Gold Standard for the Global Goals

TEMPLATE

KEY PROJECT INFORMATION & VPA DESIGN DOCUMENT (PDD)

PUBLICATION DATE **04.05.2022**

VERSION v. **2.0**

RELATED SUPPORT - Programme of Activity requirements

This document contains the following Sections

KEY PROJECT INFORMATION

Type of VPA	☒ Real case VPA ☐ Regular VPA
Scale of VPA Note that a VPA can be of one scale. Please select applicable scale accordingly.	☐Microscale ☒Small scale ☐Large scale
Title of corresponding real case VPA (if applicable)	GS11598- VPA-1 Emission Reductions due to distributed energy solutions by Bboxx – Rwanda Solar Home Systems
GS ID of real case VPA (if applicable)	GS11600
GS ID of VPA	GS11600
Title of VPA	GS11598- VPA-1 Emission Reductions due to distributed energy solutions by Bboxx – Rwanda Solar Home Systems
Time of First Submission Date	25/03/2022
Date of Design Certification	N/A
Version number of the VPA-DD	Version 03
Completion date of version	29/08/2022
Coordinating/managing entity	Bboxx Ltd.
VPA Implementer (s)	Bboxx Ltd.
Project Participants and any communities involved	N/A
Host Country (ies)	Rwanda
GS ID and Title of applicable Design Certified VPA	N/A
GS ID and Title of applicable Performance Certified VPA	N/A
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities

	☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Other Requirements applied	N/A
Methodology (ies) applied and version number	AMS III.BL "Integrated methodology for electrification of communities" Version 1.0
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A
VPA Cycle:	☐ Regular ☒ Retroactive

Land-use & Forest and Agriculture - Key Project Information

N/A

Table 1 – Estimated Sustainable Development Contributions

Sustainable Development Goals Targeted	SDG Impact (defined inError! Reference source not found.)	Estimated Annual Average	Units or Products
13 Climate Action (mandatory)	Amount of GHGs emissions avoided or sequestered (tonCO_2e/year)	14,595	tCO_2e/year
7. Affordable clean energy	Number of beneficiaries: users with access to SHS	408,819 [1]	Individual beneficiaries
8. Decent work and economic growth	Number of direct and indirect employments generated by the project activity (total)	490[2]	Employments
	Total number of employees by employment contract (permanent and temporary), by gender	Permanent: 181[3] Temporary: 309	Employments
	Total number of employees by employment type (full-time and part-time), by gender	Full-time: 490 Part-time: 0	Employments

[1] A utilization rate of 80% and an average household size of 4,3 are assumed.
[2] The first year's employment is taken as a reference for the other five years, which will be monitored to identify actual data.
[3] Jobs by gender will be available in the validation process.

SECTION A. DESCRIPTION OF PROJECT

A.1. Purpose and general description of project

The project activity consists of the distribution, installation, and use of the Bboxx Solar Home Systems (SHS) and solar water pump (SWP), aiming to promote the efficient use of innovative technologies for reducing greenhouse gas emissions by replacing fossil fuel-based lighting and energy by bPower solar fixed devices bPower 20 (also branded as bPower60)), 50 (also branded as 110), 80, 120, 160 and 240), Flexx portable units (Flexx10 (also branded Flexx12) and 40) and solar water pumps, for domestic and commercial applications at an affordable price.

The operation of the SHS and SWP is controlled monitored and managed in real time by the Bboxx Pulse® platform, which is a live dashboard that remotely collects and displays essential operational data such as current in/out, connectivity and battery performance. This real-time monitoring will contribute to the accuracy of the estimation of emission reductions from solar-powered lamps and power supply and may be suitable to incorporate digitization in the monitoring, reporting, verification, and certification of this VPA.

Flexx products will be connected only the first year to the Pulse platform and will not have a monitoring of electricity consumption but only a record of on/off of the equipment. Therefore, to give a better understanding about monitoring consumption and active users, the technologies are divided into two main groups as follows:

- IOT products (detailed monitoring, including power consumption for bPower series (bPower60, 110, 80, 120, 160 and 240) and solar water pumps.
- Non-IOT products (Flexx portable units).

Please refer to each of the monitored parameters for more details.

Rwanda is a landlocked country in East Africa. It borders Uganda, Burundi, Democratic Republic of the Congo, and Tanzania, is a low-income country, which in the last decade has been achieving the highest growth rates on the continent. Much of the population works in agriculture, mainly subsistence, but there is increasing mineral production and processing of agricultural products. Tourism is currently the country's main source of income. Rwanda has a population of 12.952 million people according to the 2020 census (The World Bank).

Considering the *Rwanda Household Survey 2019/2020*[4] it is possible to know how the population and households are distributed in rural and urban areas, which is important to determine the target population. The following table shows how these are divided and their corresponding percentages:

Table 2. Number of conventional households in Rwanda

Type	Number of conventional households	Share of type of households
Rural	**2,184,000**	**80.65%**
Urban	**524,000**	**19.35%**

The government of Rwanda asserts that the availability of an efficient and reliable energy supply and clean cooking solutions is a requisite for social prosperity, human development, and economic growth. Its objectives are to transform the country into a middle-income economy by improving its market competitiveness and guaranteeing unity and inclusive growth, without neglecting the care and effort of environmental management. The implementation of the project activity contributes to the advancement of the Sustainable Development Goals (SDG 7, 8 and 13), switching from fossil fuel-based lighting to solar-powered LED light bulbs and providing the opportunity to connect household electrical appliances (for example, phone charger, torch, radio, shaver, TV, subwoofer).

Table 3 present the sales data of the distributed technology in Rwanda from 01/04/2021 to 31/12/2021.

Table 3. SHS distributed by Bboxx, 2021

Technology	Units
bPower20- (Renamed 60)	11,447
bPower50 (Renamed 110 and 150)	1,311

[4] https://www.statistics.gov.rw/publication/rwanda-household-survey-20192020#:~:text=It%20presents%20stable%20indicators%20from,all%20at%20the%20national%20level

A.1.1. Eligibility of the VPA under approved PoA

The VPA is eligible under the criteria established in the PoA.

Table 4. Eligibility for VPA inclusion as per PoA requirements

No.	Eligibility Criterion	Description/ Required condition	Description of the VPA in relation to the criteria, Means of Verification and Supporting evidence for inclusion
1	Location of the VPA	The geographical boundary of the VPA is within one of the countries included in the PoA	The VPA is located in Rwanda (section A.2), which is within the countries included in the geographical boundary of the PoA
2	No double counting of impacts	A unique numbering or identification system for the SHS and gas stoves in each VPA will be applied in addition to the CME logo. This shall ensure no double counting of SHS, SWP or stoves within the PoA and ensure that the systems can be identified as belonging to the PoA and to a specific customer.	The project activity devices have been distributed (bPower20, 50, 80, 120, 160 and 240, Flexx12 and 40, and solar water pumps) under this VPA have a unique customer number in order to ensure no double counting of devices within the project activity. Customer information and technical specifications are linked to each serial number and available in the project database.
3	No double counting of VPA	The VPA, and any of its devices is exclusively bound to the PoA and not registered as an individual project/ or as a part of any other PoA under other carbon standards, ensuring that the VPA has the full title over the emission reductions generated by the VPA	The CME checked that the project activity is neither registered as an individual project or as part of another PoA in Gold Standard or any other standard.
4	Host Country Requirements	The VPA shall be in compliance with applicable Host Country's legal, environmental, ecological, and social regulations.	The VPA complies with Rwanda's related legal, environmental, and social regulations. The implementation and operation of Bboxx SHS technology comply with the Rwanda Energy Policy, Electricity Law, and Ministry

			of Infrastructure product regulation. A detailed legal framework analysis can be checked in Section F of this VPA-DD.
5	Technology	Each VPA will involve the distribution of solar home systems (SHS) including LED lamps, solar water pumps (SWP) and/or gas stoves (both described in section A.3) according to the geographical user's distribution	The VPA involve the distribution of the technology established in section A.3 of this VPA- DD, specifically models bPower20, bPower50, bPower80, bPower120, bPower160, bPower240, Flexx40 and Flexx10 for the SHS, which include LI0201 and LI0141 light bulbs, and the distribution of solar water pumps. Other SHS models could be distributed in Rwanda according to available possibilities during the project implementation
6	Start date	The start date will be specified in each VPA. For retroactive VPAs the start date should be maximum one year before the submission date to the Preliminary Review	The start date of the VPA is 01/04/2021[5]. The first submission to Gold Standard was 25/3/2022 as part of Preliminary Review. Therefore, the start date carries out with the VPA inclusion conditions.
7	Applicability of methodologies	Each VPA will comply withthe applicability criteria of the applied methodologies (AMS-III.BL, Version 1.0 and methodology for metered & measured energy cooking devices, Version 1.0)	The VPA is in accordance with the applied methodologies as shown in section B.2 of this VPA-DD
8	Additionality	All VPAs to be included under the PoA will be in compliance with the additionality criteria	The additionality is demonstrated following the applicable methodologies' conditions for SHS. See

[5] The conditions, legal evidence, and transactions of the start date definition is available to the VVB for validation purpose.

		presented in section C of this PoA	section B.5 of this document
9	Non-diversion of ODA	The VPAs will not receive ODA	A declaration confirming that there is no diversion of ODA is attached with the VPA-DD. The corresponding statement is made in section A.5 of this VPA-DD
10	Target group	Each VPA will involve the distribution of the specified energy systems to residential and non-residential (commercial, industrial, etc.) end-users, located in rural and urban areas within the geographical boundary currently using fossil fuels or other non-renewable and unreliable energy methods for lighting and/or cooking and not connected to the electricity grid.	The target group of the VPA correspond to households and commercial users that are located in the rural and urban areas of Rwanda that previously used fossil-fuel based lighting devices or not renewable energy system. The products of the project are distributed mainly to households with a percentage greater than 75% of the total amount distributed, to provide lighting and other energy services According to the Rwanda Household Survey 2019/2020 the target population is • 2,184,000 rural households • 524,000 urban households
11	Sampling	Sampling should be in line with the applied methodologies according to the standard of sampling of surveys for program activities	The sampling of the VPA is in line with the applied methodologies and specified in section B.7.2. of this VPA-DD
12	VPA scale	The project activity can be categorized as small-scale activity or micro-scale activity per the CDM methodology requirements and in accordance with the GS4GG. Emission reductions achieved by each one of the activities considered under the PoA are limited to a	According to the level of project implementation in Rwanda, the VPA has the category of small scale, for Solar Home Systems (bPower and Flexx technologies) and solar water pumps.

		maximum of 60,000 tonnes of CO2e in case of being small scale and 10,000 tonnes of CO2e in case of being micro scale, in any year of their crediting period	
13	SDG assessment	It is expected to have positive outcomes for at least 3 SDGs, which will be assessed using the Gold Standard SDG tool	The outcomes for SDG assessment for this VPA are described in section B.6 of this VPA-DD
14	Voluntary activity	Each project activity corresponds to a voluntary action; therefore, it is not required by law	Activities developed under this VPA are totally voluntary and not required by law.

A.1.2. Legal ownership of products generated by the VPA and legal rights to alter use of resources required to service the project

Bboxx Ltd. has full ownership of the GS VERs that are generated under the Gold Standard certification. Bboxx will notify all the beneficiaries (end users) confirming the transfer of all legal rights of the emission reductions[6].

Before the purchase of the technology, Bboxx will inform to the user, that any rights to emission reductions will be transferred to the CME, avoiding in this way a double counting of emission reductions. A User Notification will be implemented to ensure transparency on the emission reduction transfer, indicating the obligations of both parties and provisions regarding the transference of emission reductions ownership and benefits.

A.2. Location of VPA

Country: Rwanda

State: All states

Districts: All districts

[6] The evidence of notification to the end-users are available for the VVB.

