



NCPC
NATIONAL CLEANER PRODUCTION CENTRE
— SOUTH AFRICA —

**Green Support Incentive
Programme for
SME in Gauteng
Baseline report**

**K1 recycling Pty (Ltd)
Katlehong**

Date: 22/04/2022

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Baseline report for Green Support Incentive Programme at K1 recycling (Pty) Ltd Katlehong

April 2022

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I, **Edmore Manzunzu**, in my capacity as the technical consultant, hereby confirm that I have assessed **K1 recycling Katlehong** and have analysed and compiled this **Baseline and solar feasibility study**. I confirm all the report findings and representative reflection of the current status of **K1 recycling Katlehong**.

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Executive Summary

The report serves as a baseline and solar PV feasibility study for the K1 recycling (Pty) Ltd plant in Katlehong. The report addresses potential Solar PV generation from available roof space and the amount of energy saved. The report serves as a baseline against which any problem areas or gaps in Solar PV installation, process technology and environmental authorisations are identified. Future performance goals, objectives, targets and activities can be set based on this baseline report.

IBC, SAM software and Google Earth were used to simulate the number of solar panels that can be installed on the rooftop and the potential solar energy that can be harvested. The Gauteng Global annual radiation is 2 042.98 kWh/m²/year.

The facility can install 3.2 kWp solar panels with a 60 kWh battery storage. The annual energy consumption for the site is 90,500kWh at a cost of R164,710. The potential energy savings a year is 5,382 kWh (6% of the annual energy) equivalent to R9,795.24 /year. The project requires an investment of R225,000 with a payback period of 23years. The CO₂ offset from the use of renewable energy (solar PV) is 5.6 tons a year.

Table 1: Summary of potential solar energy savings and cost

Building	Capacity (kWp)	Energy Yield (MWh)	No of Modules	Energy Revenue	Capital Cost	TCO ₂	Payback
Office block	3.2	5,382	10	R9,795	R225,000	5.6	23
Totals		5,382	10	R9,795	R225,000	5.6	23

The summary of raw materials and labour costs is shown below.

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Table 2: Raw materials summary

K1 recycling (Pty) Ltd Solar PV raw materials			
Description	Unit cost	Quantity	Total cost
Solar panels (canadian CS1H-320MS)	3,500	10	35,000
Inverter (SMA SB6.01AV-41)	55,000	1	55,000
Lithium batteries 20kWh (Tri power storage)	28,000	3	84,000
SMA Data manager	8,500	1	8,500
SMA energy meter	12,000	1	12,000
SMA controller, connecting wires, fuses and other electrical accessories	5,000	1	5,000
mounting hooks, brackets	4,500	1	4,500
Solar installation labour charges	21,000	1	21,000
Total			225,000
Solar energy savings (R/year)			9,795
Payback period (years)			22.97

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1 Abbreviations

CO _{2e}	Carbon dioxide equivalents
CP	Cleaner Production
Deg. C	Degrees Celsius
FC	Fraction Capacity
HRS	Hours
IPA	In-Plant Assessment
Kj	Kilojoules
Kl	Kilolitres
R/W	Rands per Watt
GDED	Gauteng Department of Economic Development
GHG	Greenhouse Gas
MWh	MegaWatt Hour
PV	Photovoltaic
MW	MegaWatt
LPM	Litres per minute
M ²	square metres
NCPC-SA	The National Cleaner Production Centre of South Africa
P	Power
QS Assessment	Quick-scan Assessment
R	Rands
SME	Small and Medium Enterprises
GSIP	Green Support Incentive Programme
TE	Transfer efficiency
W	Watts

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2 Introduction

This project is an initiative of the Gauteng Provincial government to aid in the economic recovery of businesses still reeling from the devastating impact of Covid-19, which was followed by the July 2021 civil unrest leading to further economic damage in the province.

The programme aims to provide financial support for renewable energy implementation in SMEs affected by the economic downturn. The interventions are evaluated for feasibility in terms of estimated investment costs and project financial metrics are applied to evaluate project feasibility.

“The Southern African region, and the whole of Africa, has sunshine all year round. The annual 24-hour global solar radiation average is about 220 W/m² for South Africa, compared with about 150 W/m² for parts of the USA and about 100 W/m² for Europe and the United Kingdom. This makes South Africa’s local resource one of the highest in the world. Most areas in South Africa average more than 2 500 hours of sunshine per year, and average solar-radiation levels range between 4.5 and 6.5kWh/m² in one day”, www.energy.gov.za.

2.1 Site Solar Energy Resources

The Gauteng Global Irradiation will be used to determine the annual energy yields. SMA Sunny Design website estimates Pretoria’s global annual irradiation at **2 046.98kWh/m²year**. The daily global irradiation for each month of the year is reflected in figure 1 below

