cost rather than a capital cost.

Off-takers pay for the infrastructure by diverting a portion of their electricity spending to Sun Exchange to pay for electricity generated by the solar infrastructure, and the remaining portion is paid either to Eskom or their municipal supplier.

Off-takers may also choose different system configurations:

- Prior to 2022, the standard system design included grid-tied inverters without battery storage, giving customers a targeted 20% reduction in electricity tariffs over the life of the project. However, the grid-tied configuration shuts down by design with grid outages. If existing customers decide to upgrade to include storage, they need to make separate funding arrangements to cover the cost of batteries.
- Most new customers opt for systems with battery storage that gives them energy security. There are two options for funding the energy-security system – either i) they may include the additional cost in the crowd sale funding arrangement managed by Sun Exchange or ii) fund the batteries themselves.

Crowd Funding

Sun Exchange has access to a global network of investors. When a new project comes online, the company facilitates a crowd sale and any individual or organisation, anywhere in the world, can sign up to be a Sun Exchange member and buy solar cells. Investors, in effect, purchase micro-scale infrastructure assets (solar cells) and rent them to off-takers.

Key features of the platform business model include the following:

- Crowd funding to an international network of solar investors who finance the project and receive a commercial return on their investment. Investors can start as small as investing in a

single photovoltaic cell. This provides maximum flexibility, and crowd sales generally sell out quickly.

- Investors receive their returns over the life of the project and funds are remitted using cryptocurrency. Sun Exchange has developed a proprietary wallet that facilitates international funds remittance via bitcoin. The application of cryptocurrency avoids international bank charges allowing for additional margin in the value chain and a more seamless transfer of funds. Each investor has a personalised dashboard that provides feedback on their investment.
- Sun Exchange identifies schools, businesses and organisations that want to switch to photovoltaic energy and carefully evaluates projects to ensure that they are financially and technologically viable.
- Off takers (schools, businesses and organisations) pay for the clean energy generated.
- Revenue streams for Sun Exchange include a project fee which covers the project design and setup and an ongoing maintenance and management fee.

System Technology

- The sizes of the solar arrays in this carbon project range from 6.5kW to 510kW with a median at 65kW.
- The design is managed in-house, and procurement and construction of the energy systems is outsourced to experienced EPC contractors. Tier one¹ components are used, ensuring reliability over the life of the project.
- Prior to 2022, the vast majority of installed systems did not include battery storage, however this dynamic has started to change as power outages continue across the country.

Financial Performance

Sun Exchange is a fast-growing private company that reinvests in growth. As of the date of this PIN, the company is not yet profitable and carbon revenue will support the accelerated roll-out of projects in South Africa.

Non-Payment

For Sun Exchange off-takers, non-payment of tariffs to Sun Exchange for the solar generated portion of their electricity bill results in normal debt collection processes and both investors and Sun Exchange carry risk from non-payment.

2. Projects

The company has a growing pipeline of micro-scale rooftop solar photovoltaic projects across South Africa. As of September, 2022, projects numbered 62, totalling 7.3 MW of installed capacity. New projects are coming onstream at a steady rate, with 18 projects added in 2022 up to September 2022 but financial sustainability remains a challenge.

¹ Tier one components indicate the highest quality. Bloomberg New Energy Finance has created a tiering system that defines tier 1 manufacturers from a financial and bankability point of view.

Project sites qualify if they have:

- Available rooftop space or suitable ground-mount space.
- A captive off-taker who is usually connected to the main grid and would like to install solar PV but is unable to afford the capital costs of the system.
- An off-taker that is financially stable to and is able to afford tariffs over the lifetime of the project.

Ownership of Carbon

The projects included in this PIN are listed in Annex A from data provided by Sun Exchange.

This is not a complete list of projects in the Sun Exchange portfolio. The company has arrangements with a several carbon intermediaries, and the carbon from these projects are excluded from this PIN to avoid double counting. South Pole (<http://www.southpole.com>), Allotrope Partners (<http://www.allotropepartners.com>), and Blue World Carbon (<https://www.blueworldcarbon.com/>) own carbon in Sun Exchange projects which are not included in the project list in Annex A

In addition, 6.73% of the carbon from Spar Lulekani and 46.39% of the carbon from CPOA Avondrust Court is owned by Energea (<https://www.energea.com>). This arrangement is indicated by cells highlighted in blue and electricity production figures have been corrected to reflect the portion of carbon owned by Sun Exchange, again to avoid double counting.