The geographic coordinates of the project are:
1°56'25'' S 29°52.433' E

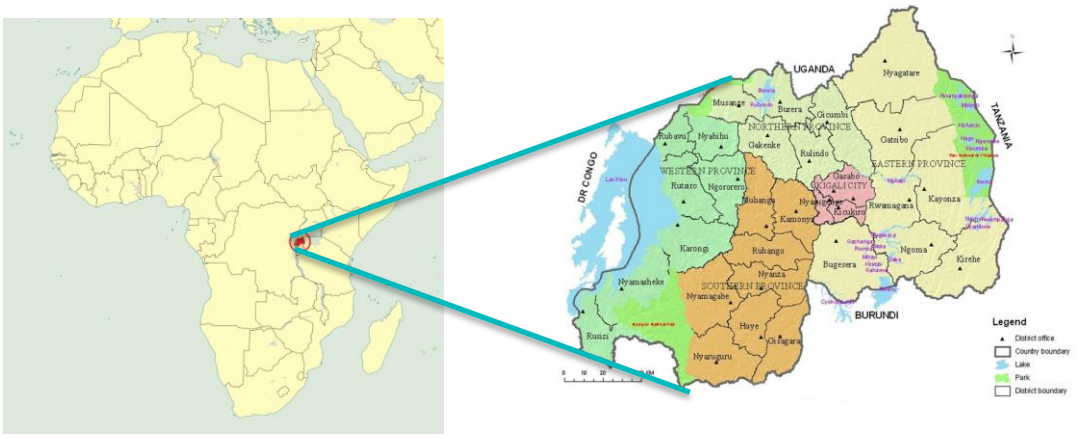

Figure 1. Location of the project

A.3. Technologies and/or measures

The VPA involves the distribution of Solar Home Systems and solar water pumps in the rural and urban areas of Rwanda.

The technical characteristics of the distributed technologies are presents as follows.

Solar Home Systems

- **bPower20 (also branded as bPower60)**

Figure 2. bPower20 system

The bPower20 is a plug and play solar home system designed for households and micro business with basic appliance requirements. The system powers LED light bulbs, so a continuous use of lighting is provided, a torch, a radio, and a phone charger

It comes with an interactive screen which provides product information enabling the energy consumption monitoring.

Lithium battery and additional features are included to reduce maintenance and service costs.

- **bPower50 (also branded as bPower110)**

Figure 3. bPower50 system

The bPower50 is a plug and play SHS designed for off-grid customers typically using candles and kerosene lamps or for customers with unreliable energy access (rural or urban categories). It deploys a 50W solar panel and comes with two battery configurations. It can power lights, radios, and TVs as well as charge phones for households and micro-business. A continuous use of lighting is provided.

- **bPower80**

The bPower80 is a solar home system that aims to provide the unserved with energy access through a 35W solar power that can power lights, smartphones, radios, torches as well as TVs

Technical specifications bPower80		
Nominal capacity (Wh)	80	
Usable daily energy (Wh)	80	
Solar panel capacity (W)	35	
Target audience	Households and small business	
Full battery runtime combination	Type and amount	Daily runtime
	3xLED lights	8 hours
	1 smartphone	1 full charge
	1 radio	1 full charge
	1 torch	1 full charge
	24” TV	4 hours

- **bPower120**

The bPower120 provides up to 120Wh of usable energy to a wide range of users in rural and urban areas.

The system uses a 50W solar panel to power LED light bulbs, so a continuous use of lighting is provided, as well as a torch, a radio, a phone charger, and a TV.

Technical specifications bPower120		
Nominal capacity (Wh)	120	
Usable daily energy (Wh)	120	
Solar panel capacity (W)	50	
Target audience	Households and small business	
Full battery runtime combination	**Type and amount**	**Daily runtime**
	4xLED lights	8 hours
	1 Mobile phone (3.7W)	2 full charge
	1 radio	1 full charge
	1 torch	1 full charge
	24” TV	6 hours

- **bPower160**

The bPower160 is an 80W solar home system that provides up to 160Wh of usable energy that can be used to power LED light bulbs so that a continuous use of lighting is provides. Additional appliances such as phones, radios, torches or even a TV can be also powered with this solar home system.

Technical specifications bPower160		
Nominal capacity (Wh)	160	
Usable daily energy (Wh)	160	
Solar panel capacity (W)	80	
Target audience	Households and small business	
Full battery runtime combination	**Type and amount**	**Daily runtime**
	5xLED lights	8 hours
	1 Smartphone	1 full charge
	1 radio	1 full charge
	1 torch	1 full charge
	32” TV	7 hours

- **bPower240**

The bPower240 provides continuous lighting service to a wide range of users through an 80W solar panel. It comes with 6 LED light bulbs and the possibility to connect smartphones, ratios, torches, and TVs.

Technical specifications bPower240		
Nominal capacity (Wh)	240	
Usable daily energy (Wh)	240	
Solar panel capacity (W)	80	
Target audience	Households and small business	
Full battery runtime combination	**Type and amount**	**Daily runtime**
	6xLED lights	8 hours
	1 Smartphone	1 full charge
	1 radio	1 full charge
	1 torch	1 full charge
	32” TV + medium speaker	8 hours

- **Flexx40**

The Flexx40 is a versatile multi-light solar system with a 12W solar panel and lithium battery, specially designed for rural or urban customers with a demand for lighting application and mobile phone charging. It offers dimmable LED light bulbs which allows a better control over the energy usage.

Figure 4 Flexx40 system

Technical specifications Flexx40		
Solar panel capacity (W)	12	
Battery size (Wh)	38.4	
Target audience	Off-grid rural households	
Appliances	**Type and amount**	**Daily runtime**
	3xLED light bulbs (1.2W) or	6 hr
	Phone charging	During the day

The technical specifications of the LED lightbulbs that are included in all the SHS are presented as follows.

Technical specifications LI0201 & LI0141 light bulbs		
Luminaire characteristics	Indoor/Outdoor	Indoor
	Voltage	12 V DC
	Power	<1.2W
Durability	LED lifetime	>30,000 hours
	On/off cycles	>15,000 times
	Lumen maintenance	>93% (6,000 hours)
Light characteristics	Light output	>120 lm
	Colour	Cool white
	Colour Rendering Index (CRI)	>80

- **Flexx10 (also branded as Flexx12)**

The Flexx10 is a portable solar lantern, designed for rural customers at the bottom of the energy pyramid. The system comes with a 9.6Wh Lithium battery and a 3 W solar panel. Flexx10 can power a LED light bulb and charge mobile phones. The system is designed to minimize lifetime costs and include other features which allows it to be sold even more affordably.

Technical specifications Flexx10		
Solar panel capacity (W)	3	
Battery size (Wh)	9.6	
Target audience	Rural households and micro businesses	
Appliances	**Type and amount**	**Daily runtime**
	LED light bulb (1.8W) and a phone charger	4 hr (Super mode)
		8 hr (High mode)
		16 hr (Normal mode)
		36 hr (Night mode)

The main unit technical specifications of the Flexx10 technology are presented as follows:

Technical specifications main unit		
Luminaire characteristics	Voltage	3.2 V
	Power	1.8W
	IP Protection	IP23
Durability	LED lifetime	25,000 hours
	Lumen efficacy	130lm/W
	Lumen maintenance	99%
Light characteristics	Light Output	20lm[7]-60lm-120lm -240lm
	Light Setting	4 settings

Table 5. Solar Home Systems characteristics

Technologies	Characteristics	
	Number of sold units	LED Lifetime
bPower20	11,447	Durability: >30,000 hours
bPower50	1,311	
bPower80	-	
bPower120	-	
bPower160	-	
bPower240	-	
Flexx40	-	>25,000 hours
Flexx12		

Solar Water Pumping Systems (SWP)

- **ClimateSmart™ Direct with RainMaker2**

[7] This configuration of 20lm light output, will not be considered in the emission reduction calculation due to it does not meet the minimum requirements according to the methodology.

Battery-free solar water pumping systems with a maximum head of 30m. Includes a submersible centrifugal axial flow pump with 50m electric cable and the corresponding irrigation fittings.

There are two types of configurations: RainMaker2S and RainMaker2C which are irrigation solutions for 0.5-1-acre farm and 2-acre farm respectively. Additional characteristics are presented as follows.

Technical specifications ClimateSmart™ Direct		
	RainMaker2S 	**RainMaker2C Kubwa** 
Max. flow (m^3/h)	1.1	2.75
Solar panel capacity (W)	310	2X310
Hours of operation @20m	1-2 hours cloudy day 6 hours sunny days	
Adds -ons	310W solar panel + 25 PE fittings + 4 sprinklers	N/A

- **ClimateSmart™ Battery with RainMaker2**

All-in-one battery and charge controller solar water pumping systems with a maximum head of 65m.

There are two types of configurations: RainMaker2S and RainMaker2C which are irrigation solutions for 1 acre farm and 2-acre farm respectively. Additional characteristics are presented as follows.

Technical specifications ClimateSmart™ Battery		
	RainMaker2S 	**RainMaker2C** 
Type of pump	Positive displacement screw pump	Centrifugal axial flow pump
Max. flow (m^3/h)	1.1	2.75
Solar panel	160W portable or 310W mounted panel with roof mounting kit	310W solar panel with roof mounting kit

Hours of operation @20m	3-4 hours cloudy day 8-9 hours sunny days	
Lightbulbs (7watt/600 lumen)	4	4
Adds-ones	SunCulture's 32 solar powered TV Direct drip irrigation kit	

Although the project activity for the first crediting period (2021 to 2023) focuses on the distribution of the bPower60 (bPower20), bPower110 (bPower50), and Flexx40; there are alternatives that other SHS and SWP technologies could distribute in the same area of the project boundary. However, these alternatives will depend on the project implementation accordingly to commercial opportunities, and future corporate marketing decisions. Consequently, the reference of technologies has been provided in the VPA as part of the project activity implementation[8].

A.4. Scale of the VPA

The VPA is considered as small scale since the total emission exceed the microscale threshold of 60,000 tonnes CO_2/year. However, each of the individual units can be considered as microscale unit according to numeral 6 of the Application of microscale thresholds at unit level of CPAs of TOOL 19 "Demonstration of additionality of microscale project activities Version 9".

A.5. Funding sources of VPA

There is no diversion of public or ODA funding for this project activity.

Through the Development Bank of Rwanda (BRD), the Government of Rwanda signed an agreement with the World Bank Group for the operation of the Renewable Energy Program Grant, called Energy Access and Quality Improvement Project EAQIP (P160699)[9]. The program has the purpose to increase electricity access in Rwanda

[8] All ER calculations and units' distributions estimation have been done based on actual technology devices considering that there are no reliable data to make reliable forecasting of the other optional technologies. Any technology inclusion will be reported during the verification process

[9] https://documents1.worldbank.org/curated/en/668511621391530619/pdf/Disclosable-Version-of-the-ISR-Renewable-Energy-Fund-P160699-Sequence-No-10.pdf

through off-grid technologies and facilitate private-sector participation in renewable off-grid electrification.

The EAQIP program supplies economic support to promote the acquisition and installation of affordable electrification. Particularly, Bboxx has an agreement with the Government of Rwanda to receive subsidies for bPower20 & 50 and the Flexx40, distributed to the poorest population in Rwanda according to the Ubudehe Category considering the household socioeconomic conditions[10]. The subsidy amount depends on the user's category, and every end-user shall contribute a proportional amount; this means that the poorest customers contribute the least. The subsidy agreement includes the provision that carbon emission reductions resulting from the subsidized units will be transferred to the Development Bank of Rwanda (BRD) in line with a further agreement. Therefore, all devices and technologies distributed with the EAQIP support have been excluded from the project activity implementation pending an agreement with BRD on how to transfer the units. CME controls and reports details to avoid any double benefit on carbon support[11].

SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

B.1. Reference of approved methodology (ies)

For Solar Home Systems and Solar Water Pumps the small-scale methodology AMS-III.BL "Integrated methodology for electrification of communities" Version 1.0, from Clean Development Mechanism (CDM).

B.2. Applicability of methodology (ies)

Under this VPA Solar Home Systems and Solar Water Pumps are distributed to households in Rwanda. The utilization of the systems will reduce the amount of fossil fuel-based energy needs, which leads to a reduction in greenhouse gas emissions. The

[10] The Ududehe Category has 1 to 4 level classification, where 1 being the poorest. The category has changed to levels A to E, where E is the lowest of poverty. https://rwandapedia.rw/hgs/ubudehe/poverty-level-categories
[11] All beneficiary records will be available to VVB.

following table presents the applicability conditions of the CDM methodology for the distribution:

Table 6. Applicability of the methodology AMS-III.BL

Applicability condition	Justification
This methodology is applicable in situations where consumers that were not connected to a national/regional grid, prior to project implementation are supplied with electricity generated from the project activity. It is also applicable in situations where a fraction of consumers that were supplied with electricity from a fossil based individual energy system or fossil fuel based mini grid prior to the implementation of the project, are supplied with electricity from the project activity (e.g., moving from carbon intensive mini grid to less carbon intensive grid or mini grid).[12]	Under this VPA the purpose is to replace lamps based on fossil fuels (e.g., kerosene, gas lamps, firewood, among others) and/or individual energy systems based on fossil fuels, in several cities and districts in Rwanda, by LED (light-emitting diode) lamps included in the bPower and Flexx product only charged with a photovoltaic system and SunCulture products that provide efficient, clean, and reliable irrigation solutions, in situations where consumers did not have a reliable connection to a national or regional grid before.
Electricity consumers may include households, commercial facilities such as shops, public services/buildings, and small, medium, and micro enterprises (SMMEs). Applications may include lighting, household electrical appliances (e.g., refrigerators, TV, radio), public lighting and water pumps. At least 75 per cent (by number) of the consumers	The products of the project are distributed mainly to households with a percentage greater than 75% of the total amount distributed, to provide lighting and other energy services. The primary use case for the technology is rural and urban, off-grid households or no reliable power supply and micro-enterprises

[12] The project developers will request a permanent deviation of applicable methodologies to consider the users' grid-connected before the project activity, but with extreme instability and lack of daily power supply (i.e., less than 12 hours). This request considers a substantial number of potential users in the countries of the project boundary that need supplementary and reliable electric service. The deviation request will present according to the DEVIATION APPROVAL REQUIREMENTS AND PROCEDURES, v 1.1

<table>
<tr>
<td>connected by the project activity shall be households.</td>
<td>with basic energy needs. These customers in Rwanda often use highly polluting, carbon-intensive, fossil fuel-based products.

The products also provide different configurations for use with other types of technologies such as TV, radio, chargers, among others.</td>
</tr>
<tr>
<td>This methodology is applicable to electrification of a community of consumers which is achieved through one or more of the following technologies/measures:
(a) New construction of individual energy systems (renewable or hybrid) such as roof-top solar photovoltaic systems or hybrid energy systems.
(b) Rehabilitation (or refurbishment) of individual energy systems, mini-grid or hybrid energy system may be undertaken, if it can be demonstrated that the existing system(s) i) are not part of another CDM activity; ii) are non-operational and iii) require a substantial investment for them to be rehabilitated to or above the original electricity generation capacity. To demonstrate compliance with this condition, the project participants shall provide documentation that:
(i) The existing system has not generated electricity, or that alternative fuels (e.g., kerosene) have been used, for at least six months prior to Project</td>
<td>The technologies/products included in the project are systems that work only with renewable energy, in this case with photovoltaic energy which directly transforms sunlight into electricity through solar panels with different capacity and size, as presented below:

<table>
<tr><th>Technology</th><th>Capacity</th></tr>
<tr><td>bPower60</td><td>20W solar panel</td></tr>
<tr><td>bPower110</td><td>50W solar panel</td></tr>
<tr><td>bPower80</td><td>35W solar panel</td></tr>
<tr><td>bPower120</td><td>50W solar panel</td></tr>
<tr><td>bPower160</td><td>80W solar panel</td></tr>
<tr><td>bPower240</td><td>80W solar panel</td></tr>
<tr><td>Flexx40</td><td>12W solar panel</td></tr>
<tr><td>Flexx12</td><td>3W solar panel</td></tr>
<tr><td>ClimateSmartTM Direct</td><td>310W or 2x310W solar panel</td></tr>
<tr><td>ClimateSmartTM Battery</td><td>310W solar panel</td></tr>
</table>
</td>
</tr>
</table>

Design Document (PDD) or SSC-CPA-DD submittal; and (ii) Substantial investments are required to rehabilitate the existing systems (e.g., investments greater than half of the cost to install a new power generation system with the same electricity generation capacity). (c) Installation or extension of a mini grid that distributes electricity generated from renewable energy systems or hybrid energy systems. (d) Hybridization of existing fossil fuel powered mini grids using renewable energy systems. (e) Extension of a grid (national or regional) to supply new consumers as well as consumers currently connected to mini grid.	All the systems are given with the specific technical characteristics and properties for each one as shown in the Appendix 06 of this VPA document to give a detailed description of the technologies used in the project. The project activity focuses for this credition period on supplying the SHS bPower60, bPower110 and Flexx40. However as explained before if some commercial possibilities appear during the project implementation the other technologies devices, including the SWP will distribute to the same population target. The project activity does not consider the rehabilitation or reconstruction of existing energy systems before the project activity, such as national grid connection or mini-grid fossil fuel generation.
Project equipment shall comply with applicable international standards or comparable national, regional, or local standards/guidelines and, when relevant,	The products have all the quality standards at the international, national, regional, and local levels, such as: - All products are tested for durability under physical, environmental, and mechanical conditions according to Lighting Global Minimum Quality Standards. - All products are tested under Lighting Global Minimum Quality Standards: IEC 60598-2-4 and IEC 60598-1 SGS certification.

	- Documentation of local or national regulations for use and disposal of batteries as well as plans for compliance are available for the Bboxx products' users. - Bboxx has retail shops in Rwanda. After the sale is approved, the shop manager assigns a shop technician to go to the customer's premises for installation and signs a contract with the customer. The technician also trains the customer on how to use the product and how to get support in case of any technical issues. - Bboxx has a special interest in the end life of the SHS so that the least amount of waste is generated. Repair activities for faulty and reprocessed product are carried out in the repair center, where it is ensures that the products meet Bboxx standard, and customers have access to replacement batteries of comparable quality. Furthermore, disposal agreements between local companies and Bboxx are made to ensure that the disposal of batteries and E-waste is done in an ethical, responsible, and environmentally friendly manner, by recycling where possible. Rwanda Government has developed a comprehensive enabling legal framework, with specific policy and legislations on e-waste, including solar products in the scope.

	The estimated volume of off-grid products placed on the Rwandan market is expected to grow exponentially and these have direct and indirect product impacts on E-waste management, that is why Rwanda has determined different policies and legislations considering the environmental considerations. • E-waste policy: was developed to provide comprehensive guidance for the efficient and effective management of discarded products through appropriate legal and regulatory instruments, which promote a sustainable economic growth for the country. • World Bank Environmental and Social Safeguard Policy: helps ensure the environmental and social sustainability of investment projects. In this way, Bboxx has a special interest in the end life of the SHS so that the less amount of waste is generating. Repair activities for faulty and reprocesses product are carried out in the repair center, where it is ensures that the products meet Bboxx standard, and customers have access to replacement batteries of comparable quality. Furthermore, a disposal agreement between Bboxx Rwanda and Associated Battery Manufacturers E.A Ltd has been made to assure that the disposal of all batteries

	involved in the project activity is done in an ethical, responsible, and environmentally friendly manner by recycling where possible. The battery disposal is included as part of the after sales service that Bboxx offers to the customers. The disposal partner provides a collection certificate indicating the amount collected in kg and ensures that any of the Bboxx batteries will be sold for reuse or any other purpose. BBOXX Rwanda has a contract with Enviroserve to treat all their E-waste and end of life of all products and their parts which include Printed Circuit Boards, Casings (hard plastic) and cables. • Printed Circuit Boards are sent to Enviroserve recycling plant in Dubai. • Enviroserve has the cable stripping machine, and they sell copper locally. • Hard plastic casings are crushed - Moreover, warranty terms[13] shall be available for all the end-users in writing, in a regionally appropriate language. Warranty terms refer to all components within the

[13] See appendix 5 for more information and detailed warranty terms for lighting systems

	systems: bulbs, batteries, solar panels, water pumps, etc.
For projects involving the installation of hydro power plants with reservoirs the requirements prescribed under AMS-I. D shall be followed.	Not applicable. The proposed VPA does not involve the installation of hydro power plants.
Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.	Expected emission reductions for this VPA will be less than or equal to 60 kt CO_2 equivalent annually.
Additional GS applicability criteria/ requirements/ remarks Emission reductions associated with difference in carbon content between a non-renewable fuel and a less carbon intensive non-renewable fuel used for substitution measure shall NOT be eligible.	The project implements solar home systems included in the bPower, Flexx products and SunCulture products. All the products are charged only with photovoltaic energy. The project does not involve use of a less carbon intensive non-renewable fuel; therefore, the emission reductions are eligible.

B.3. VPA boundary

The VPA boundary will cover distributed standalone systems and the physical sites of the consumer served by the project activity will be within the Rwanda National boundary.

Table 7 . Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Traditional fuel-based lighting & power systems	CO_2	Yes	Main source of emissions
		CH_4	No	Minor source. Exclusion is conservative.
		N_2O	No	Minor source. Exclusion is conservative.
Project scenario	LED lighting & renewable power systems	CO2	No	No attributable emissions for this project
		CH4	No	No attributable emissions for this project
		N_2O	No	No attributable emissions for this project

Each customer who acquired the SHS will directly utilize the energy generated by the solar system for power purposes. The physical delineation of the project boundary of the baseline and project scenarios of the VPA are presented in the following illustrations:

- **Baseline scenario**

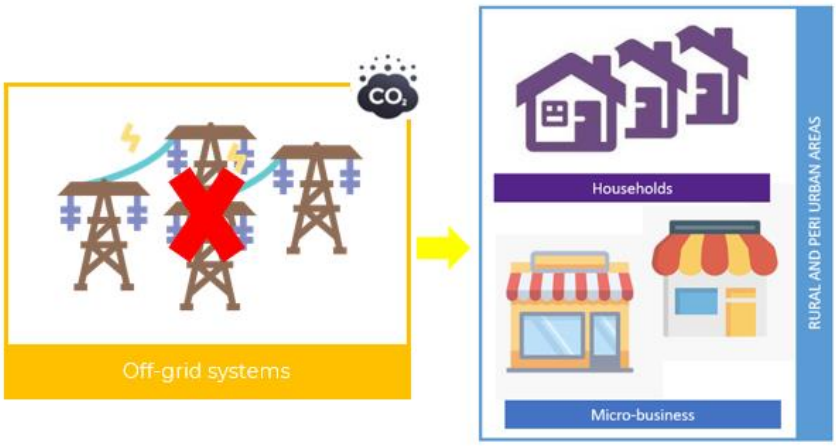

Figure 5. Baseline scenario

- **Project scenario**

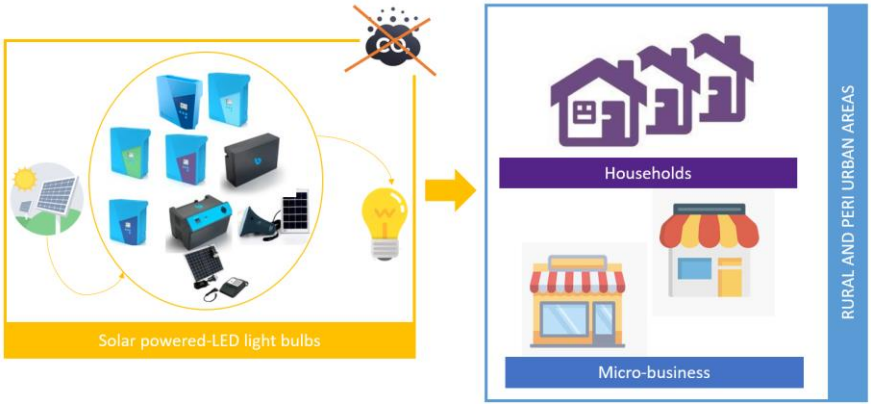

Figure 6. Project scenario

B.4. Establishment and description of baseline scenario

The baseline scenario has been established in line with the applied methodology.

