wundersight

Wunder Sight Investments (PTY) Limited

WATERFORD KAMHLABA
Solar PV and Battery Storage Project
Phase 1

September 2017

I N D E X

1 DOCUMENT CONTROL

Title:	Phase I specifications
Reference:	Waterford Kamhlaba
Prepared by:	Martijn Kolloffel
Date:	7/20/2017

Version	Date	State	By	Save as
1.0	20/07/2017		MK	WE G1000 WK Phase I Rev 1.0
2.0	24/08/2017		MK/MD	WE G1000 WK Phase 1 Rev 2.0
3.0	18/09/2017		MK	WE G1000 WK Phase 1 Rev 3.0

Revision

Version	Date	Description of changes
2.0	24/08/2017	Inclusion of battery storage
3.0	18/09/2017	Final technology components and costs Revision of Summary

Checked by: **MD**

Date: 18/09/2017

Distributed to: **Wundersight JD, MM, ED**

2 INTRODUCTION

Wunder Education G1000 invites investment for the design, supply, installation, testing, and commissioning of the first phase solar photovoltaic (PV) system at Waterford Kamhlaba (WK) United World College (UWC), located in Mbabane Swaziland.

The first phase solar system is a roof top installation approximately sized at 190 kW and configured as AC-Coupled grid-tied system where the generated energy is used for self-consumption by daytime loads without intermediate battery storage. The first phase installation does not feed energy back to the Swaziland Electricity Company (SEC) grid.

The first phase scope also includes the design, supply, installation, testing, and commissioning of intelligent bi-directional inverters with battery storage to reduce peak hour grid assistance and provide limited backup power in case of grid failure. This installation is proposed as a separate section of the grid tied system and can operate and be commissioned independently.

The first phase also includes the buy-back of the original pilot project of 22 kW solar PV commissioned by Wundersight at WK in February 2016. The total system size will be approximately 212 kW. The Financial model reflect these figures.

The second phase development will include the installation of a ground mounted grid interactive generation plant, sized to generate the total WK energy consumption, with intent to feedback access energy to the SEC grid. Currently the loads of WK are under constant analysis in order to establish the exact requirements for phase 2 – early indications being a further 500 kW

The grid-interactive system shall meet specifications of the Swaziland Renewable Power Producer (RPP) grid code as published by the Swaziland Energy Regulatory Authority (SERA).

3 SUMMARY

Phase	**Phase 1: Solar PV Standard Hours**
System size	190.4 + 22 = 212.40 kWp
System Components	PV modules, Inverters, protection, metering
Project life	25 years
Annual kWh production	498,238 kWh
LCOE Tariff 2018	E1.83
Supply tariff 2018	E1.60
Expected SEC charge at LCOE over life	E277,288,959
Proposed WEG1000 charge over life	E97,908,226
Potential life of project savings to WK	E179,380,733
Financed by	Wunder Education G1000 (Pty) Ltd
Financing Mechanism	Equity in Special Purpose Vehicle
Phase	**Peak Hour**
System size	200 amp hour
System Components	Batteries and bi-directional intelligent
Annual kWh production	10/13 annual requirements. Total 190,838
LCOE Tariff	E2.76 per kWh (Peak hours)
Supply tariff	E1.60 per kWh
Expected SEC annual charge at LCOE	E156,487 (Previous peak charge E527,546)
Potential annual savings 2017 rates	E371,058
Payback period	7.5 years
Potential life of project savings	
Financed by	Wundersight Investments
Financing Mechanism	Equity/Loan: 70/30

4 HISTORY

Global 1000 Schools Project (G1000) was conceived in 2015 by Michael Doyle as the project initiator. The express aim of the project is to facilitate the development of carbon neutral schools within the sub-Saharan African region. It is the belief of G1000 that a worldwide shift in thinking to renewable energy and carbon neutrality practices needs to begin at an early age. Schools are positioned to educate their learners about this required shift, however are often note in the financial position to implement the necessary infrastructure programs.

In order to facilitate the roll out of the renewable energy components of the project G1000 combined with Wundersight Investments (WS) during 2016 with WS primarily being tasked with the facilitation of the investment required for the project. A new company, Wuder Education G1000 (Pty) Ltd (WEG1000) was formed.

The target schools fall under the umbrella organization ISASA – the Independent Schools Association of Southern Africa. Research indicated that these independent schools were primarily A Grade credit risks, and being the end users of power would attract a higher tariff than dealing with power utilities.

Waterford Kamhlaba is serving as proof of concept for the development of the program. Already WK has installed its own solar PV array (to be sold back to WEG1000), wind turbine, bio-digester and solar thermal for hot water.

The project has subsequently attracted international attention with a proposal currently being assessed at 17 International schools in 17 different countries – all falling under the umbrella of the United World Colleges.

5 SCOPE

WK is located at 26˚18’ 10.11” S - 31˚ 06’ 15.00” E. Aerial views of proposed rooftop PV array layouts are included in the annex as site maps. Array layout has been determined after site surveys and shading analysis results show less than 2% shading.