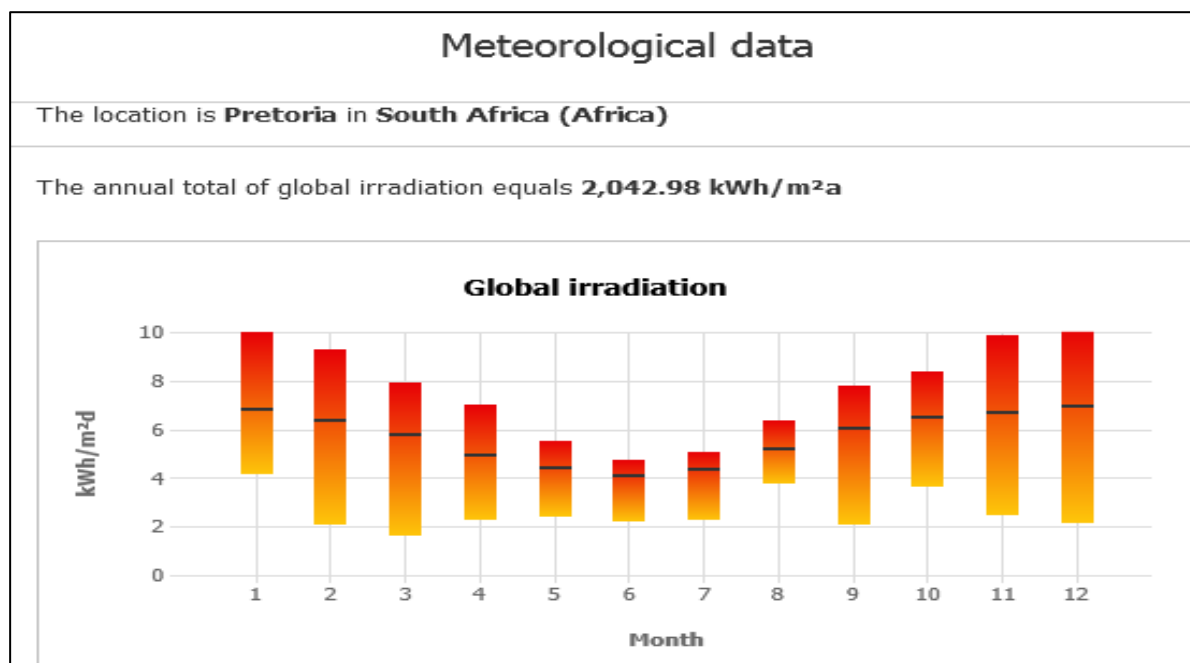


Figure 1: Global radiation data

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The global irradiation data for Gauteng is shown above. The months with the lowest Irradiation data are June and July and the highest are November, December and January.

2.2 Project Methodology

Table 3: Project methodology

Step	Action Plan	Purpose and results
1	Plan and organise (walk through audit and informal Interview)	Resource planning, Organise instruments and time frame, Macro data collection, Familiarisation of process and plant activities
2	Conduct brief meetings with stakeholders	Building up cooperation, awareness creation and issuing a questionnaire
3	Primary data gathering, a Process flow diagram	Historical data analysis and baseline data collection.
4	Conduct detailed trials for different solar panels, inverters and batteries	Trials on new products available on the market
5	Identification and development of potential value addition products	Conceive, develop, and refine ideas. Review previously suggested ideas and contact vendors for new/efficient technologies.
6	Cost-benefit Analysis	Assess technical feasibility, economic feasibility and prioritisation of the most promising projects. Prioritise short, medium and long-term measures.
7	Reporting and Presentation to top management	Documentation and report presentation to top management
8	Implementation and follow-up	Assist and implement recommendation

2.3 Design Resources Used

IBC website was used to place modules on top of the different buildings found suitable for this purpose with Google Earth's help for the buildings' location. The software determines the

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optimum number of modules that can be placed, hence determining the solar plant's size. Given the operating cost of energy, the software can also determine the annual yields and savings resulting from solar use.

To determine the capacities of the installation and energy yields, the following IBC Solar PV module was used: See table 3 below. A spreadsheet model was used to determine both the technical and financial viability of the project.

Table 4 Solar PV module specification

Module Name	<i>Canadian solar CS1H-320MS HiDM</i>	
Type of Module	<i>Mono-Crystalline</i>	
Power (STC)	<i>320</i>	<i>W_p</i>
Efficiency	<i>20.9</i>	<i>%</i>
Open circuit voltage (Voc)		<i>V</i>
Open circuit current (Isc/A)	<i>9.5</i>	<i>Amps</i>
Module Orientation	<i>N (6°)</i>	
Module Inclination	<i>20</i>	<i>°</i>

The design's main aim was to determine the maximum energy that could be harvested from the roof of the buildings and operate the buildings with a hybrid system of solar and grid electricity.

Currently, both the Municipality and Eskom are not obliged to buy green energy from IPP (Independent Power Producers). Eskom only buys from grid-scale suppliers as per declared rounds as announced by the Department of Energy and this is an auction process where energy is bought first from the least cost suppliers until the amount of energy required is fulfilled.

Power X is South Africa's first energy exchange (they have the license to buy and sell green energy and trade). The following are the stipulated in terms of the Power-X purchase contracts:

- Any term can be signed 1 - 20 years

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- No minimum supply commitments are required (Power-X will buy whatever the generator produces)
- The generator can be located anywhere in the country in an Eskom or municipal area where Power-X has a System agreement.
- The generator will be paid directly.

The following parameters were used for the economic analysis of the Solar PV plants:

Table 5 Solar PV Economic Analysis Input Variables

<u>Input Variables</u>	<u>Amount</u>
Panel Degradation (%)	0.50%
Discount Rate (%)	10.00%
Maintenance (%)	2.00%
Tariff Increase	15.00%

2.4 Design Criteria

The design concept to be used here is a hybrid solar PV system. It is important to note that during load shedding, when the grid is not available, the hybrid connected PV system will be available to supply the premises until the batteries power stored is 20%.

Considering the above points, a distributed design approach was adopted as it offers more benefits from a security point of view (i.e. backup configuration). It also takes advantage of the electrical infrastructure already available (i.e. low voltage electrical panels and smart meters).

It is also important to note that a generator greater than 100 MW requires a licence to operate.

3 Company information

K1 recycling is a waste management solutions provider, the company assist clients to comply with the National Environmental Management, the Waste act of 2008 (No 59 of 2008). The mission is to drive a zero waste environment through integrated waste management solutions. As a company situated in the township, the facility is highly affected by load shedding and reduction.

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The company was registered in 2011 and employs 15 people. The company has waste collecting trucks, a wash plant, a crusher and bailing machines. The main machine that consumes most energy and water on-site is the washplant.