The baseline scenario is no connection or lack of connection to a national/regional grid or fossil fuel power supply and instead the use of fossil fuel including kerosene in fuel-based lighting systems, which is in accordance with the scope of AMS-III.BL methodology: "displacement of fossil fuel use such as in fossil fuel-based lighting systems, stand-alone diesel generators and diesel-based mini-grids"

Background for electricity from fossil fuels in Rwanda

In terms of electrification and power access, 61% of Rwanda's population does not have access to formal electricity system (24% in urban areas and 84% in rural areas does not have grid-connection). The lighting system depends on 38 % of batteries and only the 39% from electricity system according to the Rwanda Household Survey 2019/2020)[14].

Considering the above, electricity is the main lighting source in the urban areas[15] while batteries are predominant in rural areas[16]. Firewood, candle, lantern, and solar panel are other lighting sources that are also used in Rwanda as presented in Table 8.

Table 8. Main sources of lighting in Rwanda (%)

	Electricity distributor	Oil lamp	Firewood	Candle	Lantern	Batteries	Solar panel	Other
All Rwanda	**38.9**	**0.3**	**2.2**	**3.5**	**1.3**	**38.4**	**15.4**	**0.1**
Urban	75.6	1.5	0.5	9.4	2.4	9.8	0.6	0.2
Rural	15.5	1.4	4.4	5.4	3.8	59.8	9.0	0.7

Fossil fuel-based lamps are inefficient, dangerous, and expensive, and have health and environmental drawbacks. According to the World Bank, breathing kerosene fumes is equivalent to smoke two packages of cigarettes per day, since kerosene usage is associated with soot emissions which may impair lung function and increase infectious illnesses like tuberculosis, as well as asthma and cancer in non-smokers of adult females in developing nations that still use kerosene for lighting purposes[17]. Despite the mentioned negative implications of using kerosene or others fossil fuels, still today it is a common fuel in non-electrified areas.

[14] https://www.statistics.gov.rw/publication/rwanda-household-survey-20192020#:~:text=It%20presents%20stable%20indicators%20from,all%20at%20the%20national%20level.
[15] No all urban áreas have efficient or reliable grid connection, therefore the project activity will consider some deficient electricity services (less than 12 hours of electricity service) as part of eligible final users. https://www.statistics.gov.rw/publication/rwanda-household-survey-220192020#:~:text=It%20presents%20stable%20indicators%20from,all%20at%20the%20national%20level powered LED and the emerging disposal problem, 2017

Although in terms of access to electricity in Rwanda has been improving during the last decades, the cost of electricity is among the highest in the region[18], and the size of the infrastructure is insufficient to meet the demand (connected households experience more than 12 hours without electricity) in addition to the ageing infrastructure, inefficiencies, exacerbated by high technical and power losses require urgent and timely intervention to achieve the avowed energy targets[19].

According to AMS-III.BL methodology, the baseline scenario is determined by the type of costumer, as presented below

(a) Type I – consumers who were not connected to a national/regional grid or have an absence of the service for more than 12 hour per day[20], or a mini-grid prior to the project implementation and who consume less than 500 kWh per year[21].
(b) Type II – includes two separate consumer groups (i) consumers that were previously supplied by a stand-alone fossil fuel power system such as diesel generators who consume less than 500 kWh, and (ii) consumers who use more than 500 kWh per year and had no supply prior to the project or were previously supplied by a stand-alone fossil fuel power system such as diesel generators.
(c) Type III – consumers who were connected to a mini-grid system prior to the project activity.
(d) Type IV consumer category includes water pumping and public lighting consumers, regardless of their previous supply of electricity

Table 9. Type of costumers and corresponding baseline scenario

Type of costumer	Baseline scenario
Type I	A combination of fuel based lighting and stand-alone fossil fuel generators
Type II	Stand-alone fossil fuel generators

[18] https://www.worldbank.org/en/news/feature/2019/07/01/rwanda-economic-update-making-electricity-accessible-and-affordable
[19] https://projects.worldbank.org/en/projects-operations/project-detail/P150634?lang=en
[20] The lack of the service corresponds to the methodology deviation requested as part of project activity in order to consider users that need to resolve the access to the reliable electricity services.
[21] Project developer has relevant evidence that there are a relevant portion of electricity system users that need a complementary energy supply due to the lack of the service from the public service.

Type III	Generation from existing mini grid
Type IV	Stand-alone fossil fuel generation

In the case of Rwanda, given the main sources of lighting in the baseline scenario, bPower users are considered as Type I customers.

B.5. Demonstration of additionality

Specify the methodology, activity requirement or product requirement that establishes deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	VPA complies with the additionality criteria: **SHS for lighting services**. Tool 21: Demonstration of additionality of small-scale project activities V13.1, automatic additionality using provisions of small-scales or microscale additionality tool (Figure 1 – Appendix 1 of PoADD).
Describe how the proposed VPA meets the criteria for deemed additionality.	See below description

The demonstration of additionality is conducted as indicated in each of the methodologies.

Methodology AMS-III.BL "Integrated methodology for electrification of communities" Version 1.0,

The LED lamps and renewable power system provided with the Bboxx SHS is deemed additional if the solar home system technology is equal or less that 5% of the technologies providing similar services in the region.

According to the Rwanda Household Survey 2019/2020 (See Table 12 above), similar technologies in the off-grid areas (mainly rural sectors) is higher than 5%. At the level of the Country boundary, similar solar systems account for 15.4% of supply systems; therefore, the automatic rules are not applicable.

Seeing that the emission reduction is higher than the 20 KtCO2 per year, the additionality is demonstrated following the applicability of the Tool Demonstration of additionality of small-scale project activities (TOOL 21).

According to the provisions of the Tool21, if the CPA at the unit level is less than microscale thresholds, the following conditions of Tool19 shall be checked:

The project activity solar panels have an installed capacity of 12W in the cases of Flexx40 and the maximum of 310 W in the case of solar water pumps, each of which is less than 5 MW. The emission reduction per unit will be between 0.07 to 0.25 tCO2 per/year. Therefore, the CDM microscale threshold complies.

Table 10. CDM microscale conditions

Does it meet one of the below conditions defined under Tool 19	
i) Is it implemented in an LDC/SIDS or a SUZ?	Yes, Rwanda is an LDC
ii) Does it involve technologies/measures included under para 13 (b) and end users are Households/communities/SMEs?	Yes, the project involves solar home systems for end users that are households and SMEs.
iii) Does it comprise of specific grid connected renewable energy technologies recommended by the host country and approved by the Board?	Not applicable
iv) Is it implemented in an off-grid area (=<12 hrs/day grid availability) supplying to households/communities?	Yes, the target population are off-grid activities(=<12 hrs/day grid availability) for residential and non-residential activities.

B.5.1. Prior Consideration

The retroactive projects need to submit to GS a document for the Preliminary review within one year of the project start date to meet prior consideration.

The start date was 01/04/2021, and submission of the initial project documentation to GS was on 25/03/2022. Therefore, the project meets the prior consideration requirements[22].

B.5.2. Ongoing Financial Need

N/A. Ongoing Financial Need is required only at the time of renewal of crediting period.

B.6. Sustainable Development Goals (SDG) outcomes

Relevant Target/Indicator for each of the three SDGs

Sustainable Development Goals Targeted	Most relevant SDG Target	SDG Impact Indicator (Proposed or SDG Indicator)
7. Affordable clean energy	7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services	Number of beneficiaries: users with access to SHS

[22] All evidence about the prior consideration is available for the OVV for its validation.

8. Decent work and economic growth	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Number of direct and indirect employments generated by the project activity, disaggregated by gender, age, and disability
13. Climate Action (mandatory)	13.2 Integrate climate change measures into national policies, strategies, and planning	Amount of GHGs emissions avoided (tonCO_2e/year)

B.6.1. Explanation of methodological choices/approaches for estimating the SDG Impact

- **SDG 13 (Climate action)**

Impact on climate action is calculated by applying the CDM methodology AMS-III.BL Version 1.0.

Project boundary

All the geographical boundaries are described in section A.2 and the project boundary is defined in section B.3. The project boundary includes the project lamps as well as the charging systems and the physical and geographical sites where the project systems are sold and used.

Baseline

The baseline scenario for the project activity is the continuous use of fuel-based lamps such as kerosene or gas, and stand-alone fuel generators among others that have high emission combustion fuels, before using solar home systems, with consumers that were not connected or the lack of connection to a national/regional grid or mini-grid prior to project implementation and consuming less than 500 kWh per year.

As described in the baseline scenario, the methodology requires the type of user of the project to be identified to determine the baseline emissions calculation. In the case of this VPA, bPower costumers are considered as Type I clients and it is calculated as shown below, using equation (3) of this methodology:

$$BE_{T1,y} = \sum_{x=1}^{N} (EC_{T1,x,y} \times EF_{CO2,T1})$$

Where:

$BE_{T1,y}$ = Baseline emission from Type I consumers in year y (tCO2)
$EC_{T1,x,y}$ = Annual electricity consumption of Type I consumer x in year y (MWh)
$EF_{CO2,T1}$ = - If $EC_{T1,x,y}$ is equal to or less than 0.055 MWh, then use a default value of 6.8 (tCO2/MWh)
- If $EC_{T1,x,y}$ is less than or equal to 0.250 MWh but greater than 0.055 MWh, then:

- For the portion up to and including 0.055 MWh, use a default value of 6.8 (tCO2/MWh)
- For the portion greater than 0.055 MWh, use a default value of 1.3 (tCO2/MWh)

- If $EC_{T1,x,y}$ y is greater than 0.250 MWh but less than or equal to 0.500 MWh, then:

- For the portion up to and including 0.055 MWh use a default value of 6.8 (tCO2/MWh)
- For the portion greater than 0.055 MWh and less than 0.25 MWh/y use a default value of 1.3 (tCO2/MWh); and
- For the portion greater than 0.250 MWh use a default value of 1.0 (tCO2/MWh)

- If $EC_{T1,x,y}$ is greater than 0.500 MWh then use a default value of 1.0 (tCO2/MWh) for the entire portion (i.e., default values of 1.3 (tCO2/MWh) or 6.8 (tCO2/MWh) are not eligible for any of the portions)[23]

N_Y = Number of Type I consumers in year y
x = Type I consumer (x = 1, 2, 3, …)

Project

All project lamps are included in the Solar Home Systems, thus there is only a single charging method, renewable energy, and therefore does not produce any project emissions.

$$PEy = 0$$

Emission reduction

[23] Type I consumers are defined as having less than 500 kWh/year consumption at the start of the project activity. In the event that average electricity consumption of Type-I consumers monitored during the crediting period exceeds 500 kWh/year, they should be reclassified as Type II consumers at the renewable of the crediting period.