The system is a de-centralized rooftop photovoltaic plant, connected to 3-phase 400V AC bus lines. The rooftop system includes following main components to be supplied:

- PV modules
- PV grid tied inverters
- AC/DC electrical controls/disconnects
- Lightning/surge protection
- Metering and monitoring equipment
- Mounting hardware

The battery storage system includes following main components:

- Hybrid inverters
- Batteries

Currently, two diesel generators are used as backup power for the dining hall and some administrative buildings. The generators may be operated in their current configuration or be integrated into the system design.

An electrical diagram is included in this document to illustrate the basic connections of various electrical branches at the WK estate.

PV Modules

The PV modules shall be “tier one” and rated at 240 Watt or above. Compliance with the International Electrotechnical Commission (EIC) standard norms IEC 61215 and IEC 61730 or requirements as listed in Underwriting Laboratories (UL) standard UL1703 is required. A framed module is preferred to protect from any damage during transport, installation and operation. The junction box behind the module shall be equipped with bypass diodes and rated IP 65. PV cables shall withstand thermal and mechanical loads and be resistant to weathering, UV-radiation, and abrasion.

Grid-Tied Inverter

The inverters shall comply with standard IEC 61727 or UL1741. The inverters shall also meet all applicable requirements as listed in Swaziland’s RPP grid code. The RPP grid code specifies inverter matching the phase of the grid and maintenance of the output voltage within allowed limitations. Note Section 9 – Protection and fault levels; “The *RPP* shall be equipped with effective detection of islanded operation in all system configurations and capability to shut down generation of power in such condition within 2 seconds.”

Inverter installations are both interior and exterior and inverters shall be rated for applicable temperature conditions and et least be rated IP54. Exterior installations will be protected with a shade cover and all installations shall have adequate room for air circulation.

PV grid tied inverters production may be controlled by frequency shifting, if needed to prevent issues related to back feeding the SEC grid.

AC/DC electrical controls/disconnects - Lightning/surge protection

The PV system shall have all necessary electrical protection to meet the grid code and ensure the safety of persons and goods. All inverters shall have properly rated AC and DC disconnects, surge- and overload protection. At the LV distribution boards, circuit breakers shall be included meeting IEC 60947-2 requirements. Also included are differential residual current circuit breaker for personal protection.

All system hardware shall be properly earthed and installed. Lightning protection commissioning shall be performed by an approved, certified, and licensed company.

In the case of grid failure, the corresponding electrical installation equipment must isolate the RPP from the grid. The SERA may require additional remote control AC power disconnects to manage grid interconnection.

Monitoring and metering equipment

Data acquisition and monitoring technology is required to meter PV system yield and to monitor system performance and alert if any failures have occurred.

Hybrid inverter

The hybrid battery inverter/charger should be a bi-directional pure sine wave inverter and meet standard IEC 61727 and safety standard IEC 62109-1. The main function of the hybrid battery inverter is to reduce high SEC peak hour tariff consumption by charging batteries during off peak tariff hours (22:00 – 06:00) and discharging during peak tariff hours (06:00 – 09:00 & 17:00 – 19:00). In addition, the batteries can be used as backup power in case of grid failure and facilitate operation in island mode. This mode of operation may follow an AC-coupling configuration, where the hybrid battery inverter operates as pure sine wave voltage source during grid failure. With this AC coupling the PV grid-tied inverter acts as current source, following the frequency of the battery inverter.

The inverter should have sufficient feed through capacity which may by determined from the load profile or be correlated to the corresponding transformer size.

Battery storage sizing is based on peak hour energy consumption.

To evaluate the financial feasibility of a battery storage “peak chopping” solution, a cost benefit analysis will be performed. A load profile is currently being assessed at the three proposed battery inverter locations, as illustrated on the electrical diagram.

Battery Storage

Currently load studies are being performed to support battery sizing. A rough order estimation of energy consumption during peak hours is included on the electrical diagram. Further data will be made available.

No requirements for battery storage technology are determined and the tender is open for proposals. New battery technologies with performance and/or economic advantages are encouraged.

Battery storage and electrical connection shall be installed close to the battery inverter. A battery room to facilitate technical or environmental specifications can be constructed. All further accessories like fuses, cables, and connectors shall be properly rated for DC use.

6 FINANCIALS

Waterford Phase 1, Wunder Education G1000 (PTY) Limited

FINACIAL SUMMARY

	eIRR %
IRR	
Phase 1	20.43%

	NPV %
NPV	
Phase 1	$1,787.300

13.32000 USA/ZAR

Input data

Leverage (%)	Interest (%)	Dev Costs USD/MWp	other USD/MWp	EPC USD/MWp	Generation Cost Wp
70.000%	1.600%	$82,645		$1,211,712	16.14 not including battery system provision

EPC	PLAs & Other	CAPEX	OPEX	Electricity Revenue	
$441,910	$82,645	$524,554	-$297,597	$3,741,116	0.187016654

Includes battery solution

WACCa	**Weighted Average Cost of Capital (after tax)**	**1.280%**
D	Indebtedness	100.000%
RD	Rate of interest paid	1.600%
t	Tax rate	20.000%
E	Equity	0.000%
RE	Return expected by the shareholders	**20.433%**