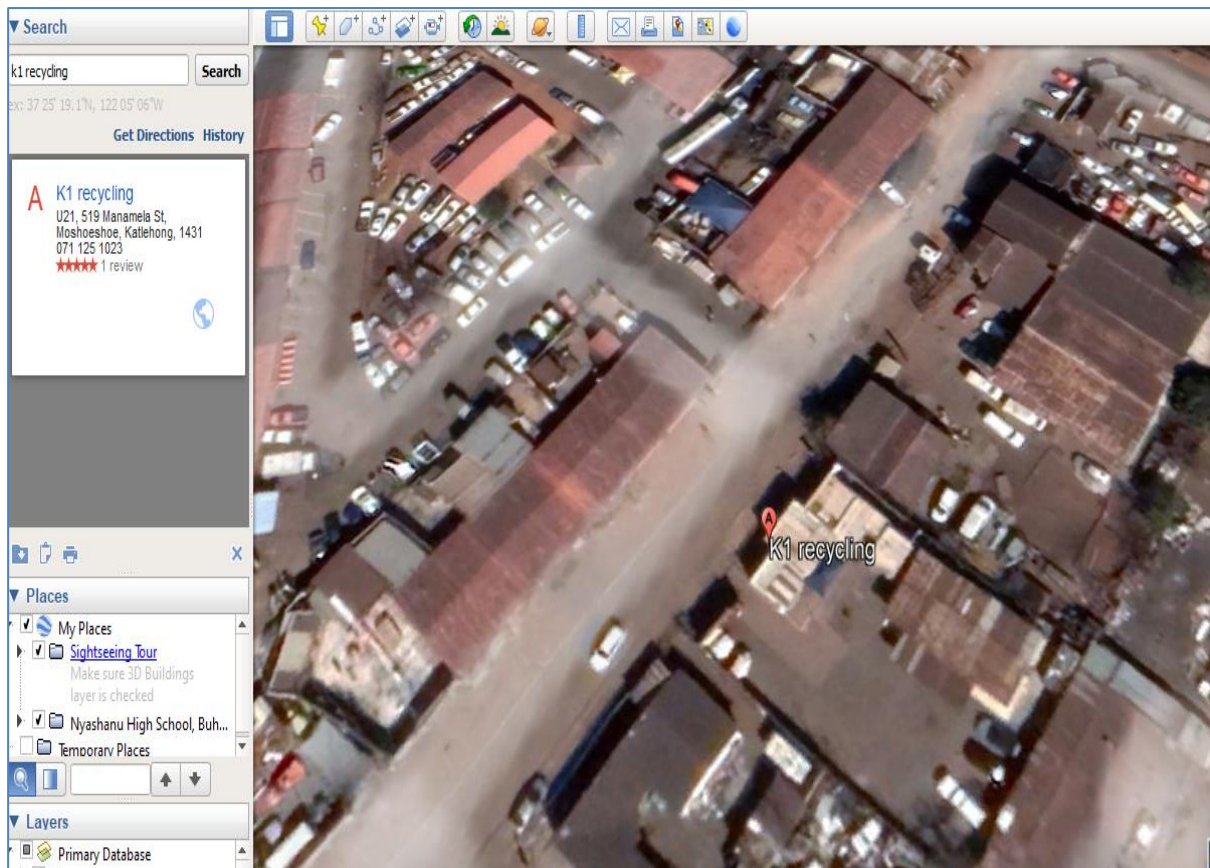


Figure 2: Google map site location

3.1 Contact details

Table 5: Company information

Company name	K1 recycling Pty (Ltd) Katlehong
Address	U21, 519 Manamela Street, Katlehong 1431
Phone, Fax	071 125 1023 / 011 909 0037

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e-mail	tshepo@k1recycling.co.za
Website	https://www.K1recycling.co.za
Trading since (year)	2011
No. of Employees	15
Contact person:	
Name	<i>Tshepo Mazibuko</i>
Position	<i>Managing Director</i>
Phone & mobile numbers	<i>071 125 1023</i>

4 Initial environmental assessment

K1 recycling Katlehong uses an integrated waste management system that encourages waste segregation at the source. The factory-installed energy-efficient lights at the facility.

Table 6: Rating table

	GOOD	FAIR	POOR
Storm-water			X
Waste separation		X	
Wastewater	X		

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	GOOD	FAIR	POOR
Solid waste			X
Air quality		X	
Noise			X
Hazardous materials (including intermediates and by-products)		X	
Energy		X	
Environmental policy			X

Environmental Questionnaire

This section summarises the plant's current state in terms of wastewater quality, raw materials, air quality, hazardous waste, noise management, and general management of the premises.

Table 7: Environmental questionnaire

<p>Water Quality Management</p> <p>Stormwater</p> <p>Do you know where the stormwater drains on your premises are located?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have any features or procedures in place to prevent stormwater pollution?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Is the stormwater drains around your business free of pollution? (litter, Sand, metal shavings etc.)</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you store all equipment, materials and liquids so that spills or leaks could not enter the stormwater system?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you regularly clean up the surface areas around your premises?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>	<p>Raw Material</p> <p>Do you know the composition of your materials?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>If a supplier was willing to take your waste for reuse, can you guarantee a regular supply?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have a licensed waste transporter to transport:</p> <p>General production waste?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>waste chemicals? X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>liquid wastes? X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Air Quality Management</p> <p>Do you take measures to prevent dust from leaving your premises?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you take measures to prevent fumes and vapour (including odorous emissions) from leaving your premises?</p>
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<p>Do you use a broom instead of a hose to sweep and clean up the surface areas around your premises?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Wastewater</p> <p>Do you have a permit from the local water authority (if needed)?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do floor drains in the work area drain to either a storage tank or directly to the sewer?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you use a vacuum cleaner (appropriate to the process) to clean up dust and Sand?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Groundwater</p> <p>Do you know if your site has groundwater under it?</p> <p><input type="checkbox"/> Yes x No <input type="checkbox"/> N/A</p> <p>If groundwater is under your site, do you take precautions to prevent pollutants from entering the groundwater?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Noise Management</p> <p>Do you regularly check and carry out maintenance on noisy equipment?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Have you identified the noise source and taken steps to reduce its effects if you have had noise complaints?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>	<p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Hazardous Materials</p> <p>Do you store all hazardous materials (such as resins, catalysts) in a bunded, covered area that will not allow any spilt or leaked materials to enter the stormwater system?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have a Dangerous Goods Licence, if needed?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have all the relevant material safety data sheets (MSDS) and keep them in an accessible place?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have spill fighting equipment and written procedures?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Management of Premises</p> <p>Have you made any changes to your business for environmental reasons?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>Do you have an environmental policy or plan?</p> <p>X Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p> <p>If you answered no of the questions in this checklist, you could use the information in this package to develop an environmental improvement program that will be good for you, your staff and customers.</p> <p>Now that you have completed this checklist and identified the areas where you can make improvements:</p> <ul style="list-style-type: none"> • Read through the environmental information sheets. • Get started on an environmental improvement program that will be good for you, your staff and your customers.
--	--

Note: N/A stands for “not applicable”.

5 In-Plant Assessment Phase

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5.1 Pre-assessment Phase (preparation phase)

It is imperative to use the correct rate when performing the economic analysis of the solar PV feasibility study. Since solar energy is only available between 7 am and 5 pm during the day, the effective rate should be determined for this period. This rate was used to calculate an effective electricity rate applicable to the consumption of solar energy. The effective rate was calculated to be **R1.82**, and this is the rate that will be used to perform the Solar PV system's economic feasibility.