3. South Africa Electricity Supply

South Africa is the world's 14th largest emitter of greenhouse gases (GHGs), principally due to a heavy reliance on coal for powering its electricity grid, and has amongst the most carbon-intensive electricity system in the world.

The country's GHG emissions in 2015 were 460 million tonnes of CO₂ equivalent (MtCO₂e), according to data compiled by the Potsdam Institute for Climate Impact Research (PIK). Emissions rose steadily for much of the past 50 years, growing from around 250MtCO₂e in 1970 to a peak of 490MtCO₂e in 2008. The updated Nationally Determined Contribution (NDC), released for public comment in March, 2021 provides a lower upper range emissions target of 510 Mt CO₂-eq for 2025, down from 614 Mt CO₂-eq in the 2015 NDC, and also commits the country to reach net zero emissions by 2050.

However, Climate Action Tracker (CAT), an independent scientific analysis produced by three research organisations tracking climate action, rates South Africa's NDC as "highly insufficient". This means its pledge is outside a "fair share" of the emissions cuts needed to meet the goals of the Paris Agreement, and "not at all" consistent with limiting global warming to less than 2°C or 1.5°C. (Carbon Brief, 2018).

Energy Crisis

Underinvestment in new infrastructure and maintenance for the past two decades, coupled with mismanagement and corruption has left the national utility in an unstable state. Frequent planned and unplanned power outages increasing in duration and severity have been occurring across the country for the past decade. In spite of significant increases in tariffs since 2008, Eskom finds

itself with a massive debt of more than R400 Bn which it is unable to service and relies on annual bailouts from National Treasury.

The sector is in crisis and it is causing widespread disruption to the economy. The graph in Figure 1 below illustrates the electricity tariff escalation over the past two decades compared to inflation (Moolman, 2021).

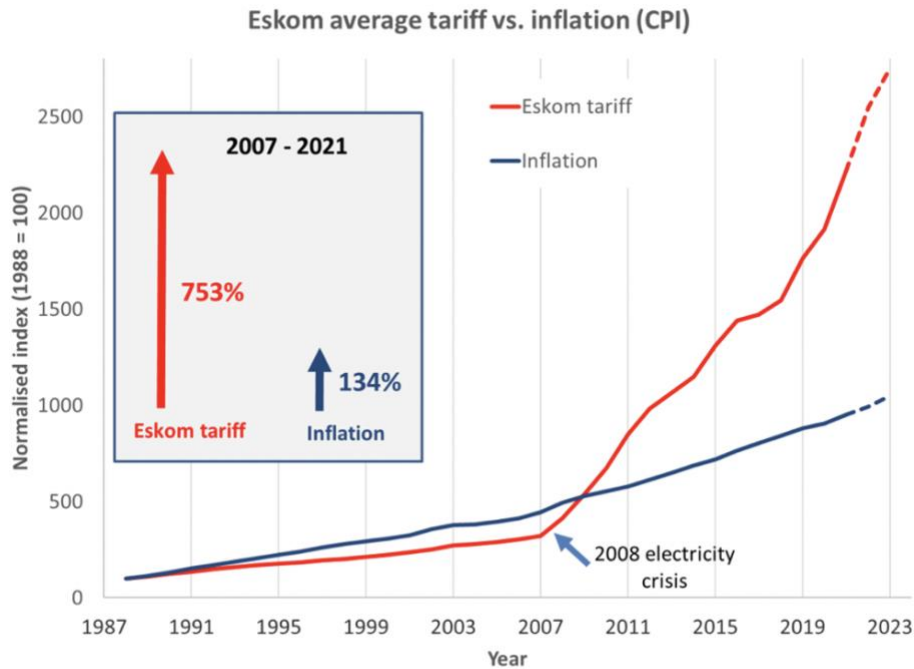


Figure 1: Eskom tariffs from 1988 to 2021, plotted against inflation over the same period.

Figure 2 below captures statistics from load shedding app, EskomSePush and shows statistics between 2015 and 2022. The statistics for Q1 2023 show a further continued increased in the frequency and severity of power outages in South Africa.