Waterford Phase 1, Wunder Education G1000 (PTY) Limited

INPUT ASSUMPTIONS

Life of the project in years	**25**

ASSUMPTIONS	
Peak Capacity Installed (MWp)	0.216
Nominal Capacity Installed (MW)	0.10
Inflation	6%
PPA, ZAR/Mw/Hour	1600
PPA escalation, p.a.	8%
Hours	1450
Degradation	0.50%

EPC	$441,910
Permissions, Licenses and Authorizations & Others	$82,645
Tax rebate for investment in PV	0.0%
VAT rate	0.0%
O&M, security, administration and insurance (% production)	10.0%
Rental of land (% production)	0.0%
Corporate Income Tax	20.0%
CAPEX leverage (excluding VAT), %	70.0%
CAPEX, excluding VAT	**$524,554**

FINANCIAL PROJECTION							
		0	1	2	3	4	5
PROFIT & LOSS ACCOUNT							
In thousands of US dollars		2017E	2018E	2019E	2020E	2021E	2022E
Annual degradation (%)		0.0%	0.0%	0.5%	0.5%	0.5%	0.5%
Capacity (MWp)		0.2160	0.2160	0.2160	0.2160	0.2160	0.2160
Equivalent hours after degradation		0	1,450	1,443	1,436	1,428	1,421
Production (MWh)		0	313	312	310	309	307
Limit in equivalent hours							
PPA (USD/MWh)		120.12 $/MWh	129.73 $/MWh	140.11 $/MWh	151.32 $/MWh	163.42 $/MWh	176.50 $/MWh
Tariff revenue (USD)		**0**	**41**	**44**	**47**	**50**	**54**
Pool price (USD/MWh)		0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh
Pool revenue		**0**	**0**	**0**	**0**	**0**	**0**
Other revenues - Battery for Peak Hours			**14**	**15**	**16**	**17**	**19**
Total revenues for sale of electricity (USD)		**0**	**54**	**58**	**63**	**68**	**73**
O&M, security, administration and other (USD)		-	(5)	(6)	(6)	(6)	(7)
Land Rent (USD)		-	-	-	-	-	-
				-	-	-	-
				-	-	-	-
				-	-	-	-
OPEX		**-**	**(5)**	**(6)**	**(6)**	**(6)**	**(7)**
EBITDA		**-**	**49**	**53**	**57**	**61**	**66**
% on revenue	*n.a.*		*90.0%*	*90.1%*	*90.3%*	*90.4%*	*90.6%*
Depreciation			(35)	(35)	(35)	(35)	(35)
EBIT		**-**	**14**	**18**	**22**	**26**	**31**
Interest		(1)	(6)	(6)	(5)	(4)	(4)
EBT		**(1)**	**8**	**12**	**17**	**22**	**27**
Corporation Tax		-	(1)	(2)	(3)	(4)	(5)
NET INCOME		**(1)**	**7**	**10**	**13**	**17**	**22**

SENIOR DEBT SERVICE	0	1	2	3	4	5
Year	2017E	2018E	2019E	2020E	2021E	2022E
Opening balance	367	367	330	294	257	220
Debt Service	1	43	42	42	41	41
Interest rate (%)	*1.60%*	*1.60%*	*1.60%*	*1.60%*	*1.60%*	*1.60%*
Interest	1	6	6	5	4	4
After tax interest	1	5	4	4	4	3
Amortization of Capital		37	37	37	37	37

CALCULATION OF CORPORATION TAX	0	1	2	3	4	5
Year	2017E	2018E	2019E	2020E	2021E	2022E
EPC invested	442	-	-	-	-	-
Tax rebate on investments on renewable energy	-	-	-			
Previous tax credit	-	0	-	-	-	-
Previous Taxable amount (EBT)	(1)	8	12	17	22	27
Previous tax payable	0	(2)	(2)	(3)	(4)	(5)
Credit used	(0)	0	-	-	-	-
Corporation tax	**-**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

EQUITY CASH FLOWS						
Year	2017E	2018E	2019E	2020E	2021E	2022E
	-	**49**	**53**	**57**	**61**	**66**
(-) Depreciation	-	(35)	(35)	(35)	(35)	(35)
EBIT	**-**	**14**	**18**	**22**	**26**	**31**
(-) Tax on operating income	-	(1)	(2)	(3)	(4)	(5)
(+) Depreciation	-	35	35	35	35	35
(-) CAPEX	(525)	-	-	-	-	-
(+) Loan withdrawal	367	-	-	-	-	-
(+ or -) Advance against future PPA income		-	-	-	-	-
(-) VAT on initial CAPEX	-	-	-	-	-	-
Cash flows before senior debt service	**-157**	**48**	**50**	**53**	**57**	**60**
(-) After-tax interests	(1)	(5)	(4)	(4)	(4)	(3)
(-) Amortization of Capital	-	(37)	(37)	(37)	(37)	(37)
Net equity cash flows	**(159)**	**6**	**9**	**13**	**17**	**21**