5.2 Energy Consumption Trends

The K1 recycling plant uses a prepaid meter and the facility does not have the records of their annual electricity usage therefore metering was done on the main electricity incomer. The measured incomer is shown below.

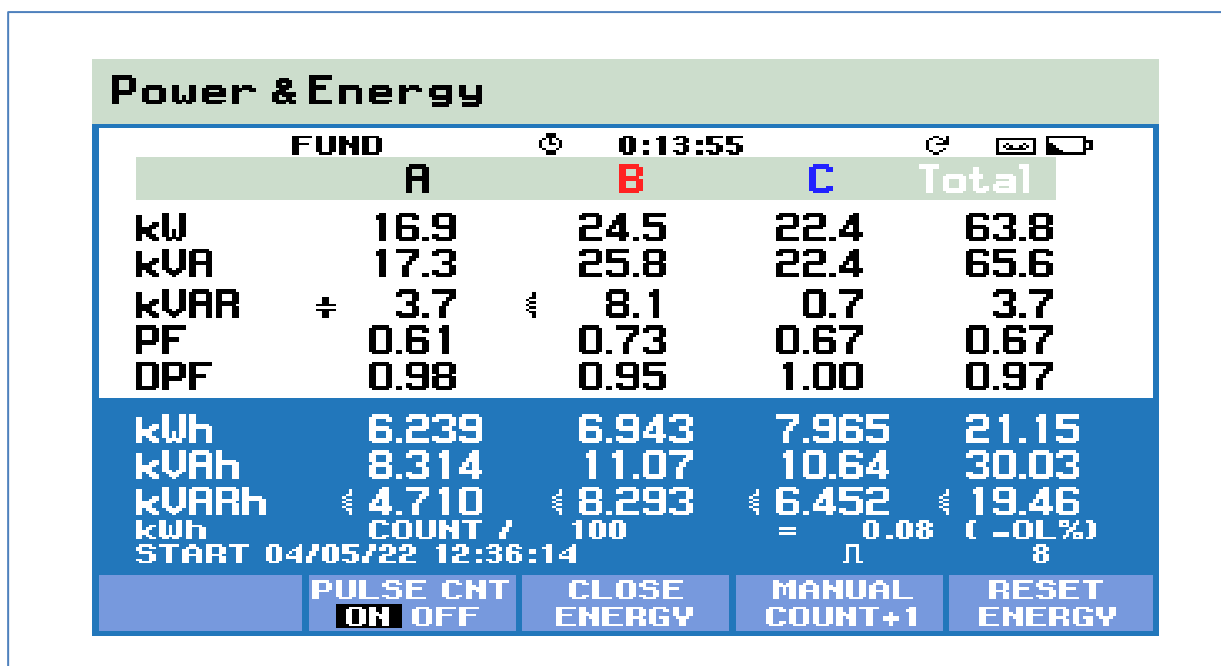


Figure 3: measured power on the main incomer

The measured energy in 15 minutes is 21.15kWh and the projected daily energy is 338 kWh/day (21.15kWhx4x4 hours a day). As the company operates 5 days a week and 50weeks a year the projected annual energy is 84,600kWh/year (21.15x4x4x5x50).

Figure 3 below shows the energy consumption profile.

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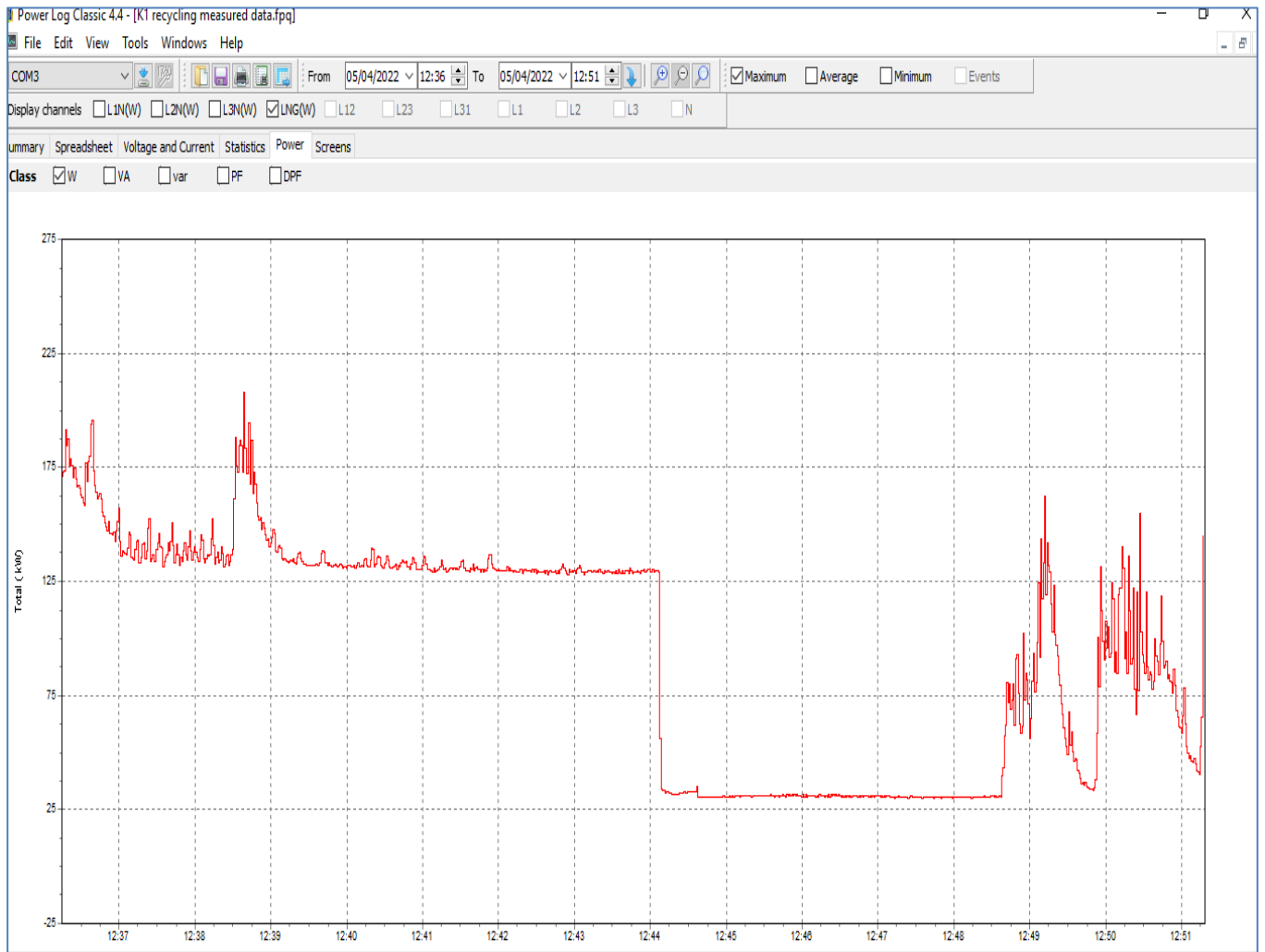