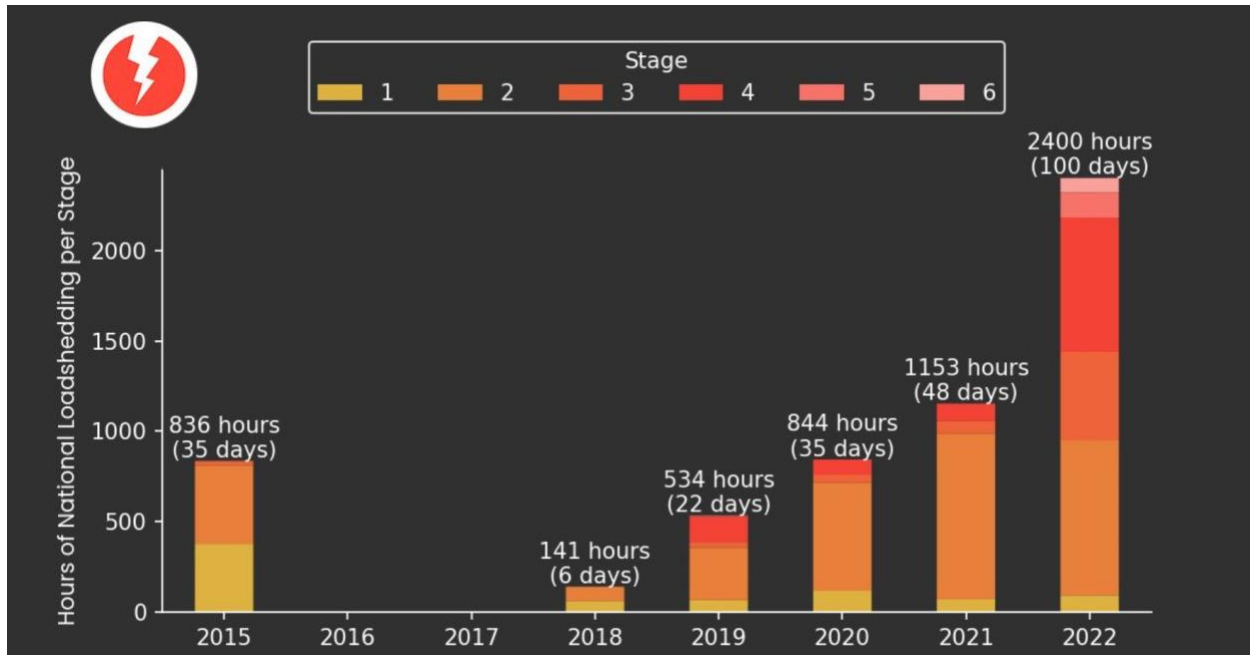


Figure 21: The graph compares the hours and days of load-shedding between 2015 and 2022.

Small Scale Renewable Energy

The Council for Scientific and Industrial Research (CSIR) estimates that by 2050, residential solar PV will grow to 11GW of installed capacity. This represents over R500bn of renewable equipment and services and it is estimated that at least six million households are potential rooftop solar customers.

By 2020, 56 municipalities in the country had active Small-Scale Embedded Generation (SSEG) Programmes, up from 34 in 2017. SSEG is a local government programme of grid-connected rooftop solar implementations, with a maximum of 1 MW production capacity. It is installed by electricity customers on residential, commercial, agricultural or industrial properties and connected to the customer's electrical network behind the electricity meter – and is thus 'embedded' in, and synchronized with, the distribution network, as opposed to off-grid systems which are not connected to the distribution network. The number of Small-Scale Embedded Generation SSEG installations in South African distribution network areas is accelerating. It is one of the few generation options that can be deployed rapidly, and is thus a critical step in responding to the energy crisis. The majority of energy generated through SSEG in South Africa is from solar photovoltaic (PV) systems, and thus supports climate change mitigation and green economy policy objectives.

The Renewable Energy Programme

Reports analysing the South African Renewable Energy Independent Power Producers Procurement Programme (REI4P) are widely available online.

South Africa first introduced the REI4P in 2011. There have been six bid windows completed and 8891.86 MW of mostly wind, solar capacity installed, funded largely by domestic private capital.

The program intends to install 17.8GW of renewable energy in South Africa before 2030 and remains the most obvious route to decarbonise the country's power sector.