FINANCIAL PROJECTION					
	6	7	8	9	10
PROFIT & LOSS ACCOUNT					
In thousands of US dollars	2023E	2024E	2025E	2026E	2027E
Annual degradation (%)	0.5%	0.5%	0.5%	0.5%	0.5%
Capacity (MWp)	0.2160	0.2160	0.2160	0.2160	0.2160
Equivalent hours after degradation	1,414	1,407	1,400	1,393	1,386
Production (MWh)	305	304	302	301	299
Limit in equivalent hours					
PPA (USD/MWh)	190.62 $/MWh	205.86 $/MWh	222.33 $/MWh	240.12 $/MWh	259.33 $/MWh
Tariff revenue (USD)	**58**	**63**	**67**	**72**	**78**
Pool price (USD/MWh)	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh
Pool revenue	**0**	**0**	**0**	**0**	**0**
Other revenues - Battery for Peak Hours	**20**	**22**	**23**	**25**	**27**
Total revenues for sale of electricity (USD)	**78**	**84**	**91**	**97**	**105**
O&M, security, administration and other (USD)	(7)	(8)	(8)	(9)	(9)
Land Rent (USD)	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
OPEX	**(7)**	**(8)**	**(8)**	**(9)**	**(9)**
EBITDA	**71**	**76**	**82**	**89**	**96**
% on revenue	*90.7%*	*90.9%*	*91.0%*	*91.1%*	*91.3%*
Depreciation	(35)	(35)	(35)	(35)	(35)
EBIT	**36**	**42**	**47**	**54**	**61**
Interest	(3)	(3)	(2)	(1)	(1)
EBT	**33**	**39**	**45**	**52**	**60**
Corporation Tax	(7)	(8)	(9)	(10)	(12)
NET INCOME	**26**	**31**	**36**	**42**	**48**

SENIOR DEBT SERVICE	6	7	8	9	10
Year	2023E	2024E	2025E	2026E	2027E
Opening balance	184	147	110	73	37
Debt Service	40	39	39	38	38
Interest rate (%)	*1.60%*	*1.60%*	*1.60%*	*1.60%*	*1.60%*
Interest	3	3	2	1	1
After tax interest	3	2	2	1	1
Amortization of Capital	37	37	37	37	37

CALCULATION OF CORPORATION TAX	6	7	8	9	10
Year	2023E	2024E	2025E	2026E	2027E
EPC invested					
Tax rebate on investments on renewable energy					
Previous tax credit	-	-	-	-	-
Previous Taxable amount (EBT)	33	39	45	52	60
Previous tax payable	(7)	(8)	(9)	(10)	(12)
Credit used	-	-	-	-	-
Corporation tax	**(7)**	**(8)**	**(9)**	**(10)**	**(12)**

EQUITY CASH FLOWS					
Year	2023E	2024E	2025E	2026E	2027E
	71	**76**	**82**	**89**	**96**
(-) Depreciation	(35)	(35)	(35)	(35)	(35)
EBIT	**36**	**42**	**47**	**54**	**61**
(-) Tax on operating income	(7)	(8)	(9)	(10)	(12)
(+) Depreciation	35	35	35	35	35
(-) CAPEX	-	-	-	-	-
(+) Loan withdrawal	-	-	-	-	-
(+ or -) Advance against future PPA income	-	-	-	-	-
(-) VAT on initial CAPEX	-	-	-	-	-
Cash flows before senior debt service	**64**	**69**	**73**	**78**	**84**
(-) After-tax interests	(3)	(2)	(2)	(1)	(1)
(-) Amortization of Capital	(37)	(37)	(37)	(37)	(37)
Net equity cash flows	**25**	**30**	**35**	**40**	**46**

FINANCIAL PROJECTION					
	11	12	13	14	15
PROFIT & LOSS ACCOUNT					
In thousands of US dollars	2028E	2029E	2030E	2031E	2032E
Annual degradation (%)	0.5%	0.5%	0.5%	0.5%	0.5%
Capacity (MWp)	0.2160	0.2160	0.2160	0.2160	0.2160
Equivalent hours after degradation	1,379	1,372	1,365	1,359	1,352
Production (MWh)	298	296	295	293	292
Limit in equivalent hours					
PPA (USD/MWh)	280.08 $/MWh	302.48 $/MWh	326.68 $/MWh	352.82 $/MWh	381.04 $/MWh
Tariff revenue (USD)	**83**	**90**	**96**	**104**	**111**
Pool price (USD/MWh)	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh
Pool revenue	**0**	**0**	**0**	**0**	**0**
Other revenues - Battery for Peak Hours	**29**	**32**	**34**	**37**	**40**
Total revenues for sale of electricity (USD)	**113**	**121**	**131**	**141**	**151**
O&M, security, administration and other (USD)	(10)	(10)	(11)	(12)	(12)
Land Rent (USD)	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
OPEX	**(10)**	**(10)**	**(11)**	**(12)**	**(12)**
EBITDA	**103**	**111**	**120**	**129**	**139**
% on revenue	*91.4%*	*91.5%*	*91.6%*	*91.8%*	*91.9%*
Depreciation	(35)	(35)	(35)	(35)	(35)
EBIT	**68**	**76**	**85**	**94**	**104**
Interest	-	-	-	-	-
EBT	**68**	**76**	**85**	**94**	**104**
Corporation Tax	(14)	(15)	(17)	(19)	(21)
NET INCOME	**55**	**61**	**68**	**75**	**83**