Figure 4 Energy Consumption Profile

The profile above shows a maximum demand of 190kW when the wash plant is running and a minimum of 25kW when the machine is in idling mode during cleaning. The wash plant is assumed to run for 4 hours a day for 5 days of the week.

5.2.1 Baseline data

The energy driver for the facility is production (tons of washed products from the wash plant). Due to the unavailability of electricity and production data, we couldn't develop a regression model for the site.

6 CARBON INVENTORY

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6.1 Scope and Boundaries

Activities taking place within a specific area can generate greenhouse gas (GHG) emissions that occur inside the area's boundary and outside the area's boundary. To distinguish between them, the Global Protocol for Community-scale Greenhouse Gas Emission Inventories (GPC) groups emissions into three categories based on where they occur, as summarised in the following table.

Table 9: Scope definitions for GHG inventories

Scope	Definition
Scope 1	GHG emissions from sources located within an area's boundary.
Scope 2	GHG emissions are occurring because of grid-supplied electricity, heat, steam and cooling within a city boundary.
Scope 3	All other GHG emissions that occur outside a boundary result from activities taking place within the limit, e.g. transmission and distribution losses from grid-supplied energy consumption for stationary energy, emissions from transboundary journeys, waste streams generated within the city boundary but landfilled or treated outside the city boundary.

Source: GPC

The scope and boundaries of the carbon inventory are defined for the entire facility. As a minimum, the Carbon emissions from on-site electricity consumption will be considered. Electricity consumption data was measured to be 84,600 kWh/year, and the only resource for which data is available is electricity. Thereafter, estimates are made for the plant's common area, based on its estimated contribution to these emissions.

Based on available activity data, the emissions included in the inventory are as follows:

- Scope 2 emissions from grid-supplied electricity.

Emissions excluded from this inventory (due to a lack of activity data) are as follows:

- Scope 1 fugitive emissions from air conditioning and refrigeration leaks;
- Scope 1 emissions from fuels used by employees' vehicles;
- Scope 1 and 3 emissions from fuels used by suppliers and distributors entering the site;
- Scope 3 emissions from business travel of employees and plant trips
- Scope 3 emissions from waste produced on-site but landfilled elsewhere.

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The carbon emissions can be direct or indirect emissions, direct emissions for the K1 recycling Katlehong plant come from diesel used by trucks, and indirect emissions are from electricity consumption that is generated using coal. The greenhouse gas emissions factors for South Africa are summarised in the table below.

Table 8: Greenhouse gas emissions factors

SA IEEP Phase II GHG Emission Factors		
Fuel	tCO ₂ /GJ	tCO ₂ /MWh
Grid Electricity	0.2896	1.0425
Natural Gas	0.0561	0.2020
LPG	0.0631	0.2272
Diesel	0.0741	0.2668
Residual Oil	0.0774	0.2786
Motor Gasoline	0.0693	0.2495
Kerosene	0.0719	0.2588
Coal Bituminous	0.0946	0.3406
Coal Sub-bituminous	0.0961	0.3460
Coal Anthracite	0.0983	0.3539
Coal Lignite	0.1010	0.3636
Charcoal	0.1120	0.4032
Metallurgical Coke	0.1070	0.3852
Wood fuel	0.1120	0.4032

K1 recycling Katlehong plant's carbon footprint will be based on electricity data only. K1 recycling consumed 84.6 MWh, and the equivalent carbon produced is 88.2 tCO₂/year.

6.2 Development of inventory

K1 recycling Katlehong consumed 84.6 MWh and the equivalent carbon produced is 88.2 tCO₂/year.

6.3 Carbon management

The setting of IEE objectives, goals, and targets will give the company direction on how to manage the utilities, reduce emissions from the use of energy-efficient technologies, and develop purchasing policies that consider lifecycle costs and efficient use of resources.

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K1 recycling can improve the way they operate by being proactive through gathering information on resource usage and consumption patterns. The company has an online metering system to manage electricity consumption. K1 recycling should record data, as shown in the table below.

Table 9: Sample carbon reporting format

Scopes and categories	Metric tons CO ₂ e
Scope 1: Direct emissions from owned/controlled operations	
Scope 2: Indirect emissions from the use of purchased electricity, steam, heating, and cooling	
Upstream scope three emissions	
Category 1: Purchased goods and services	
Category 2: Capital goods	
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	
Category 4: Upstream transportation and distribution	
Category 5: Waste generated in operations	
Category 6: Business travel	
Category 7: Employee commuting	
Category 8: Upstream leased assets	
Downstream scope 3 emissions	
Category 9: Downstream transportation and distribution	
Category 10: Processing of sold products	
Category 12: End-of-life treatment of sold products	
Category 13: Downstream leased assets	
Category 14: Franchises	
Category 15: Investments ¹	

A sample of the objectives the company can set are

- Promotion of organisational behavioural change
 - Conservation of energy and improving energy efficiency
-

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- Maximise the use of renewable energy sources
- Reducing the carbon footprint of the chillers, trucks and lighting.

7 Detailed design

7.1 Whole facility

The main constraint in the design is the available budget, therefore, management of the facility suggested that the solar panels to be installed should service the offices, the inverter to be connected to office DB and provide for key equipment. Like computers, servers and scale.

The area is highly affected by load reduction and power outages therefore battery storage is among the most important factors to consider in the design. The solar system must meet the minimum requirements of the business during load reduction times, that is lighting, powering the scale, office equipment and other basic loads on site.