The overall GHG reductions achieved by the project activity in year y are calculated as follows:

$$ERy = BEy - PEy$$

Where:

ERy = Emission reductions in year y (t CO2e)

The emission reductions shall be considered from the date of distribution of the project lamp to end-users.

- **SDG 7 (Affordable clean energy)**

Baseline

Before the project activity, in the baseline scenario, customers used fuel-based inefficient lighting and/ or stand-alone fossil fuel generators, which were expensive and polluting.

Project

The VPA involves the distribution and implementation of clean energy solutions such as solar powered-LED lightbulbs (as part of Solar Home Systems) and solar water pumps.

The methodology for monitoring these results will be by estimating the number of beneficiaries in active customer households.

Benefit

The benefit is related to the proportion of population with primary reliance on clean fuels and technology and is measured in number of beneficiaries, meaning the number of individuals with access to SHS.

Indicator description

The number of SHS is taken from the sales and installation records and multiplied by the usage rate, giving the number of active customers

$$N_{a,y} = N_{t,y} * U_y * S_y$$

Where:

$N_{a,y}$ = Number of beneficiaries in year y
$N_{t,y}$ = Project SHS distributed in year y
U_y = Usage rate
S_y = Household size

- **SDG 8 (Decent work and economic growth)**

Baseline

It is assumed that before the start of the project, in the baseline scenario, a specific number of people was unemployed, or dedicate to other activities different from the project activity.

Project

Bboxx provides full, decent, and productive employment to women, men, and young people. Direct and indirect jobs created by Bboxx are given to the local population aiming to improve the economic situation and therefore contribute to the economic growth.

Benefit

The benefit is measures as the number of new direct and indirect employments generated by the project activity, disaggregated by gender, age and disability.

Indicator description

The indicator will be registered and monitored in every monitoring period, as the number of local direct and indirect employments on record by the Bboxx regional partner organization and other local entities involved in project implementation and compared to the number of jobs of the baseline scenario.

The employments will be disaggregated as follows:

E_T = Number of direct and indirect employments generated by the project activity (total)
E_{ec} = Total number of employees by employment contract (permanent and temporary), by gender
E_{et} = Total number of employees by employment type (full-time and part-time), by gender

B.6.2. Data and parameters fixed ex ante

For solar lighting products from AMS-III.BL methodology:

SDG13

Data/parameter	EF_{CO2}
Unit	tCO2e/MWh
Description	Baseline emission factor from Type I consumers in year y
Source of data	AMS-III.BL Version 1.0 methodology

Value(s) applied	If $EC_{T1,x,y}$ is equal to or less than 0.055 MWh, then use a default value of 6.8 (tCO_2/MWh) If $EC_{T1,x,y}$ is less than or equal to 0.250 MWh but greater than 0.055 MWh, then: o - For the portion up to and including 0.055 MWh, use a default value of 6.8 (tCO_2/MWh); o - For the portion greater than 0.055 MWh, use a default value of 1.3 (tCO_2/MWh); If $EC_{T1,x,y}$ is greater than 0.250 MWh but less than or equal to 0.500 MWh, then: - For the portion up to and including 0.055 MWh use a default value of 6.8 (tCO_2/MWh); - For the portion greater than 0.055 MWh and less than 0.25 MWh/y use a default value of 1.3 (tCO_2/MWh); and - For the portion greater than 0.250 MWh use a default value of 1.0 (tCO_2/MWh); If $EC_{T1M,j,y}$ is greater than 0.500 MWh then use a default value of 1.0 (tCO_2/MWh) for the entire portion (i.e. default values of 1.3 (tCO_2/MWh) or 6.8 (tCO_2/MWh) are not eligible for any of the portions)
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

B.6.3. Ex ante estimation of SDG Impact

SDG 13

Er,y SHS:

Table 11. Data used to calculate emission reduction for SHS in 2021

Parameter	Description	Values
$EC\_{T1,x,y}$	Annual electricity consumption of Type I consumer x in year y – bPower20 (MWh)	0.014

	Annual electricity consumption of Type I consumer x in year y– bPower50 (MWh)	0.037
$EF\_{CO2,T1}$	Emission factor (tCO2/MWh); <0.055 MWh bPower 20, 50	6.8
$BE_{T1,y}=\Sigma EC_{T1,x,y} \times EF_{CO2,T1}$		
$BE_{T1,y}$	Baseline emission from Type I consumers in year y (tCO2/lamp)	649.21
PEy	Project emissions in year y	0
$ERy=\Sigma N \times BE_{T1,y}-PE_y$		
ERy	Emission reductions in year y (tCO2e)	649.21

Table 12. Emission reductions for the project in 2021 and annual average

Climate action	Description	Values
Er,y SHS 2021	CO2 emission reductions for the current monitoring period	649.21
Er,y SHS 2022-2026	Average CO2 emission reductions for the current monitoring period	17,384

SDG 7

Table 13. Estimated Annual Average for SDG 7 for 2021

Affordable and clean energy	Description	Values
$N_{t,y}$	Project SHS	5,843
U_y	Usage rate	80%
S_y	Household size	4.3[24]
$N_{a,y} = N_{t,y} * U_y * S_y$		
$N_{a,y}$	Project SHS and active	**20,100**

[24] https://www.dhsprogram.com/pubs/pdf/SR229/SR229.pdf

SDG 8

Table 14. Estimated Annual Average for SDG 8

Decent work and economic growth	Description	Values
E_T	Number of direct and indirect employments generated by the project activity (total)	490
E_{ec}	Total number of employees by employment contract (permanent and temporary), by gender	Permanent: 181 Temporary (agent+fixed term employee): 309
E_{et}	Total number of employees by employment type (full-time and part-time, by gender	Full-time: 490 Part-time: 0

B.6.4. Summary of ex ante estimates of each SDG outcome

SDG 13

Table 15 Summary of ex ante estimates (tCO2)

Year	Baseline estimate	Project estimate	Net benefit
Year 1 (1/04/2021-31/12/2021)	649	0	649
Year 2 (2022)	3,185	0	3,185
Year 3 (2023)	10,337	0	10,337
Year 4 (2024)	18,105	0	18,105
Year 5 /2025)	25,791	0	25,791
Year 6 (1/01/2026-31/03/2026)	29,461	0	29,461

Total	**87,569**	**0**	**87,569**
Total number of crediting years	**5**		
Annual average over the crediting period	14,595	0	14,595

SDG 7

Table 16 Summary of ex ante estimates (Number Beneficiaries)

Year	Baseline estimate	Project estimate	Net benefit
Year 1 (1/04/2021-31/12/2021)	0	20,100	20,100
Year 2 (2022)	0	85,001	85,001
Year 3 (2023)	0	293,181	293,181
Year 4 (2024)	0	519,202	519,202
Year 5 /2025)	0	739,734	739,734
Year 6 (1/01/2026-31/03/2026)	0	795,698	795,698
Total	**0**	**2,452,916**	**2,452,916**
Total number of crediting years	**5**		
Annual average over the crediting period	0	408,819	408,819

SDG 8

Table 17 Summary of ex ante estimates

Year	Baseline estimate	Project estimate	Net benefit
Year 1 (1/04/2021-31/12/2021)	0	490	490
Year 2 (2022)	0	490*	490*
Year 3 (2023)	0	490*	490*
Year 4 (2024)	0	490*	490*
Year 5 /2025)	0	490*	490*
Year 6 (1/01/2026-31/03/2026)	0	490*	490*

Total number of crediting years	**5**		
Annual average over the crediting period	0	490	490

**For these years, the information provided for year 1 (2021) of the total direct and indirect jobs created by the project activity is included; this is a parameter that will be monitored for each year to provide real data for each one.

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

SDG 13

Data / Parameter	Number of customers
Unit	Number of SHS (Type I)
Description	Number of Solar Home Systems distributed to end users
Source of data	Pulse management platform Customers data base (Flexx products)
Value(s) applied	12,758
Measurement methods and procedures	The data for bPower units 20 & 50 is recorded in a web management platform (Pulse). Among the data is a single identification number per device, how many have been sold and installed, specific location and personal data of the end user. The Flexx products (non-IOT products) will be connected to the Pulse platform for the first year of use and only the on/off time of the units will be monitored. A data of the total users of the units in the sales records (defined as customers with purchase of Flexx products) will be checked to determine the users of the products during this first year. After the first year of delivery and for all years of monitoring the mitigation project, the usage rate surveys (See parameters *Uy*) will be applied to the Flexx units to define the total active users. This survey will determine the active users of the products and be able to

	calculate the emission reductions in a correct and conservative way.
Monitoring frequency	Annual
QA/QC procedures	Sales database can be cross-checked against product serial numbers
Purpose of data	Calculation of annual emission reductions
Additional comment	The value is only for April 2021 – December 2021

Data / Parameter	$EC_{T1,x,y}$
Unit	MWh
Description	Electricity consumption at Type I
Source of data	Usable daily energy of each SHS
Value(s) applied	bPower20 (Renamed bPower60) = 0.014 MWh bPower50 (Renamed bPower110) = 0.037 MWh Flexx12 has not been included in this monitoring period assumption.
Measurement methods and procedures	Electricity meters or pre-payment meters. For electricity meters, the difference between the meter reading at the end of the monitoring period and the start of the period. It will be demonstrated by the historical and sales records in the Pulse platform. An alternative way to measure the parameter is with the manufacturing information of each of the systems considering the daily energy use that can be generated in the different configurations of Solar Home Systems respectively. Flexx product measurement: Considering that Flexx products will be delivered with one year of service included (connected to the Pulse platform only to see on/off), and will then be fully available to the customer, each user has a record in the sales log data where the number of users can be determined. To be

	certain of the monitored amount of electricity consumed during the years within the credit period, the methodology guidelines will be followed as described below: The monitoring methodology mentioned in option D, section 6.4 will be used: Estimated consumption: This option can be used by type I consumers (Flexx Users), who, within the framework of the project activity, are served by individual energy systems using only renewable energy. The consumption is calculated as the installed capacity of the project renewable energy generation systems multiplied by an annual average value for availability/capacity factor. For this project and following the principle of conservatism, the factor taken is option D1: Assume a conservative default value of twelve per cent (12 per cent) for the annual average value for availability. It means the total capacity of the panel in the products offered will be considered for the number of days per year for this factor mentioned above. In the case of Flexx 40 (Branded 12) the solar panel capacity of 12Wp the technology will deliver (0,012 x 8760x0,12) =12,6 KWh/ unit installed/year
Monitoring frequency	Continuous, with annual reporting
QA/QC procedures	Only users not connected or lack of services to the network will be considered as required by the methodology
Purpose of data	Calculation of baseline emission reductions
Additional comment	Some additional devices could be included during project activity implementation according the commercial and market opportunities. The technologies bPower80, 120, 160 and 240, Flexx12, and solar water pumps could be included. The value applied above have been assumed from the install units during the period April 2021 – December 2021.

Data / Parameter	Customers not connected to the grid

Unit	%
Description	Proportion of customers not connected to the national/regional grid
Source of data	Pulse platform
Measurement methods and procedures	45.80
Monitoring frequency	Annually
QA/QC procedures	Type of user is checked in the platform A methodological deviation has been requested as part of the project activity for lack of service in Rwanda to consider users who need to resolve access to reliable electricity services. This deviation allows to consider users who were not connected to a national/regional network or who have an absence of service for more than 12 hours per day.
Purpose of data	Calculation of baseline emission reductions
Additional comment	For 2021 the value is taken from Rwanda Household Survey 2019/2020. This value its applied for 2021 and 2022 years of the crediting period in the ex-ante calculation.