Initially the program was a hailed internationally as a success but recently has become mired in political infighting related to just transition dynamics and the pace of the transformation has almost stopped in spite of the shortage of generating capacity.

Based on South Africa's new integrated resource plan (IRP) from 2019, the coal decommissioning plan requires 10.5 GW of coal to come offline by 2030 and 35 GW by 2050, thus providing a completely different energy mix from the one currently in place

4. Methodology

There are several registered and approved CDM methodologies that could be applied to this project to calculate avoided emissions.

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid ⁶ system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

Table 1: Applicability of AMS-I.D, AMS-I.F and AMS-I.A based on project types. (CDM, 2022)

Based on the above table from CDM, the following methodology has been applied: AMS-I.F – 1 : Renewable electricity generation for captive use and mini-grid

AMS-I.F. Renewable electricity generation for captive use and mini-grid

Assumptions

- Grid emissions factor: 1.07 kgCO₂/kWh. This figure is a marginal grid factor from version 3.0 of the IFI Dataset, which was updated and published in December 2021. (UNFCCC, 2021).
- The Karoo Fresh project is not grid connected and the solar system replaces diesel generators during the day. Tool 33, required by AMS-I.F provides a set of emissions factors for diesel generators. In keeping with the conservative nature of this carbon assessment, we have used an emissions factor of 0.8 kg CO₂/kWh for all energy generated by Karoo Fresh system.

- Apart from the exceptions noted in the project dataset in Table 3, all the carbon for the listed projects belongs to Sun Exchange.
- The solar PV-generated electricity data provided by the company, is based on data exports from the inverters at each project site. Recently the company has implemented AMMP (<https://www.amp.io/>) which is a cloud data aggregation platform used for monitoring in more than 35 countries.

Additionality

Verra and the Gold Standard’s current perspective is that grid connected solar PV in South Africa is not additional. There are suggestions that these two carbon standards are reviewing this status and it may change. On the other hand, a number of micro-scale CDM PoA’s for grid-connected solar PV remain active in the country indicating that from a CDM perspective, grid connected solar is indeed additional.

In a country such as South Africa with more than 80% of electricity produced from thermal coal, coupled with the urgent need to reduce emissions, Credible Carbon supports the acceleration of grid-tied renewable energy until energy supply is at least 50% renewable. The need for support is illustrated by this PIN – Sun Exchange while growing fast and bringing on new projects on a monthly basis is not yet profitable. Carbon revenue will assist the organisation to achieve financial sustainability and continue to grow its project portfolio.

5. Estimated CO₂e reduction schedule

As indicated in Table 3 on Page 16, there are 27 project sites where carbon emissions are available for sale with almost 4 MW of installed capacity. Emissions for some of the older projects date back to 2020 with a total of 5,499,150 kWh of clean energy generated between 2020 and the end of 2022. Other Sun Exchange project sites not included in the table below have been included in separate carbon projects under different standards and will be kept separate to avoid double counting.

Emission factors for the South African Grid vary. This PIN uses a figure of 1.07 kgCO₂/kWh published by the UNFCCC in December 2021, except for the Karoo Fresh Project which uses an emissions factor of 0.8 kgCO₂/kWh as per instruction from Tool33.

This gives a total figure of 5,871 tCO₂e available for sale as per table 2 below.


Baseline emissions in year y = Net energy displaced by the PV in year y X Grid Emission Factor in year y				
	2020	2021	2022	Total

PV generated energy per year (kWh/year)	95,755.2	2,095,359	3,248,373	5,439,487
Grid Emission Factor (kg CO ₂ e/kWh)	1.07	1.07	1.07 ² 0.8 for Karoo Fresh	1.07
Avoided CO ₂ emissions (tCO ₂ /yr)	102	2,242	3,462	5,807




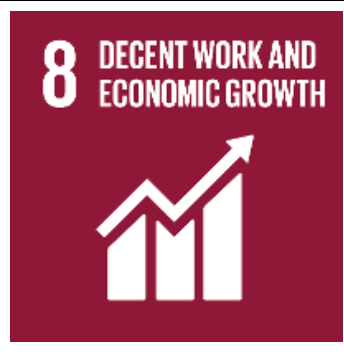
Table 2: Emissions reduction schedule for the period under review - 2020 to 2022. Emissions figures by individual project provided in Table 3 on page 16.

6. Alignment with Sustainable Development Goals

Sun Exchange Project are closely aligned with the following SDGs.

 <p>1 NO POVERTY</p>	<p>The state of the country's national utility, Eskom has significant impacts on South Africa's economic growth and unemployment. Public funds diverted to service the mounting debt burden mean reduced funding for social services, such as education, healthcare and poverty alleviation funding. Widespread reports underscore the effect on small business and public healthcare services. Increasing energy poverty across the country is the outcome.</p> <p>In this respect, companies like Sun Exchange occupy an important niche in the renewable energy funding ecosystem by enabling the financing of micro-scale projects and, in the process, they have a positive impact on employment and education. The organisation is a good example of a small green economy business that creates jobs and has a positive impact on the environment, society and broader stakeholders. Sun Exchange currently employs 35 people.</p>
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² The Karoo Fresh project used an emissions factor of 0.8 in keeping with recommendations in the methodology.

 <p>4 QUALITY EDUCATION</p>	<p>A growing number of Sun Exchange project sites are at schools. In addition, the organisation has committed to the formation of a fund to reduce electricity tariffs at poorer schools and other organisation which will see the ability to role solar PV to a broader customer base.</p>
 <p>7 AFFORDABLE AND CLEAN ENERGY</p>	<p>SDG 7 is the key SDG addressed by Sun Exchange and is particularly relevant in the South African context with the carbon-intensive electricity from the national grid being both unreliable in terms of supply and increasingly expensive.</p>
 <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>SDG 11 aims to make cities inclusive, safe, resilient and sustainable.</p>
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<p>Power outages and energy cost inflation are a significant risk to the South African economy with small business struggling to survive the impact of a dysfunctional power generation network. A number of Sun Ex customers are retailers or agriculture processing operations in small rural towns across the country which would otherwise be threatened by closure.</p>

A Fund to Subsidise Social Impact Projects

In terms of the direct impact on poverty alleviation as required by the Credible Carbon Standard, the executive team have proposed the formation of a fund to support social impact projects through Sun Exchange.

Half the carbon revenue generated from the sale of carbon credits will be used to subsidise tariffs at poorer schools and other social impact projects. The fund will not be formally constituted at this stage but rather managed an allocation within the company's accounting records.

7. Project boundary

Spatial boundaries

This component project involves twenty-seven sites across South Africa. One site in Zimbabwe has been excluded due to complexities of supporting projects that cross national boundaries. New sites are opening up frequently and the update of the PIN will include new sites that have come online. Details about each site including the location are available at <https://thesunexchange.com/project>.

Temporal boundaries

Accounting period:

- Start date: 1st January 2020
- For version 1 of the PIN, the accounting period ends on 31st December 2022.
- The project will last for 20 years.
- The project will be audited every 3 years, and this document will be updated with new projects and carbon emissions calculations prior to each audit.
- The baseline emissions factor will be adjusted with each PIN update to reflect the realities of the South African grid using published emissions factors from UNFCCC or updates in the Methodology.

Trading period

- Starting date: 1st January 2020
- End date: 31st December 2022.

8. Leakages

Tool 5 provides guidance related to possible leakages related to the project. Emissions from electricity consumption include CO₂ emissions from the combustion of fossil fuels at any power plants at the site(s) of the projects. (UNFCCC, 2017; UNFCCC, 2017).

Due to the design of the utilised methodology, which calculates baseline avoided emissions by year from clean energy used by the off-taker or exported to the grid, we do not expect leakages from the project.

9. Monitoring plan

1. Third party audits are to be conducted at least every three years as part of the project.

2. Electricity generation records from each site should be archived electronically and be kept at least for 2 years after the end of the last crediting period, using a timestamp and password protected security to ensure that the records are accurate and original.
3. The auditor should select at random two project sites to visit. This figure may change as the project portfolio grows.
4. Electricity generation records are recorded by inverters at each site and uploaded to AMMP which has recently been implemented at Sun Exchange. AMMP provides digital solutions for distributed energy using a SaaS platform and offers remote monitoring and management for energy users and energy service companies. Electricity generation data from each site and captured in AMMP should be made available to auditors for review.
5. 100% of the data should be monitored.
6. The emissions factor (EF) for the South African grid is expected to drop over time. The latest EF provided by the UNFCCC should be used to calculate the emission reduction schedule for the period under audit.

About AMMP

AMMP, which is used in 35 countries across the world, is a software as a service (SaaS) cloud platform providing remote monitoring and management for energy users, energy service companies, and vendors of renewable energy systems.

AMMP monitors range from low complexity sites in residential applications, to high complexity PV-hybrid systems in the commercial and industrial sector. AMMP integrates with all devices present and provides various levels of visibility to stakeholders. Integrations include a wide variety of inverters, devices and technologies including PV arrays, battery inverters, diesel generators, smart meters and meteorological sensors.

The software has been design to ensure integrity of data under conditions where there are frequent power outages, and connectivity issues. The company has received a number of awards and has developed strategic partnerships with leading vendors and stakeholders in the distributed energy space. (The monitoring solution for hybrid energy systems, 2021).

10. References

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- ❖ The monitoring solution for hybrid energy systems. (2021). Retrieved from AMMP: <https://www.ammio.io/>

11. Annex A: Project List

Project Name	Solar Array Size kWp	SunEx Ownership of Credits	2020 Actual kWh	2021 Actual kWh	2022 Actual kWh	Total
Brackenfell High School	56	100%	28,195.2	102,903	86,178	217,276.4
Boland Wine Cellar	472.7	100%	67,560.0	665,295	548,051	1,280,905.5
Westville Girls' High School	80.34	100%		45,639	86,498	132,137.5
Spar Plaza	360.8	100%		256,216	381,606	637,821.2
ECHO Foundation - Munro Kirk	145.2	100%		141,917	163,556	305,472.9
CPOA Kronendal Retirement Village	165.4	100%		195,827	230,809	426,635.8
Watergate Apartments	114.48	100%		111,450	188,843	300,293.2
Vondeling Wines Winery	52.6	100%		53,644	78,619	132,263.0
Vondeling Wines Carport	6.52	100%		5,288	9,039	14,327.1
Morgenster Shopping Centre	140.8	100%		144,519	206,808	351,327.6
SPAR Lulekani	368.08	93.27%		182,779	402,269	585,048.2
La Recolte Retirement Village	57.24	100%		47,940	92,231	140,171.1
Knysna Primary School	22.41	100%		17,470	28,295	45,764.8
Rondebosch Boys High School 2021	136.95	100%		94,987	138,696	233,682.7
Rob Ferreira High School	140.85	100%		29,484	118,014	147,497.7
Kingsway High School	58.32	100%			76,816	76,815.6
Avontuur Estate	122.58	100%			115,441	115,441.5
Bo Karoo Farm	108.00	100%			61,294	61,294.0
Karoo Fresh	332.1	100%			49,350	49,350.3
CPOA Avondrust Court	187.92	53.61%			38,755	38,755.3
South Peninsula High School	32.76	100%			22,113	22,113.5
Groot Constantia Estate	164.59	100%			58,371	58,370.8
Plumstead High School	55.08	100%			18,302	18,301.7
Somerset West Primary School	21.84	100%			8,344	8,344.0
CPOA Berghof Retirement Village	69.12	100%			30,839	30,839.1
Tamboerskloof Primary School	32.70	100%			9,237	9,236.9
Total	3505.38		95,755.2	2,095,359	3,248,373	5,439,487.4
Emissions by period tCO2e						
Emissions factor (UNFCCC)	1.07	kgCO2/kWh	102	2242	3423	5767
Diesel Genset Emissions	0.80				39	39
Total Emissions						5807

Table 3: Sun Exchange projects and electricity generated from 2020 - 2022. Cells in blue indicate partial ownership of carbon and electricity production figures have been corrected to reflect the portion of carbon owned by Sun Exchange viz. 6.73% of the carbon from Spar Lulekani and 46.39% of the carbon from CPOA Avondrust Court is owned by Energea (<https://www.energea.com>). South Pole (<https://www.southpole.com/>), Allotrope Partners (<https://www.allotropepartners.com>), and Blue World Carbon (<https://www.blueworldcarbon.com/>) own carbon in Sun Exchange projects which are not included in the project list in the table above. This data has been provided by Sun Exchange.