The maximum daily energy demand is 84.6 kWh/day, which will be used to determine the battery storage, and check if the roof space available will accommodate panels that will generate the required energy. The facility has plenty of roof space that can be installed with solar panels as shown below.

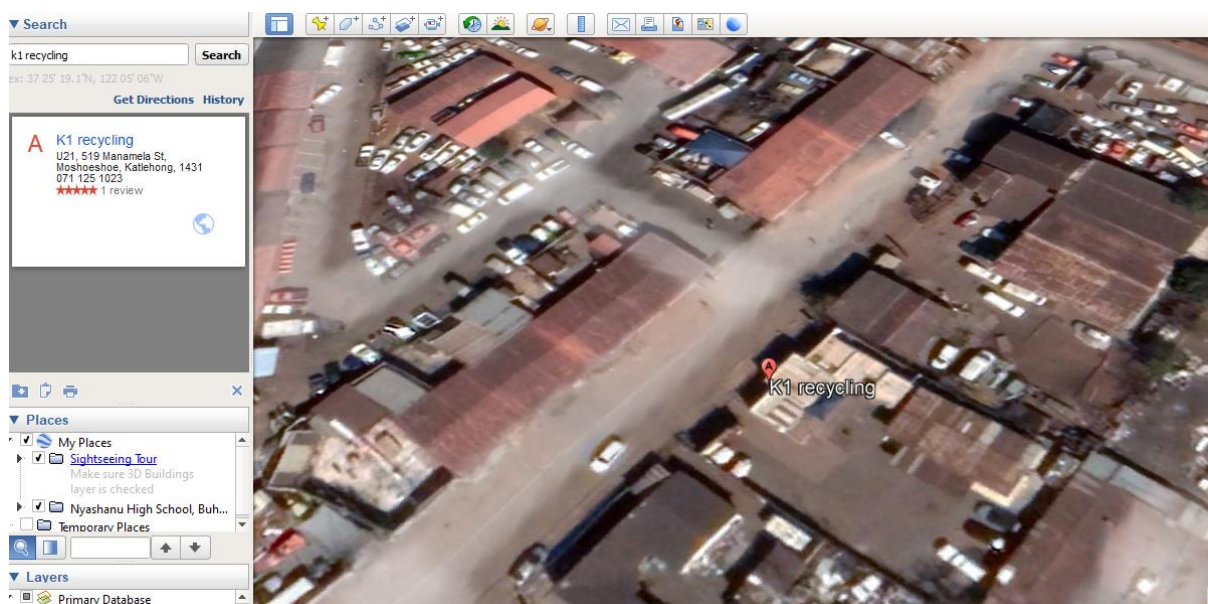


Figure 5: Roof space available

The suggested design according to the financial constraints the facility can install is shown below.

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Project:	K1 recycling	Location:	South Africa / Pretoria
Project number:	---	Grid voltage:	220V (220V / 380V)
System overview			
10 x Canadian Solar Inc. CS1H-320MS HiDM (1000V) (11/2018) (PV array 2) Azimuth angle: 180 °, Tilt angle: 20 °, Mounting type: Roof, Peak power: 3.20 kWp 10 x JMS-F			
1 x SMA STP5.0-3AV-40			
Battery system			
3 x SMA Sunny Island 8.0H		3 x Lithium (20 kWh)	
PV design data			
Total number of PV modules:	10	Line losses (in % of PV energy):	---
Peak power:	3.20 kWp	Unbalanced load:	0.00 VA
Number of PV inverters:	1	Annual energy consumption:	95,907 kWh
Nominal AC power of the PV inverters:	5.00 kW	Self-consumption:	5,382 kWh
AC active power:	5.00 kW	Self-consumption quota:	100 %
Active power ratio:	156.3 %	Self-sufficiency quota:	5.4 %
Annual energy yield*:	5,382 kWh	Total nominal capacity:	20.00 kWh
Energy usability factor:	90.6 %	Annual nominal energy throughputs of the battery:	38
Performance ratio*:	76.8 %	CO ₂ reduction after 20 years:	36 t
Spec. energy yield*:	1682 kWh/kWp		
Signature _____			

Figure 6: Annual energy generated from solar summary

The projected annual energy produced is 5,382 kWh/year, and the yearly facility demand is 84,600 kWh/year; therefore, the solar system can manage to supply 6.4% of the facility's energy use. The system size is summarised below.

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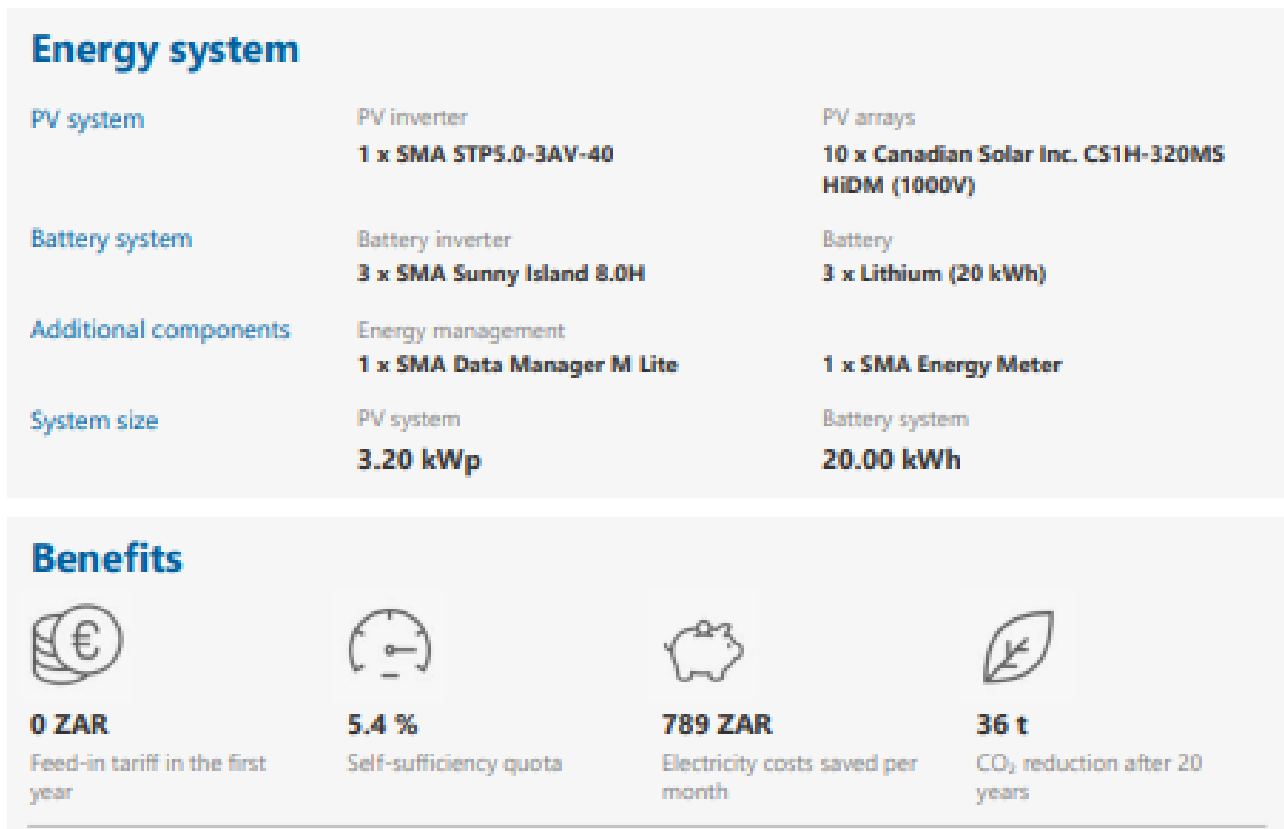