SENIOR DEBT SERVICE	11	12	13	14	15
Year	2028E	2029E	2030E	2031E	2032E
Opening balance	(0)	(0)	(0)	(0)	(0)
Debt Service	-	-	-	-	-
Interest rate (%)	*1.60%*	*1.60%*	*1.60%*	*1.60%*	*1.60%*
Interest	-	-	-	-	-
After tax interest	-	-	-	-	-
Amortization of Capital					

CALCULATION OF CORPORATION TAX	11	12	13	14	15
Year	2028E	2029E	2030E	2031E	2032E
EPC invested					
Tax rebate on investments on renewable energy					
Previous tax credit					
Previous Taxable amount (EBT)	68	76	85	94	104
Previous tax payable	(14)	(15)	(17)	(19)	(21)
Credit used	-	-	-	-	-
Corporation tax	**(14)**	**(15)**	**(17)**	**(19)**	**(21)**

EQUITY CASH FLOWS					
Year	2028E	2029E	2030E	2031E	2032E
	103	**111**	**120**	**129**	**139**
(-) Depreciation	(35)	(35)	(35)	(35)	(35)
EBIT	**68**	**76**	**85**	**94**	**104**
(-) Tax on operating income	(14)	(15)	(17)	(19)	(21)
(+) Depreciation	35	35	35	35	35
(-) CAPEX	-	-	-	-	-
(+) Loan withdrawal	-	-	-	-	-
(+ or -) Advance against future PPA income	-	-	-	-	-
(-) VAT on initial CAPEX	-	-	-	-	-
Cash flows before senior debt service	**89**	**96**	**103**	**110**	**118**
(-) After-tax interests	-	-	-	-	-
(-) Amortization of Capital	-	-	-	-	-
Net equity cash flows	**89**	**96**	**103**	**110**	**118**

FINANCIAL PROJECTION					
	16	17	18	19	20
PROFIT & LOSS ACCOUNT					
In thousands of US dollars	2033E	2034E	2035E	2036E	2037E
Annual degradation (%)	0.5%	0.5%	0.5%	0.5%	0.5%
Capacity (MWp)	0.2160	0.2160	0.2160	0.2160	0.2160
Equivalent hours after degradation	1,345	1,338	1,332	1,325	1,318
Production (MWh)	291	289	288	286	285
Limit in equivalent hours					
PPA (USD/MWh)	411.52 $/MWh	444.45 $/MWh	480.00 $/MWh	518.40 $/MWh	559.87 $/MWh
Tariff revenue (USD)	**120**	**128**	**138**	**148**	**159**
Pool price (USD/MWh)	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh	0.00 $/MWh
Pool revenue	**0**	**0**	**0**	**0**	**0**
Other revenues - Battery for Peak Hours	**43**	**47**	**50**	**54**	**59**
Total revenues for sale of electricity (USD)	**163**	**175**	**188**	**203**	**218**
O&M, security, administration and other (USD)	(13)	(14)	(15)	(15)	(16)
Land Rent (USD)	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
OPEX	**(13)**	**(14)**	**(15)**	**(15)**	**(16)**
EBITDA	**150**	**161**	**174**	**187**	**202**
% on revenue	*92.0%*	*92.1%*	*92.2%*	*92.4%*	*92.5%*
Depreciation	-	-	-	-	-
EBIT	**150**	**161**	**174**	**187**	**202**
Interest	-	-	-	-	-
EBT	**150**	**161**	**174**	**187**	**202**
Corporation Tax	(30)	(32)	(35)	(37)	(40)
NET INCOME	**120**	**129**	**139**	**150**	**161**

SENIOR DEBT SERVICE	16	17	18	19	20
Year	2033E	2034E	2035E	2036E	2037E
Opening balance	(0)	(0)	(0)	(0)	(0)
Debt Service	-	-	-	-	-
Interest rate (%)	*1.60%*	*1.60%*	*1.60%*	*1.60%*	*1.60%*
Interest	-	-	-	-	-
After tax interest	-	-	-	-	-
Amortization of Capital					

CALCULATION OF CORPORATION TAX	16	17	18	19	20
Year	2033E	2034E	2035E	2036E	2037E
EPC invested					
Tax rebate on investments on renewable energy					
Previous tax credit					
Previous Taxable amount (EBT)	150	161	174	187	202
Previous tax payable	(30)	(32)	(35)	(37)	(40)
Credit used	-	-	-	-	-
Corporation tax	**(30)**	**(32)**	**(35)**	**(37)**	**(40)**

EQUITY CASH FLOWS					
Year	2033E	2034E	2035E	2036E	2037E
	150	**161**	**174**	**187**	**202**
(-) Depreciation	-	-	-	-	-
EBIT	**150**	**161**	**174**	**187**	**202**
(-) Tax on operating income	(30)	(32)	(35)	(37)	(40)
(+) Depreciation	-	-	-	-	-
(-) CAPEX	-	-	-	-	-
(+) Loan withdrawal	-	-	-	-	-
(+ or -) Advance against future PPA income	-	-	-	-	-
(-) VAT on initial CAPEX	-	-	-	-	-
Cash flows before senior debt service	**120**	**129**	**139**	**150**	**161**
(-) After-tax interests	-	-	-	-	-
(-) Amortization of Capital	-	-	-	-	-
Net equity cash flows	**120**	**129**	**139**	**150**	**161**