SDG 7

Data / Parameter	$N_{t,y}$
Unit	Number of project devices
Description	Number of projects SHS distributed
Source of data	Data base
Value(s) applied	SHS bPower60 & 110: 12,758
Measurement methods and procedures	The Sales Record of the Project will be updated at least annually.
Monitoring frequency	Annual
QA/QC procedures	Supporting evidence of sales record from VPA Implementer, Bboxx
Purpose of data	Calculation of SDG 7 indicator
Additional comment	Period from April 2021 to December 2021

Data / Parameter	U_y
Unit	Percentage
Description	Usage rate - Active end-users' proportion that use the project devices
Source of data	Bboxx Pulse Monitoring survey (Sampling Plan)
Value(s) applied	80%
Measurement methods and procedures	Real time measurement of device usage
Monitoring frequency	Annual
QA/QC procedures	Annual checks that individual systems are still working, carried out with a statistically significant sample of consumers. It will be demonstrated by the historical records in the Pulse platform and a monitoring survey divided by two groups (IOT and non-IOT products) to ensure the use of active users who are not in Pulse.
Purpose of data	Calculation of SDG 7
Additional comment	Please refer to sampling plan section for more information of the monitoring survey

SDG 8

Data / Parameter	E_T, E_{ec}, E_{et}
Unit	Employments
Description	Number of direct and indirect employments generated by the project activity desegregated by: • Total number • Employees by employment contract, by gender • Employees by employment type, by gender
Source of data	Bbbox Human Resources database
Value(s) applied	E_T = 490 E_{ec} = Permanent: 181, Temporary (agent + fixed term): 309 E_{et} = Full-time: 490, Part-time: 0
Measurement methods and procedures	The database should be updated annually

Monitoring frequency	Annual
QA/QC procedures	NA
Purpose of data	Calculation of SDG 8
Additional comment	NA

B.7.2. Sampling plan

When sampling or surveys are utilized to define parameters for SHS VPA, the sampling and surveys must be undertaken with reference values from other relevant data sources in mind, and project-specific survey and sampling results are expected to correlate with results from other relevant data sources.

The monitoring survey to demonstrate the active users that have the distributed technology will be conducted according to "Guidelines for sampling and surveys for CDM project activities and programme of activities" and its standard given by CDM for distributed technology development. Since the population under study is homogenous, considering that all project activity end-users or customers have the same or similar conditions, a simple random sampling method will be employed across the VPA when drawing up a sample.

A survey should be conducted for each technology group, one for IOT products and one for non-IOT products which are not monitored after the first contract year by the Pulse platform and this survey is mandatory. Therefore, a project survey could be useful to monitor the usage rate in case the Pulse platform does not provide this information.

Sample	Technology
1	IOT products (bPower devices and solar water pumps) (If required)
2	Non-IOT products (Flexx devices) (Mandatory)

As mentioned above, the population to be studied presents similar conditions and can be represented as homogeneous. In this case, simple random sampling will be used, which is a subset of a population (e.g., villages, individuals, buildings, pieces of equipment) chosen at random, so that each element (or unit) of the population has the

same probability of being selected. This type of sample requires 90% confidence and 10% precision (90/10), which will be contemplated in the sample size calculations performed in the relevant monitoring period.

The number of users in Rwanda that will need to be sampled for a 90/10 confidence/precision will be determined, according to the documents mentioned above. The random sample group is reselected for every monitoring period to ensure the selection remains random.

B.7.3. Other elements of monitoring plan

Sales Records and Project Database

The Sales and Installation Record will be stored electronically and any paper records, where applicable, will be filled out by the shop technician.

The following data will be collected:

- The date of installation
- The location of the energy solutions beneficiaries
- Unique SHS identification
- The total number of SHS installed
- Address and telephone number of all users
- Whether the SHS will be used for commercial or domestic purposes

The Project Database is derived from the Installation Record. It is divided by different project scenarios if these were to occur because of the monitoring surveys. Technologies aged beyond their useful lifetime are removed from the Project Database and no longer credited.

Sustainable Development Goal (SDGs)

Some quantitative and qualitative information of end-users shall be collected to disclosure the contribution of the project activity to Sustainable Development Goals. Information about the amount of fuel consumption and fuel sources, or air quality condition and public services conditions before the installation should be collected during the project implementation.

SECTION C. DURATION AND CREDITING PERIOD

C.1. Duration of project

C.1.1. Start date of VPA

The start date of the project is 01/04/2021 defined as the date when the CME sold the first SHS units in Rwanda under this Real Case VPA. The definition of the project start date follows section 4.1.40 of the GS4GG Principles & Requirements.

C.1.2. Expected operational lifetime of VPA

The project is expected to have an operational lifetime of 5 years, renewable

C.2. Crediting period of project

C.2.1. Start date of crediting period

01/04/2021

C.2.2. Total length of crediting period

5 years twice renewable

SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

D.1. Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in Appendix 1, ongoing monitoring is summarized below.

Principles	Mitigation Measures added to the Monitoring Plan
Hazardous and Non-hazardous Waste	Monitoring of the disposal certificates of the batteries and E-waste

D.2. Assessment that project complies with GS4GG Gender Sensitive requirements

Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy?	The VPA meets the mandatory Gender Sensitive requirements by complying with the Gender Safeguarding Principles and Requirements. Both women and men will benefit from the project activities, no group is excluded from participating in the project activities or use of the SHS. The project will decrease the workload of women in collecting the fuel source for lighting purposes and other energy purposes, therefore allowing more time to engage in other activities. Moreover, both men and women are encouraged to attend to the Stakeholder Consultation and express their opinions.
Question 2 - Explain how the project aligns with existing country policies, strategies, and best practices	Regarding official government documentation on Gender Policy, Rwanda has the Strategic Plan 2017-2019 by the Gender Monitoring Office[25] National Gender and Equality, the National Gender

[25] http://gmo.gov.rw/fileadmin/user_upload/strategic/GMO%20Strategic%20Plan%202017-2022.pdf

	Policy[26] and the Gender Equality Strategy[27] The project activity implementation will be aligned to these policy documents, so the best gender practices are considered and applied.
Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements?	An Expert is not required for the Gender Safeguarding Principles & Requirements
Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	Based on the answers on questions 1 and 2, there is no need of an expert to assist with Gender issues at the Stakeholder Consultation

[26] https://evaw-global-database.unwomen.org/fr/countries/africa/rwanda/2010/national-gender-policy--2010-
[27] https://www.undp.org/content/dam/rwanda/docs/demgov/Gender%20Equality%20Strategy.pdf

SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

The below is a summary of the 2 step GS4GG Consultation for monitoring purposes. Please refer to the separate Stakeholder Consultation Report for a complete report on the initial consultation and stakeholder feedback round.

E.1. Summary of stakeholder mitigation measures

The physical meeting in Rwanda took place on 13/07/2022. Bboxx developed a presentation entitled "Distributed Emission Reductions by Bboxx Energy Solutions (Solar Home System)", which presents all the general and specific topics that participants in the consultation should be aware of and have knowledge of so that they can subsequently give their opinions, suggestions, questions or any comments about technical concepts or implementation of the clean energy distribution mitigation project in the identified country.

All comments are received and considered in the development of the project. The comments that were received during the physical meeting didn’t involve alterations in the design of the project. The comments received discuss the need to request the exclusion of credits as part of Rwanda's NDC. Bboxx identifies this for non-government subsidized units, reports, and documents this according to all requirements for the time of project validation and verification.

All stakeholders are invited to the feedback round of comments in the next phase, which will be described with their respective evidence and methods used to obtain comments to assist in the development and design of the project. The project information will be available through the agreed means accessible to the public, including details on the procedure and detailed contact details for the submission of additional comments. On the official Bboxx website at the following link: https://www.bboxx.com/carbon-project-consultation/, there is a tab called "Carbon Project Consultation" for Rwanda where the presentation of SHS is available for comments where they are addressed one by one to take them into account in the development and design of the project.

E.2. Final continuous input / grievance mechanism

Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	Bboxx Ltd, England and Wales at Fifth Floor, 5 New Street Square, London, EC4A 3BF, United Kingdom Telephone access +44 (0)2089 873 195 +44 (0)7933 445 669 Email contact info@bboxx.co.uk n.suzuki@bboxx.co.uk
GS Contact (mandatory)	help@goldstandard.org
Other	Not applicable

SECTION F. Eligibility and inclusion criteria for VPAs inclusion

The below table shall be completed for all VPAs.

The CME shall provide clear description on how eligibility criteria set at real case VPAs are complied with for each real case and regular VPAs submitted for inclusion.

The CME shall not change the eligibility criteria and required condition set at real case VPAs. At the time of inclusion of regular VPAs, the CME shall only describe how the regular VPAs comply with the eligibility criterion.

No.	Eligibility Criterion	Description/ Required condition	Description of the VPA in relation to the criteria, Means of Verification and Supporting evidence for inclusion
1	Location of the VPA	The geographical boundary of the VPA is within one of the countries included in the PoA	The VPA is located in Rwanda (section A.2), which is within the countries included in the geographical boundary of the PoA
2	No double counting of impacts	A unique numbering or identification system for the SHS and gas stoves in each VPA will be applied in addition to the CME logo. This shall ensure no double counting of SHS, SWP or stoves within the PoA and ensure that the systems can be identified as belonging to the PoA and to a specific customer.	The project activity devices have been distributed (bPower 60, 110, 80, 120, 160 and 240, Flexx10 and 40, and solar water pumps) under this VPA have a unique customer number in order to ensure no double counting of devices within the project activity. Customer information and technical specifications are linked to each serial number and available in the project database.
3	No double counting of VPA	The VPA, and any of its devices is exclusively bound to the PoA and not registered as an individual project/ or as a part of any other PoA under other carbon standards, ensuring that the VPA has the full title over the	The CME checked that the project activity is neither registered as an individual project or as part of another PoA in Gold Standard or any other standard.

		emission reductions generated by the VPA	
4	Host Country Requirements:	The VPA shall be in compliance with applicable Host Country's legal, environmental, ecological, and social regulations.	The VPA complies with Rwanda's related legal, environmental, and social regulations. As it can be checked in Table 10 below, the implementation and operation of Bboxx SHS technology complies with the Rwanda Energy Policy, Electricity Law, and Ministry of Infrastructure product regulation. The off-grid initiatives have specific recognition as part of sustainable energy solutions for households, commerce, and industrial activities
5	Technology	Each VPA will involve the distribution of solar home systems (SHS) including LED lamps, solar water pumps (SWP) and/or gas stoves (both described in section A.3) according to the geographical user's distribution	The VPA involve the distribution of the technology established in section A.3 of this VPA- DD, specifically models bPower60, bPower110, bPower80, bPower120, bPower160, bPower240, Flexx40 and Flexx10 for the SHS, which include LI0201 and LI0141 light bulbs, and the distribution of solar water pumps. Other SHS models could be distributed in Rwanda according to available possibilities during the project implementation
6	Start date	The start date will be specified in each VPA. For retroactive VPAs the start date should be maximum one year before the submission date to the Preliminary Review	The start date of the VPA is 01/04/2021.
7	Applicability of methodologies	Each VPA will comply with the applicability criteria of	The VPA is in accordance with the applied methodologies as shown in section B.2 of this VPA-DD

		the applied methodologies (AMS-III.BL, Version 1.0 and methodology for metered & measured energy cooking devices, Version 1.0)	
8	Additionality	All VPAs to be included under the PoA will be in compliance with the additionality criteria presented in section C of this PoA	The additionality is demonstrated following the applicable methodologies' conditions for SHS. See section B.5 of this document
9	Non-diversion of ODA	The VPAs will not receive ODA	A declaration confirming that there is no diversion of ODA is attached with the VPA-DD. The corresponding statement is made in section A.5 of this VPA-DD
10	Target group	Each VPA will involve the distribution of the specified energy systems to residential and non-residential (commercial, industrial, etc.) end-users, located in rural and urban areas within the geographical boundary currently using fossil fuels or other non-renewable and unreliable energy methods for lighting and/or cooking and not connected to the electricity grid.	The target group of the VPA correspond to households and commercial users that are located in the rural and urban areas of Rwanda that previously used fossil-fuel based lighting devices or not renewable energy system. The products of the project are distributed mainly to households with a percentage greater than 75% of the total amount distributed, to provide lighting and other energy services According to the Rwanda Household Survey 2019/2020 the target population is • 2,184,000 rural households • 524,000 urban households
11	Sampling	Sampling should be in line with the applied methodologies according to the standard of sampling of surveys for program activities	The sampling of the VPA is in line with the applied methodologies and specified in section B.7.2. of this VPA-DD

12	VPA scale	The project activity can be categorized as small-scale activity or micro-scale activity per the CDM methodology requirements and in accordance with the GS4GG. Emission reductions achieved by each one of the activities considered under the PoA are limited to a maximum of 60,000 tonnes of CO2e in case of being small scale and 10,000 tonnes of CO2e in case of being micro scale, in any year of their crediting period	According to the level of project implementation in Rwanda, the VPA has the category of small scale, for Solar Home Systems (bPower and Flexx technologies) and solar water pumps.
13	SDG assessment	It is expected to have positive outcomes for at least 3 SDGs, which will be assessed using the Gold Standard SDG tool	The outcomes for SDG assessment for this VPA are described in section B.6 of this VPA-DD
14	Voluntary activity	Each project activity corresponds to a voluntary action; therefore, it is not required by law	Activities developed under this VPA are totally voluntary and not required by law.