Figure 7: Solar system specifications

The solar system will have a battery backup of 60 kWh lithium battery and 10 Canadian solar panels that will generate 3.2kWp. The figure below shows the projected monthly energy production.

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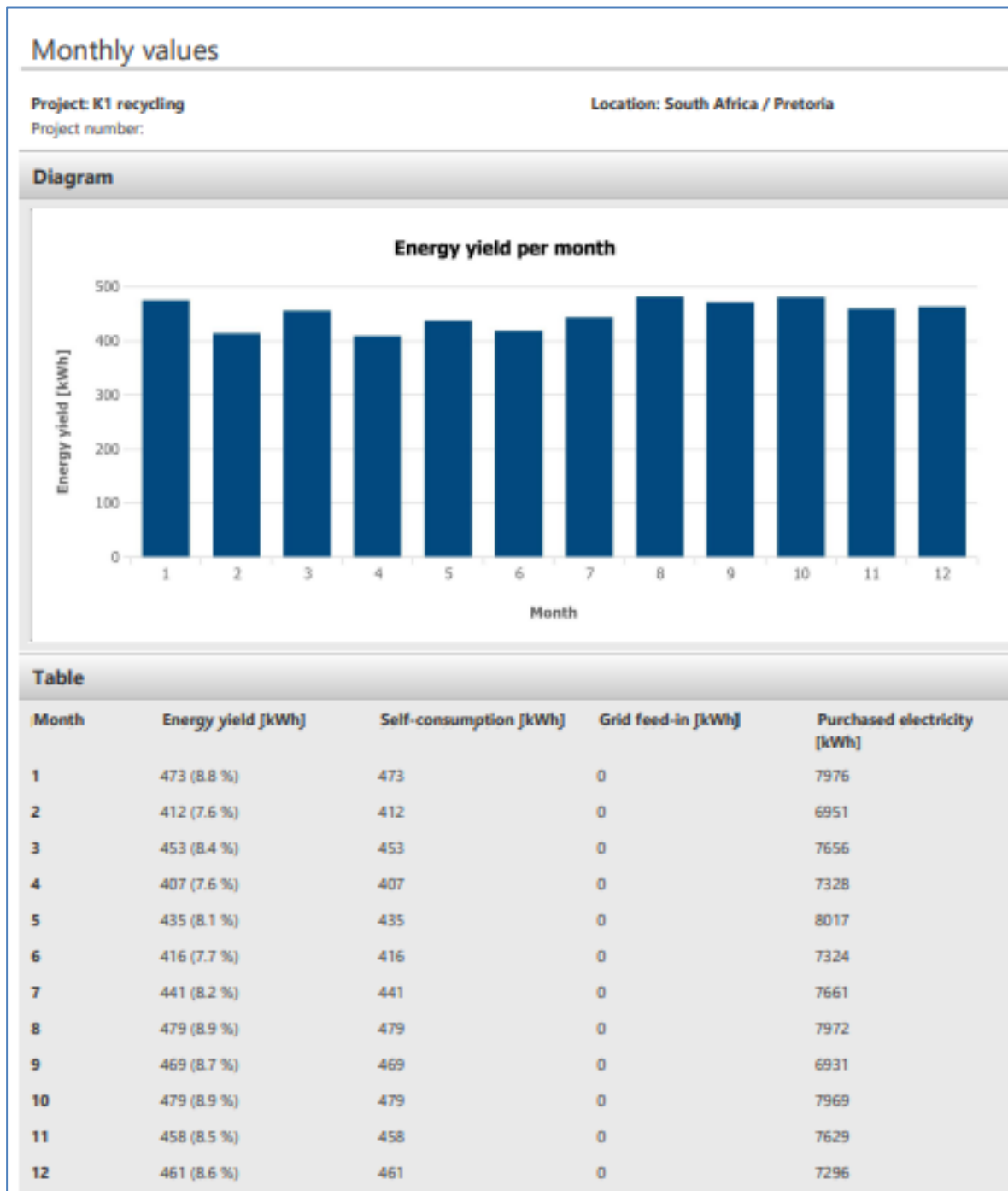


Figure 8: Monthly energy production trend

The monthly energy produced is less than the monthly demand, therefore the plant cannot be off grid but a hybrid system of solar and grid electricity. The annual energy cost savings is R9,795/year, which is 8% of the annual electricity bill. The main components (solar panels, battery storage, inverter) cost R194,500 as shown in the figure below

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Cost estimate (non binding)			
Project: K1 recycling		Location: South Africa / Pretoria	
Project number:			
Project costs			
PV system		Unit price	Total
10	Canadian Solar Inc. CS1H-320MS HIDM (1000V)	3,500.00 ZAR	35,000.00 ZAR
1	SMA STP5.0-3AV-40	55,000.00 ZAR	55,000.00 ZAR
Battery system			
3	SMA Sunny Island 8.0H	28,000.00 ZAR	84,000.00 ZAR
Accessories			
1	SMA Data Manager M Lite	8,500.00 ZAR	8,500.00 ZAR
1	SMA Energy Meter	12,000.00 ZAR	12,000.00 ZAR
Subtotal (net sum)			194,500.00 ZAR
Discount			---
Total (net)			194,500.00 ZAR
Value-added tax			---
Total amount (gross)			194,500.00 ZAR
Fixed cost			
Annual fixed costs (as percentage of capital expenditure)		1.50 % of investment costs	2,917.50 ZAR

Figure 9: Main components cost breakdown

The accessories and labour charges are summarized in the table below.