Waterford Phase 1, Wunder Education G1000 (PTY) Limited

DEVELOPMENT COSTS

			USD	Rands	Notes
Concept Development Costs			32,546	433,507	As per Agreement 23 February 2016
Design costs			-		Since January 2017
Management Costs			-		Since March 2016
Total Other			*33,219*	*433,507*	
Development			31,408	418,349	Calculated at 12% of total project costs
Battery Development			18,018	240,000	
Total Development costs			**82,645**	**851,856**	
Incurred as follows:					
G1000					
	Concept costs		33,219	433,507	
	Management		-	-	
	Development	50%	25,224	329,174	
	Total due		**58,443**	**762,681**	
Wundersigh	Design		-	-	
	Development	50%	25,224	329,174	
	Total Due		**25,224**	**329,174**	

Waterford Phase 1, Wunder Education G1000 (PTY) Limited

FUNDING

		USD	Rands
Project costs		$524,554	R6,987,065
Debt/Equity ratio			
Debt	70%	$367,188	R4,890,945
Wunder Equity	30%	$157,366	R2,096,119

Waterford Kamhlaba Technology Specifications and Pricing

QUANTITY	UNITS	DESCRIPTION	TOTAL PRICE (ZAR)	UNITARY SALE (ZAR)
		604 x 320W Canadian Solar plus Solar Edge System		
193,280	Wp	Modules - 320Wp CS6U-320	1,457,331.20	7.54
	Ea	Solar Edge Inverters	269,750.00	1.40
302	Ea	SE Power optimizer P700	294,057.40	1.52
193,280	Wp	Mounting (clamps, rails, fasteners,	223,624.96	1.16
		DC string boxes	15,600.00	0.08
		AC panel & wiring	104,130.00	0.54
		Roof PV wiring	72,800.00	0.38
400	m	10mm^2 Al. lightning conductors	52,000.00	0.27
20	Ea	3m x 3m crows foot 70mm2 bare Cu	33,800.00	0.17
480	Ea	4mm grounding between module rails	864.00	0.00
1,520	Hr	Installation labor	307,800.00	1.59
14	each	Earth testing	72,800.00	0.38
	Km	Transportation	48,000.00	0.25
		Handling & Storage	18,000.00	0.09
	5%	Contingency	148,527.88	0.77
		TOTAL	3,119,085.44	16.14

7 WK SOLAR IRRADIATION SITE MAPS:

The following daily irradiation for the Waterford location was obtained from source NASA-SSE

Month	Diffuse daily [kWh/m²]	Direct daily [kWh/m²]	Global daily [kWh/m²]
January	2.56	3.39	5.95
February	2.30	3.32	5.62
March	1.91	3.16	5.07
April	1.42	3.08	4.50
May	0.95	3.14	4.09
June	0.77	2.99	3.76
July	0.82	3.15	3.97
August	1.18	3.22	4.40
September	1.67	3.28	4.95
October	2.21	2.76	4.97
November	2.53	2.72	5.25
December	2.66	2.94	5.60
Yearly	**1.75**	**3.09**	**4.84**

Considering the monthly average daily irradiation and the number of days which make up the twelve months of the year, the value of the annual global irradiation on a horizontal surface for Waterford is equal to 4.84 [kWh/m²].
Any shading of a photovoltaic array should be avoided because it causes loss of power and therefore of energy produced. As illustrated on the site sketches, the PV rooftop locations and array layouts have been carefully selected and designed to prevent any shading on the roof.

The producibility of the system was calculated on the basis of data, derivates from source of climate data NASA-SSE, of the installation site relative to the average monthly global of solar radiation incident on horizontal surface.

The procedure for the calculation of the energy produced by the system considers the nominal power (190 kW), the angle of tilt and azimuth of the PV generator, the losses on the PV generator (resistive losses, losses due to difference in temperature of the modules, for reflection and for mismatching between strings), the efficiency of the inverter as well as the coefficient reflectance of the ground in front of the modules (20%) (albedo).

The energy produced by the system on an annual basis is calculated based on the following average power losses. The table below lists these loss factors and their values assumed by the procedure for the calculation of system producibility.

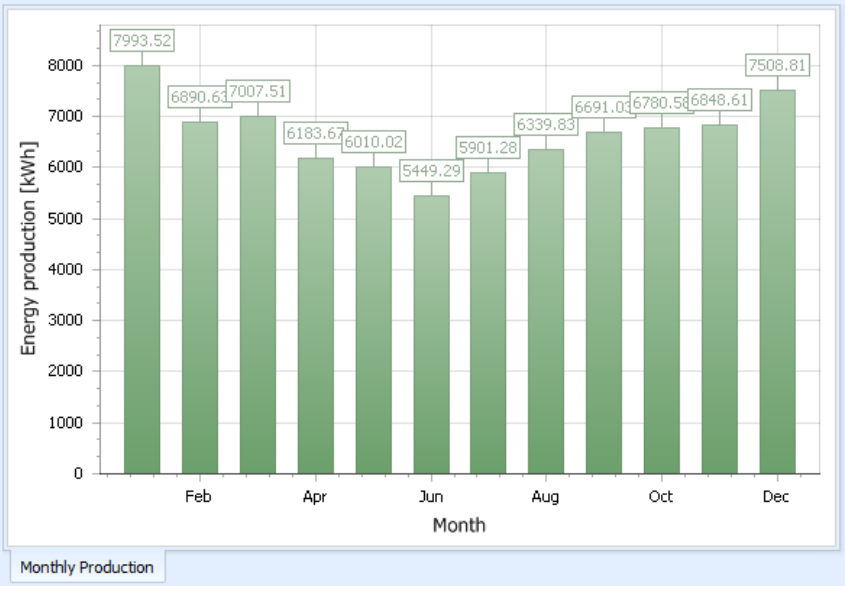
Losses	
Temperature losses	3.00 %
Mismatching losses	2.00 %
Resistive losses	4.00 %
Losses for DC/AC conversion	2.40 %
Other losses	2.00 %
Shading losses	1.00 %
Total losses	**13.71 %**

Power Generation Specifications

The following Tables indicate the technical details with respect to system size in kWp and the expected Annual Production in kWh per location for Phase 1 of the project – MP Hall, Dining Hall, CCLD, Maths & History Classroom Blocks, and Emhlabeni hostel. It is expected that all the power produced will be self-consumed at point of generation or within the Waterford Micro-grid.

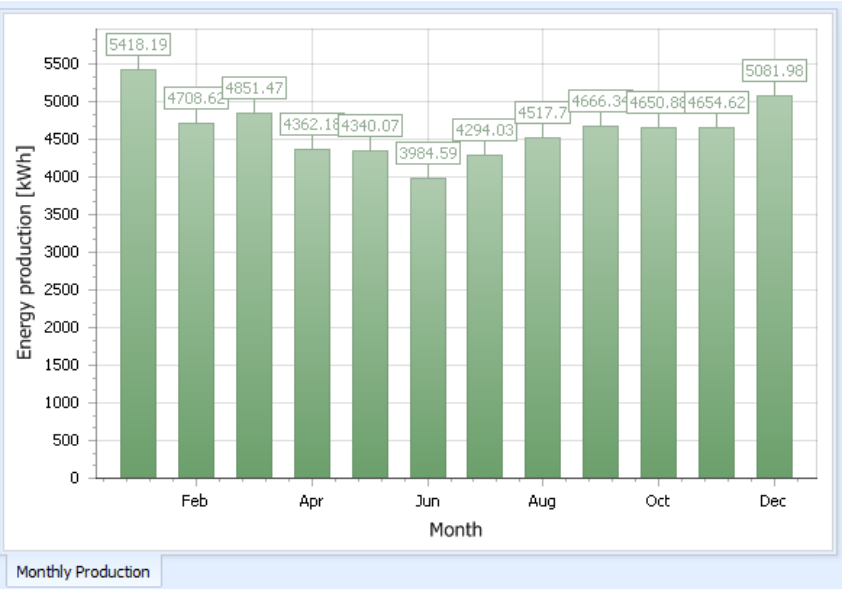
MP Hall:

Nominal power	49.92 kWp
Maximum DC voltage	563.33 V
Maximum DC current	45.0 A
Maximum voltage MPPT	459.33 V
Minimum voltage MPPT	368.84 V
Annual energy production	79604.78 kWh
Annual producibility	1594.65 kWh/kWp
Shading loss	0.00 %
Conversion loss	2.20 %
Global loss	12.54 %
Minimum system temperature	12 °C
Maximum system temperature	66 °C
Number of strings	12
Number of modules	156
Modules area	302.64 m²



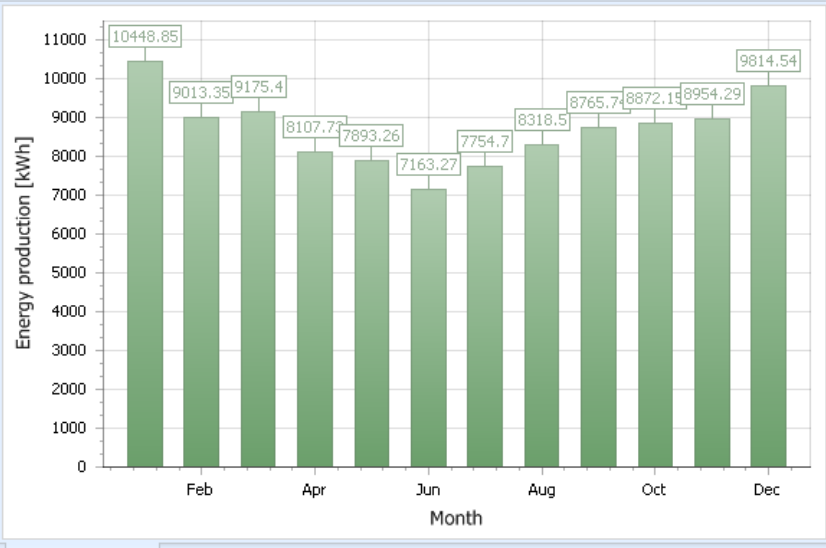
Dining Hall:

Nominal power	34.88 kWp
Maximum DC voltage	520.0 V
Maximum DC current	67.5 A
Maximum voltage MPPT	424.0 V
Minimum voltage MPPT	340.46 V
Annual energy production	55530.67 kWh
Annual producibility	1592.05 kWh/kWp
Shading loss	0.00 %
Conversion loss	4.10 %
Global loss	14.23 %
Minimum system temperature	12 °C
Maximum system temperature	66 °C
Number of strings	9
Number of modules	109
Modules area	211.46 m²



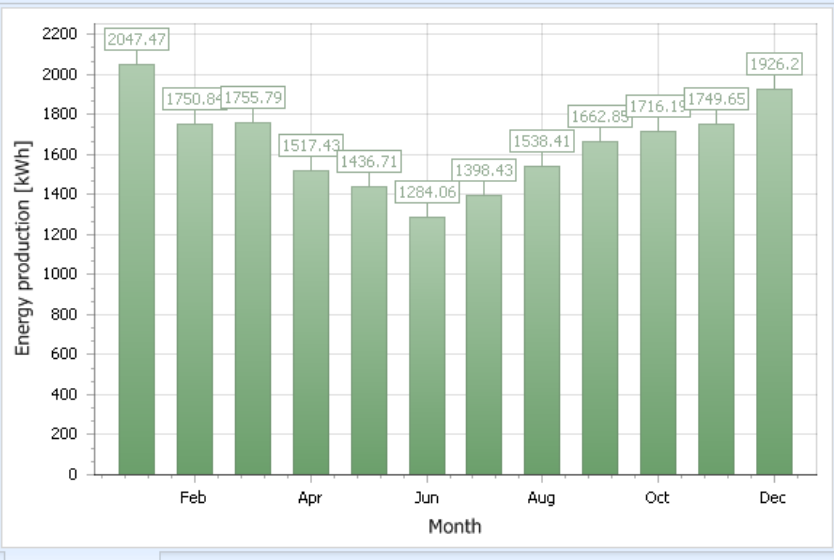
Maths (B) and History (C) classroom blocks, including walkway covers

Nominal power	65.28 kWp
Maximum DC voltage	736.66 V
Maximum DC current	45.0 A
Maximum voltage MPPT	600.66 V
Minimum voltage MPPT	482.32 V
Annual energy production	104281.77 kWh
Annual producibility	1597.45 kWh/kWp
Shading loss	0.00 %
Conversion loss	2.20 %
Global loss	12.54 %
Minimum system temperature	12 °C
Maximum system temperature	66 °C
Number of strings	12
Number of modules	204
Modules area	395.76 m²



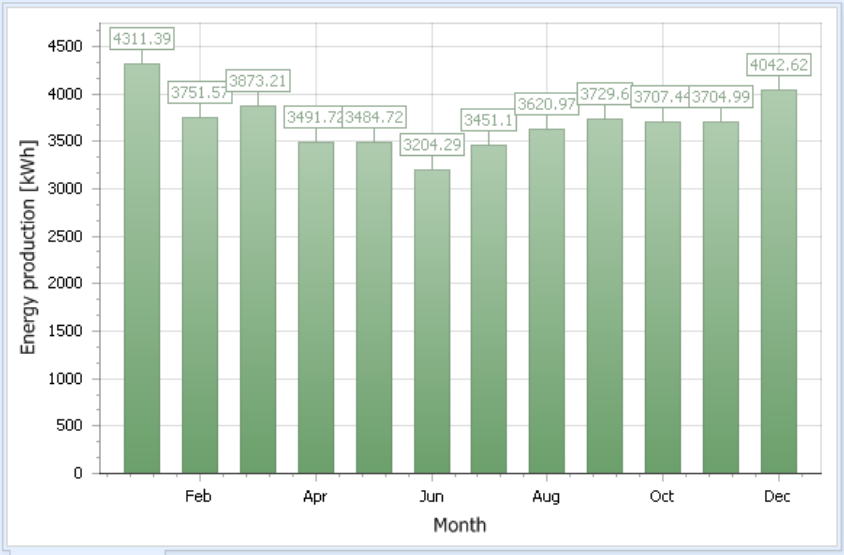
CCLD

Nominal power	12.8 kWp
Maximum DC voltage	866.66 V
Maximum DC current	15.0 A
Maximum voltage MPPT	0.0 V
Minimum voltage MPPT	0.0 V
Annual energy production	19784.03 kWh
Annual producibility	1545.63 kWh/kWp
Shading loss	0.00 %
Conversion loss	2.80 %
Global loss	13.07 %
Minimum system temperature	12 °C
Maximum system temperature	66 °C
Number of strings	2
Number of modules	40
Modules area	77.6 m²



Emhlabeni

Nominal power	27.52 kWp
Maximum DC voltage	945.09 V
Maximum DC current	24.44 A
Maximum voltage MPPT	760.59 V
Minimum voltage MPPT	627.67 V
Annual energy production	44373.62 kWh
Annual producibility	1612.41 kWh/kWp
Shading loss	0.00 %
Conversion loss	2.20 %
Global loss	12.54 %
Minimum system temperature	12 °C
Maximum system temperature	66 °C
Number of strings	24
Number of modules	344
Modules area	247.68 m²



Monthly Production

8 WK ESTATE ELECTRICAL DIAGRAM