Table 18 Host County Legal Framework

National Policies & Regulation	Rwanda SHS operation
Rwanda Energy Policy[28] *"To ensure all residents and industries can access energy products and services that are sufficient, reliable, affordable, and sustainable."* *Core objective: enhance access to modern, sustainable energy services for all Rwandans*	The Solar Home System has been recognized as a viable, sustainable technology allowing households low-cost access and effective energy solutions. Moreover, electricity increases the quality of life, reduces poverty, and promotes entrepreneurship in female-headed households, as can verified in the

28 https://rura.rw/fileadmin/Documents/Energy/RegulationsGuidelines/Rwanda_Energy_Policy.pdf

<table>
<tr><td>Strategic Plan: Increase household access to off-grid electricity.</td><td>National Energy Policy declarations.
In Rwanda, energy is a critical productive sector that can catalyze broader economic growth and contribute significantly to facilitating the achievement of the country’s socio-economic transformation agenda</td></tr>
<tr><td>Electricity Law (2011)
The Rwanda Utilities Regulatory Authority (RURA)[29]
Article 6: Electricity operations not requiring a license
Operation of a project meant for electricity auto-production for less than fifty kilowatts (50 kW) shall not require any license issued by the Authority.</td><td>All Bboxx SHS technology solutions are less than 50kW of capacity; therefore, they do not require a previous license or specific process to install, commercialize, or operate in Rwanda.
The establishment of self-generation power plants for industrial or household purposes is explicitly allowed for under the Electricity law.</td></tr>
<tr><td>Ministerial Guidelines on Minimum Standards Requirements for Solar Home System[30]
<table>
<tr><th>No</th><th>Equipment</th><th>Technical specifications</th></tr>
<tr><td>1</td><td colspan="2">Lamp</td></tr>
<tr><td>1.1</td><td>Type</td><td>Light Emitting Diode (LED)</td></tr>
<tr><td>1.2</td><td>Number of lumens per lamp</td><td>> 120 lm</td></tr>
<tr><td>1.3</td><td>Power consumption</td><td>2 W</td></tr>
<tr><td>1.4</td><td>Life time</td><td>>20,000 hours</td></tr>
<tr><td>2</td><td colspan="2">Solar PV Panel</td></tr>
<tr><td>2.1</td><td>Cell type</td><td>Crystalline or Poly Si</td></tr>
<tr><td></td><td>System Voltage</td><td>12V, 24 V, 48 V</td></tr>
<tr><td>2.2</td><td>Minimum Watt Peak</td><td>12 Wp</td></tr>
<tr><td>3</td><td colspan="2">Battery</td></tr>
<tr><td>3.1</td><td>Type</td><td>Deep cycle, maintenance free</td></tr>
<tr><td>3.3</td><td>Storage Capacity</td><td>60 Wh or 5Ah / 12 V</td></tr>
<tr><td>3.4</td><td>Depth of Discharge</td><td>80%</td></tr>
</table></td><td>As can be checked in Section A.3 in the document, all Bboxx technologies and their manufacturing configuration comply with technical specifications established by the Rwanda Ministry of Infrastructure.
The guidelines aim to establish the minimum requirements of SHS to ensure quality and reliable service to the beneficiaries.</td></tr>
</table>

[29] https://www.reg.rw/fileadmin/user_upload/Electricity_Licensing_Regulations.pdf

[30] https://www.reg.rw/fileadmin/user_upload/MINSITERIAL_GUIDELINES_On_Minimum_Standards_Requirements_for_Solar_Home_Systems-August_2018.pdf

APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

Complete the Assessment below and copy all Mitigation Measures for each Principle into SECTION D above. Please refer to the instructions in the Guide to Completing this Form below.

Assessment Questions/ Requirements	Justification of Relevance (Yes/potentially/no)	How Project will achieve Requirements through design, management or risk mitigation.	Mitigation Measures added to the Monitoring Plan (if required)
Principle 1. Human Rights			
1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights	No	The project developers are aware of the importance of respecting human rights and therefore are not complicit in violence or human right abuses as defined in the Universal Declaration of Human Rights[31]	N/A

[31] http://www.claiminghumanrights.org/rwanda.html?&L=...i

2. The Project shall not discriminate with regards to participation and inclusion	No	The project will not discriminate with regards to participation as the SHS can be purchased by credit and used by anyone who is located within the geographical boundaries of the VPA	N/A
Principle 2. Gender Equality			
1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women	No	The implementation of the project activity does not contribute to adverse impacts on gender equality. Rwanda has ratified ILO 100 convention (Equal Remuneration) and 111 conventions (Discrimination-Employment and Occupation)[32]. The project is, by inviting women's organization and youth groups to the LSC, contributing to Rwanda's Gender Strategy ("Gender Accountability for Sustainable Development – Strategic Plan 2017-2022[33])	N/A

[32] https://www.ilo.org/dyn/normlex/en/f?p=1000:11200:0::NO:11200:P11200_COUNTRY_ID:103460
[33] http://gmo.gov.rw/fileadmin/user_upload/strategic/GMO%20Strategic%20Plan%202017-2022.pdf

		Moreover, women within the project boundary can access to SHS and be directly benefited since they are mostly responsible for cooking and domestic activities. The project activity will not restrict in any way women's rights or access to clean energy services	
2. Projects shall apply the principles of non-discrimination, equal treatment, and equal pay for equal work	No	Both women and men will benefit from the project activities, following the principles of non-discrimination and equal treatment. Any paid or volunteer work within the implementation of the project activity is framed under the principle of equal work, and equitable participation is intended	N/A
3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks (where required)	No	The project will not include any gender related risks. On the contrary, by recognizing the critical role that women play in the development of the country, the project is in line with	

		the Gender Equality Strategy[34] and the country's ling term development framework Vision 2020[35], which allows Rwanda to continue having one of the highest rates of female labour force participation in the world with more than 80%[36]	
4. Summary of opinions and recommendations of an Expert Stakeholder(s)	No	Not applicable	N/A
Principle 3. Community Health, Safety and Working Conditions			
1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	No	The project activity does not expose the community to increased health risks, thus not affecting the health of workers and community. Switching from kerosene and others fossil fuels to solar power has a positive impact in the	N/A

[34] https://www.undp.org/content/dam/rwanda/docs/demgov/Gender%20Equality%20Strategy.pdf
[35] https://repositories.lib.utexas.edu/bitstream/handle/2152/5071/4164.pdf
[36] https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS?locations=RW

		community health, since less amount of air pollutants is released when cooking and using lighting devices, improving in such way indoor air pollution. Furthermore, workers participating in this project are not exposed to unsafe or unhealthy environments since no hazardous chemicals or materials are used in the distribution process.	
Principle 4.1 Sites of Cultural and Historical Heritage			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	The project does not include sites, structures, or objects with historical, cultural, artistic, traditional, or religious values. The distribution of energy services does not require the alteration, damage, or removal of any forms of culture since it is target to household and micro-business located in rural and peri-urban areas of Rwanda.	N/A
Principle 4.2 Forced Eviction and Displacement			
Does the Project require or cause the physical or economic relocation	No	The project involves the distribution of SHS in the rural	N/A

of peoples (temporary or permanent, full, or partial)?		and peri-rural areas of Rwanda, and therefore there is no need to cause physical or economic relocation of people at any level	
Principle 4.3 Land Tenure and Other Rights			
a. Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership?	No	The project does not require changes to land tenure arrangements or to access usage rights or land ownerships.	N/A
b. For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership?	No	Not applicable since the project does not involve land use tenure.	N/A
Principle 4.4 - Indigenous people			
Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No relevant. The project activity does not involve any land occupation or territory claim. Access to affordable modern technology will only benefit the indigenous people in improving their quality of life	N/A
Principle 5. Corruption			

1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	No	The project shall not involve, be complicit in or contribute to reinforce corruption or corrupt projects considering that Bboxx and other project partners have ethical codes against corruption. In addition, the United Nations Convention against corruption was signed and ratified by Kenya on the 4th of October 2006[37].	
Principle 6.1 Labour Rights			
1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions	No	Employment generated under this project follows the Labour Law: N° 66/2018 of 30/08/2018 [38]regulating labour in Rwanda, set out in 'Official Gazette no Special of 06/09/2018' Moreover, it follows the principles and standards embodied in the ILO fundamental conventions[39]: convention 29 (Forced Labour Convention) and 105 (Abolition of Forced Labour Convention).	

[37] https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XVIII-14&chapter=18
[38] https://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=108704&p_country=RWA&p_count=411&p_classification=01.02&p_classcount=4
[39] https://www.ilo.org/dyn/normlex/en/f?p=1000:11200:0::NO:11200:P11200_COUNTRY_ID:103460

2. Workers shall be able to establish and join labour organisations	No	Workers under this project are able to establish and join labour organisations according to the ILO convention 98: Right to Organise and Collective Bargaining Convention, which was ratified by Rwanda.	N/A
3. Working agreements with all individual workers shall be documented and implemented and include: a) Working hours (must not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND	No	The working agreements with individual workers are framed under the Labour Law[40] and are documented and include the minimum requirements regarding working hours, duties and tasks, remuneration, modalities on health insurance, contract termination conditions, permission for annual leave.	N/A

[40] https://www.ilo.org/dyn/travail/docs/530/rwanda_labour_law.pdf

e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave			
4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion)	No	All personnel working in this project is above 16, respecting in such way the minimum age requirement stated by the Labour Law	N/A
5. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures	No	All works within the project activity will be carried out using the appropriate equipment and personnel training. Documentation and reporting of accidents, incidents and emergencies will be done, and the respectively measures will be taken.	N/A
Principle 6.2 Negative Economic Consequences			

Appendix 1.	Does the project cause negative economic consequences during and after project implementation?	No	The project has positive economic consequences since it is based in the commercial model PAYG (Pay as you go), where customers pay only for the energy they use. If the customer keeps paying for the service, the ownership of the appliance's transfers to the customer within 3 years and the main solar kit transfers in 10 years	
>>				
Principle 7.1 Emissions				
Will the Project increase greenhouse gas emissions over the Baseline Scenario?		No	The project will provide reductions in comparison to the baseline scenario since it replaces kerosene fuel-lighting devices with solar-powered LED light bulbs and other electric devices.	N/A
>>				
Principle 7.2 Energy Supply				
Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?		No	The project involves the use of solar power energy; hence, it does not use energy from a local grid or power supply, nor use other local resources that could impact other local users.	N/A
>>				