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Table 10: Installation cost summary

K1 recycling (Pty) Ltd Solar PV raw materials			
Description	Unit cost	Quantity	Total cost
Solar panels (canadian CS1H-320MS)	3,500	10	35,000
Inverter (SMA SB6.01AV-41)	55,000	1	55,000
Lithium batteries 20kWh (Tri power storage)	28,000	3	84,000
SMA Data manager	8,500	1	8,500
SMA energy meter	12,000	1	12,000
SMA controller, connecting wires,fuses and other electrical accessories	5,000	1	5,000
mounting hooks, brackets	4,500	1	4,500
Solar installation labour charges	21,000	1	21,000
Total			225,000

The total investment required is R225,000 with a payback period of 23years.

8 Solar PV feasibility study summary

The table below tabulates the results of the solar PV feasibility assessment. This table indicates both the technical and economic feasibility.

Table 11: Summary of recommendations

Building	Capacity (kWp)	Energy Yield (MWh)	No of Modules	Energy Revenue	Capital Cost	TCO2	Payback
Office block	3.2	5,382	10	R9,795	R225,000	5.6	23
Totals		5,382	10	R9,795	R225,000	5.6	23

9 Conclusion

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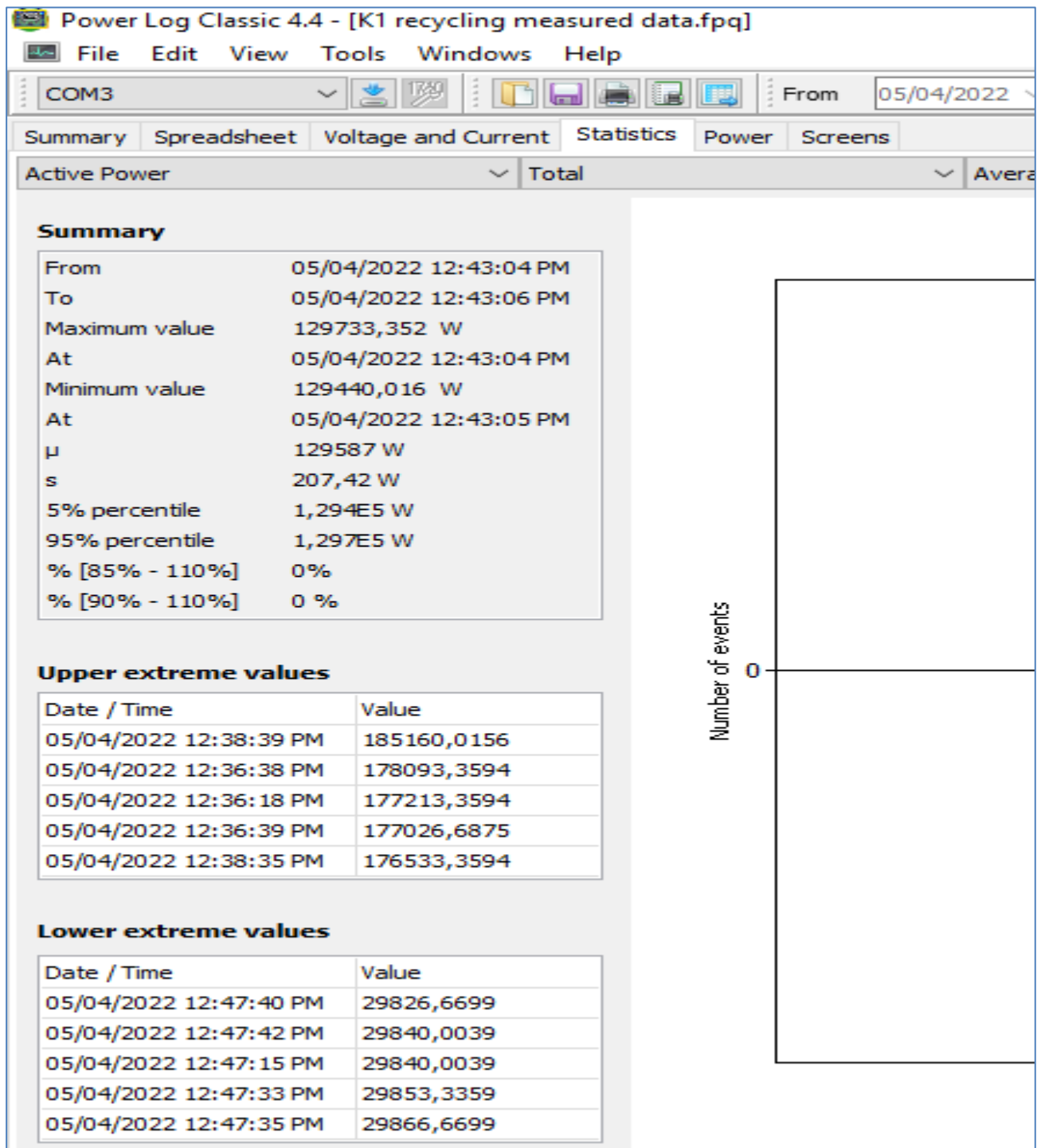
K1 recycling Katlehong can install rooftop solar panels on most buildings and generate much-needed energy from solar PV. Due to financial constraints, the project can fund a 3.2kWp solar system, with 60kWh battery storage. The system can be extended in future to supply the whole office block and the production plant because the roof space can accommodate more panels. The proposed system should reduce the electricity bill by 6%, and have a battery to power critical equipment during load-shedding.

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10 Annexures

10.1 Measured profiles



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10.2 Solar installation hourly rate