Principle 8.1 Impact on Natural Water Patterns/Flows			
Will the Project affect the natural or pre-existing pattern of watercourses, groundwater and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?	No	The project does not negatively impact natural or existing patters of watercourses, groundwater and/or watersheds.	N/A
>>			
Principle 8.2 Erosion and/or Water Body Instability			
a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	No	The project does not involve any activity that may causes erosion and/or water body instability in a directly or indirectly way	N/A
>>			
b. Is the Project's area of influence susceptible to excessive erosion and/or water body instability?	No	The project area is not susceptible to excessive erosion and/or water body instability	
Principle 9.1 Landscape Modification and Soil			
Does the Project involve the use of land and soil for production of crops or other products?	No	The project does not involve the use of land and soil to produce any kind of product	N/A

>>			
Principle 9.2 Vulnerability to Natural Disaster			
Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought, or other extreme climatic conditions?	No	The project has no connection with increasing vulnerability to any extreme climatic condition	N/A
>>			
Principle 9.3 Genetic Resources			
Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)?	No	The project does not involve GMOs and has no possibility of being impacted by GMOS	N/A
>>			
Principle 9.4 Release of pollutants			
Could the Project potentially result in the release of pollutants to the environment?	No	The project reduces the amount of air pollutants in comparison to the baseline. As for water and land pollutants, the distribution of	
>>			

		SHS does not contribute to releasing these kind of pollutants	
Principle 9.5 Hazardous and Non-hazardous Waste			
Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials? >>	Potentially	Batteries from the SHS can be considered as hazardous waste once its lifespan is completed. In addition, E-waste resulted from the utilization of SHS can also be considered as hazardous.	A disposal agreement between Bboxx Rwanda and Associated Battery Manufacturers E.A. Ltd. has been made to ensure that the disposal of all batteries involved in the project activity is done in an ethical, responsible, and environmentally friendly manner, by recycling where possible. The battery disposal is included as part of the after sales service that Bboxx offers to the customers. The disposal partner provides a collection certificate indicating the amount collected in kg and ensures that any of the Bboxx batteries will be sold for reuse or any other purpose.

			BBOXX Rwanda has a contract with Enviroserve to treat all their E-waste and end of life of all products and their parts which include Printed Circuit Boards, Casings (hard plastic) and cables. • Printed Circuit Boards are sent to enviroserve recycling plant in Dubai. • Enviroserve has the cable stripping machine, and they sell copper locally. • Hard plastic casings are crushed
Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers? >>	No	The project does not involve the application of pesticides and/or fertilizers as part of its activities	N/A
Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests?	No	No harvesting of forests is involved as part of the project	N/A

>>			
Principle 9.8 Food			
Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	The project has no impact on the quantity or nutritional quality of food available	N/A
>>			
Principle 9.9 Animal husbandry			
Will the Project involve animal husbandry?	No	No animal husbandry is involved in the project development	N/A
>>			
Principle 9.10 High Conservation Value Areas and Critical Habitats			
Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	No	The project location does not include High Conservation Value areas, so no physical affectation is expected with the project implementation	N/A
>>			
Principle 9.11 Endangered Species			
a. Are there any endangered species identified as potentially being present within the Project	No	No endangered species are identifies as potentially being present within the project	N/A

boundary (including those that may route through the area)?		boundary, which is the areas where the SHS are distributed.	
b. Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	No	The project activity It is not expected to potentially impact other areas where endangered species be present through transboundary affects	N/A

APPENDIX 2- CONTACT INFORMATION OF VPA IMPLEMENTER

Organization name	Bboxx Ltd.
Registration number with relevant authority	
Street/P.O. Box	9B Power Road
Building	
City	London
State/Region	
Postcode	W4 5PY
Country	England, United Kingdom
Telephone	+44-79-3344-5669
E-mail	n.suzuki@bboxx.co.uk
Website	https://www.bboxx.com/
Contact person	Norio Suzuki
Title	Focal Point
Salutation	Mr.
Last name	Suzuki
Middle name	
First name	Norio
Department	
Mobile	
Direct tel.	+44-79-3344-5669
Personal e-mail	n.suzuki@bboxx.co.uk

APPENDIX 3- LUF ADDITIONAL INFORMATION

N/ARisk of change to the Project Area during Project Certification Period:	
Risk of change to the Project activities during Project Certification Period:	
Land-use history and current status of Project Area:	
Socio-Economic history:	
Forest management applied (past and future)	
Forest characteristics (including main tree species planted)	
Main social impacts (risks and benefits)	
Main environmental impacts (risks and benefits)	
Financial structure	
Infrastructure (roads/houses etc):	
Water bodies:	
Sites with special significance for indigenous people and local communities - resulting from the Stakeholder Consultation:	
Where indigenous people and local communities are situated:	
Where indigenous people and local communities have legal rights, customary rights or sites with special cultural, ecological, economic, religious or spiritual significance:	

APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

Please refer to Design Changes Requirements for more information on procedures governing Design Changes

APPENDIX 5-WARRANTY TERMS AND CONDITIONS

The duration of the warranty for each Bboxx product is outlined in the table below:

Table 19. Warranty terms

Content	Warranty (from installation date)
Control Unit	For the duration of the Pay Plan (36 to 120 months)
Solar Panel	For the duration of the Pay Plan (36 to 120 months)
Lights	36 months
Appliances (phone charger, torch, radio, shaver, TV, subwoofer)	21 - 36 months

The Bboxx warranty shall be void in any of the following circumstances:

- Breakdown of the system due to accidents, over-use, unauthorized modifications, or misuse.
- Theft or attempted theft of the system or any parts thereof leading to damage.
- Unauthorized repair or modification by anyone; or
- Any act of God such as but not limited to lighting damage, flood damage.

Emissions reductions

The client warrants to not sell, transfer, assign, license, dispose of, grant, or otherwise create any interest in the emission reductions generated by this solar home systems to any other party. All rights and titles to the emission reductions generated by this solar home system are hereby granted, ceded, assigned, and transferred to Bboxx who shall be entitled to grant, cede, assign, and transfer to any other party.

APPENDIX 6- REQUIREMENTS FOR THE DESIGN SPECIFICATIONS OF SHS AND SWP

<table>
<tr><th>Parameter</th><th>Technical specifications</th></tr>
<tr><td>Lamp wattage (in Watts)</td><td><1.2 W
1.8 W (Flexx10)</td></tr>
<tr><td>Luminous flux output (in lumens)</td><td>>120 lm
20lm-60lm-120lm-240lm (Flexx10)</td></tr>
<tr><td>Rated lamp life (in hours)</td><td>>30,000 hrs
25,000 hrs (Flexx10)</td></tr>
<tr><td>Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts);</td><td>
<table>
<tr><th>Technology</th><th>Type and capacity</th></tr>
<tr><td>bPower20 (Renamed bPower60)</td><td>20W solar panel</td></tr>
<tr><td>bPower50 (Renamed bPower110)</td><td>50W solar panel</td></tr>
<tr><td>bPower80</td><td>35W solar panel</td></tr>
<tr><td>bPower120</td><td>50W solar panel</td></tr>
<tr><td>bPower160</td><td>80W solar panel</td></tr>
<tr><td>bPower240</td><td>80W solar panel</td></tr>
<tr><td>Flexx40</td><td>12W solar panel</td></tr>
<tr><td>Flexx10 (Renamed Flexx12)</td><td>3W solar panel</td></tr>
<tr><td>ClimateSmart™ Direct</td><td>310W or 2x310W solar panel</td></tr>
<tr><td>ClimateSmart™ Battery</td><td>310W solar panel</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Type (e.g., NiMH, Lead-Acid, Li-ion, Lithium-iron-phosphate, etc.), nominal voltage, and rated capacity of the batteries (in Ampere hours);</td><td>
<table>
<tr><th>Technology</th><th>Battery</th></tr>
<tr><td>bPower20 (Renamed bPower60)</td><td>6.4V, 9.9Ah LiFePO4
64Wh battery size</td></tr>
<tr><td>bPower50 (Renamed bPower110)</td><td>Configuration 1: 12.8V, 9.9Ah LiFePO4
Configuration 2: 12.8V, 13.2Ah LiFePO4</td></tr>
<tr><td>bPower80</td><td>12V, 6.6Ah LiFePO4
80Wh battery size</td></tr>
<tr><td>bPower120</td><td>12V, 9.9Ah LiFePO4
120Wh battery size</td></tr>
<tr><td>bPower160</td><td>12V, 13.2Ah LiFePO4
160Wh battery size</td></tr>
<tr><td>bPower240</td><td>12V, 19.8Ah LiFePO4
240Wh battery size</td></tr>
<tr><td>Flexx40</td><td>6.4V, 6Ah LiFePO4
38.4Wh battery size</td></tr>
<tr><td>Flexx10 (Renamed Flexx12)</td><td>3.2V, 3.2Ah LiFePO4
9.6Wh battery size</td></tr>
<tr><td>ClimateSmart™ Direct</td><td>No battery</td></tr>
<tr><td>ClimateSmart™ Battery</td><td>Lithium-ion battery (5-year lifetime)</td></tr>
<tr><td colspan="2">Type of batteries: lithium iron phosphate</td></tr>
</table>
</td></tr>
<tr><td>Type of charge controller (e.g., active or passive);</td><td>Active</td></tr>
<tr><td>Solar Run Times(s) (SRT) for products with solar energy charging systems.</td><td>The typical light bulb run time of the solar home system is designed for at least 4 hours use per day</td></tr>
</table>

Technology	Runtime
bPower20 (Renamed bPower6o) 4 x LED	4 hrs/day
bPower50 (Renamed bPower11o) Conf. 1: 10 x LED Conf. 2: 10 x LED	10 hrs/day 14 hrs/day
bPower80 3 x LED	8 hrs/day
bPower120 4 x LED	8 hrs/day
bPower160 5 x LED	8 hrs/day
bPower240 6 x LED	8 hrs/day
Flexx40 3 x LED (1.2W) 3 x LED (1.7W)	6 hrs/day 4 hrs/day
Flexx10 (Renamed Flexx12) 1 x LED (1.8W)	4 hr (Super mode)
	8 hr (High mode)
	16 hr (Normal mode)
	36 hr (Night mode)
ClimateSmart™ Battery	3-4 Hours cloudy days

	4 x LED (7.0W) 8-9 Hours sunny days
Physical protection against environmental factors (e.g., rain, heat, insect ingress).	The equipment has protection from permanent outdoor exposure and occasional rain

Table 20. Technical specifications of project lamps

Certification

Quality	ISO9001: 2015 certified quality system
Certifications	IEC 60598-2-4 & IEC 60598-1 SGS certification

APPENDIX 7- DOCUMENT LIST

1. Legal ownership of GHG Emission Reductions.doc
2. Project database.xls
3. Bboxx Light Bulb 2.pdf
4. LG-SSS_LG-bb-home-ar-V4.pdf
5. Product brochure_2021.pdf
6. VS-SSS_bb-bpower20_v2.pdf
7. VS-SSS_bb-home_v1.0-211018.pdf
8. LG-SSS_LG-bb-home-ar-V4.pdf
9. (confidential) SunCulture - Product Guidebook.pdf
10. (confidential) Teide Range Specs_01042022.pdf

Revision History

Version	Date	Remarks
2.0	4 May 2022	
1.1	7 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Inclusion criteria table added Gender sensitive requirements added Prior consideration (1 yr rule) and Ongoing Financial Need added Safeguard Principles Assessment as annex and a new section to include applicable safeguards for clarity Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on Stakeholder Consultation information required Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption