

Gold standard for the global goals  
Monitoring report



June 2017, version 1

Title of the project	Campion II Mini hydro power project
Gold Standard project id	GS-5923
Version number of the monitoring report	Monitoring Report Version 04
Completion date of the monitoring report	17/01/2020
Date of project design certification	09/12/2019
Start date of crediting period	12/05/2017
Duration of this monitoring period	12/05/2017 to 28/2/2019
Duration of previous monitoring period	N/A
Project representative(s)	Bogawanthalawa Tea Estate PLC
Host Country	Sri Lanka
Certification pathway (activity certification/impact certification)	Impact certification
SDG Contributions targeted (as per approved PDD)	SDGs 7, 8 and 13
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GSVER
Selected methodology(ies)	"AMS-I.D. Grid Connected renewable electricity generation" (Version 18),
Estimated amount of annual average certified SDG impact (as per approved PDD)	3,013 tCO <sub>2</sub>
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	5,538 tCO <sub>2</sub>

## SECTION A. Description of project

### A.1. Purpose and general description of project

The Campion II Mini hydropower project provides clean renewable electricity to the Sri Lanka national grid ("the national grid"), which is owned and operated by Ceylon Electricity Board (CEB). In the absence of the project, the similar electricity would have been generated by fossil fuel-based power plants, which dominates the national grid.

The project is an in-stream plant and therefore the water used is released back to the same stream. The project was constructed to have approximately equal lengths of canal and penstocks for water conveyance. The water stream was partially blocked by building a weir and was diverted via a channel along the bank of the river to reach the forebay tank. Then the water is carried down to the turbine via steel penstocks. After running through turbines, the tail water is diverted back to the same stream.

The install capacity is 1MW and annual electricity generation (actual) of the project activity is 4.267 GWh. The project was jointly developed by Bogawanthalawa Tea Estate PLC and Campion Hydro Pvt Ltd.

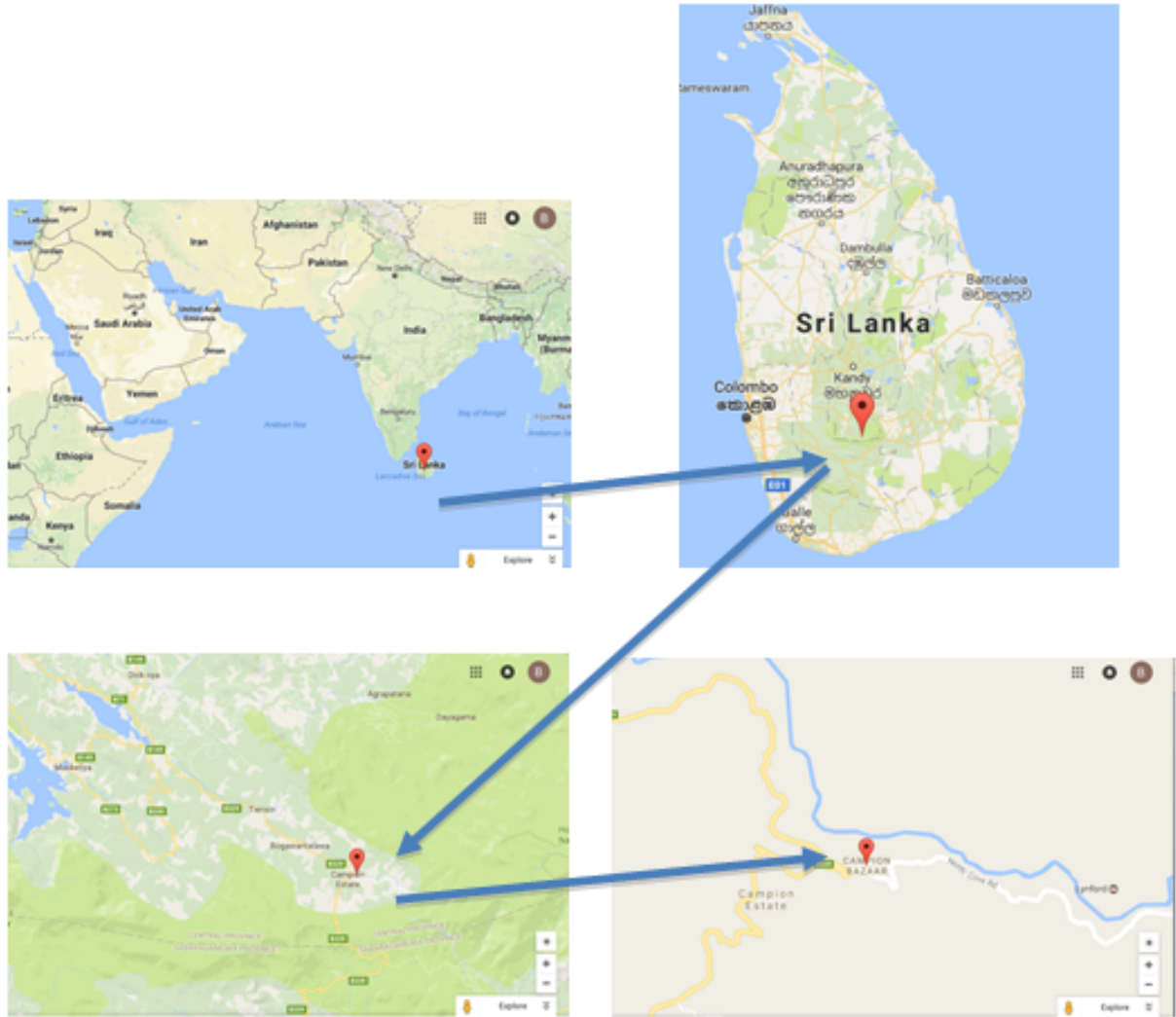
Date	Project activity
19.05.2014	Obtained electricity generation licence for 20 years for the project activity from the Public utility commission of Sri Lanka
03.2015	Revised feasibility study reports due to escalation of the material, equipment and labour costs
13.07.2015	Extension was requested for the environment approval letter from Central Environment Authority.
10.09.2015	Obtained the extension for Environment approval from CEA. This is valid until 19.07.2018.
26.02.2016	Sub lease agreement between Bogawantalawa Tea Estate PLC and Campion hydro Pvt Ltd has been entered into after considering the carbon credit benefits.
05.07.2016	The Construction contract was signed between construction company and the project developer.
25.07.2016	The EPC contract was signed between the project developer and the EPC contractor.
28.04.2017	Commercial operation of the project activity was started on 28.04.2017.
28.04.2017	Commissioning date
24.06.2017	Uploading GS Passport and GS PDD for the project activity in Gold Standard registry (Markit Registry)
23.05.2019	Registration of the project (as per SustainCERT web page)
18-19.06.2019	Site visit of VVB
25.02.2020	Submit the 1 <sup>st</sup> monitoring report to SusCERT

## A.2. Location of project

The project is located at upper Kehelgamu Oya running through Campion Estate in Bogawantalawa in Nuwara Eliya District, Sri Lanka.

The weir point is located at co-ordinates  $80^{\circ} 42' E$  and  $6^{\circ} 52' 06'' N$ . The physical location of the weir is located just downstream of the bridge across Kehelgamu oya near Campion bazaar. The physical location of the powerhouse (co-ordinates  $80^{\circ} 40'56'' E$  and  $6^{\circ} 52'46'' N$ ) is located at the right bank of Kehelgamu oya near the Bogawana factory.

Access to the project site is from the Colombo–Hatton Road and 150 km downstream of Bogawana factory. Fig. 01 below shows the location of Campion II Mini hydro power project.



**Fig. 01: Location of Power Plant**

**Fig. 01: Location of Power Plant**

Fig.02 below shows the locations of the weir and the powerhouse in the 1: 50,000 map. These are prepared based on the maps prepared by Survey Department of Sri Lanka.

### A.3. Reference of applied methodology

The project used the approved methodology “AMS-I.D. Grid Connected renewable electricity generation” (Version 18), EB81.

In line with application of the methodology the project draws on the following tools: “Tools for demonstration of additionality of small-scale project activities, version 12.0” and; “Tool to calculate the emission factor for an electricity system” (version 05.0).

For more information regarding the methodology, please refer to <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>

## A.4. Crediting period of project

The project has a 7-year renewable crediting period. Starting date of the first crediting period on 12<sup>th</sup> May 2017(date at which the project design document and passport were submitted for pre-feasibility assessment).

## SECTION B. Implementation of project

### B.1. Description of implemented project

Technical characteristics of Campion II Mini hydropower project have been summarized in table below.

Campion II Mini hydro power project	Technical Specifications		
General	Catchment Area	25 km <sup>2</sup>	
	Mean Flow	1.29 m <sup>3</sup> /s	
	Average Annual Catchment Rainfall	2334 mm	
	Design Flow	1.76 m <sup>3</sup> /s	
	Gross Head	76 m	
	Net Head	72 m	
	Installed Capacity	1 MW	
	Mean Annual Energy Generation	4.179 GWh	
Weir & Intake	Type	Concrete Gravity	
	Max. Height	1 m	
	width	1.5 m	
	Length	18 m	
Headrace Channel	Type	Reinforced Concrete	
	Length	1000 m	
	Flow area	1.6 m width * 1.4 m height	
Penstock	Type	Spirally welded	
	Length	947 m	
	Diameter	1050 mm	
	Head loss	2.1%	
Powerhouse	Turbine 1	Type	Francis horizontal
		Rated flow	0.688 cumes
		Rated output	400 kW
		Efficiency	88%
		Rated head	74 m
	Turbine 2	Type	Francis horizontal
		Rated flow	1.349 cumes

		Rated output	600 kW
		Efficiency	88%
		Rated head	74 m
	Generator 1	Type	Synchronous Generator
		Capacity	500 kVA
		Rated voltage	400 V
		Rated Output	400 kW
		Frequency	50 Hz
		Power Factor	0.8 Cos
		Runaway Speed (min)	1800 R/min
	Generator 2	Type	Synchronous Generator
		Capacity	750 kVA
		Rated voltage	400 V
		Rated Output	600 kW
Frequency		50 Hz	
Power Factor		0.8 Cos	
Runaway Speed (min)		1800 R/min	
Transformer1	Type	Oil-Immersed, hermetically sealed	
	Capacity	500kVA	
	Rated voltage	400/33,000 V	
	Frequency	50Hz	
Transformer2	Type	Oil-Immersed, hermetically sealed	
	Capacity	750kVA	
	Rated voltage	400/33,000 V	
	Frequency	50Hz	

## B.2. Post-registration changes

### B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

There was no check meter installed at the beginning since it is not required according to the CEB regulation however in order to meet the requirement of approved PDD, the PP has taken the initiative to install check meter.

#### B.2.2. Corrections

N/A

#### B.2.3. Changes to start date of crediting period

N/A

## B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

N/A

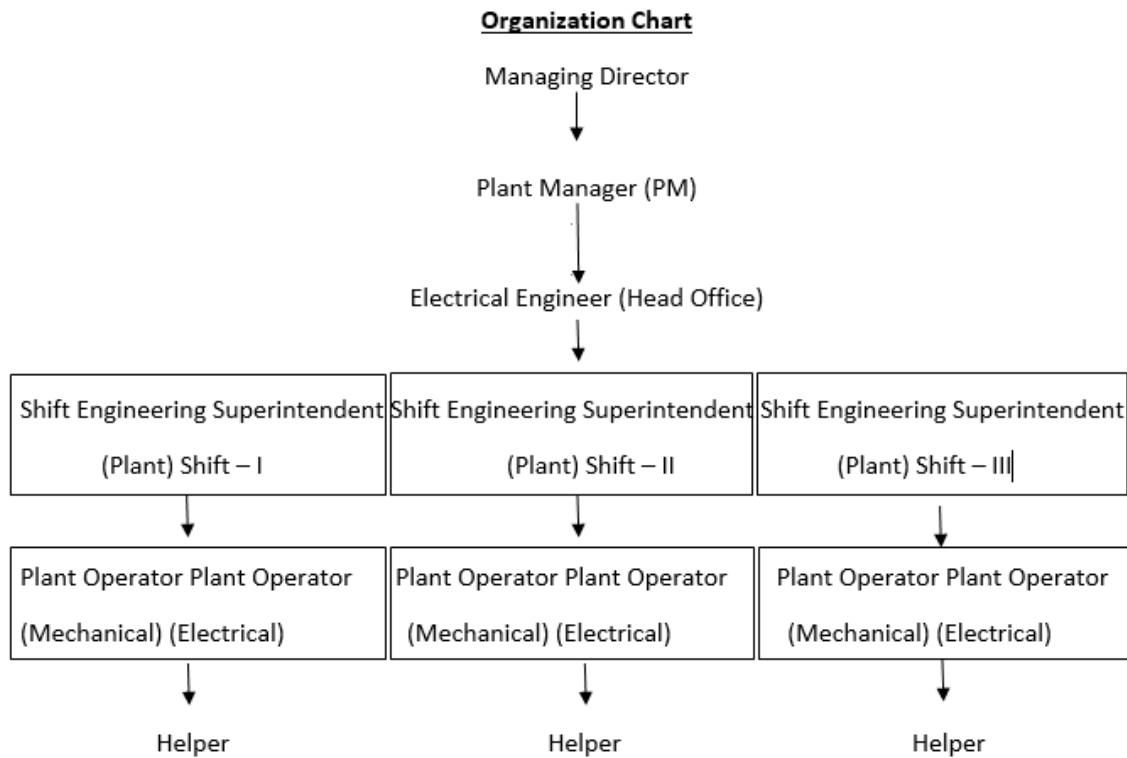
### B.2.5. Changes to project design of approved project

Change of length of the penstock: The actual penstock length (947 m) is significantly higher than the value in FSR. However, increased penstock length can lead to higher total investment, which will make the project activity even less economically attractive than what was expected in the registered PDD. Penstock dimensions can influence gross power generation too. Penstock loss was considered as 2.1% for a length of 550m. If all other conditions remain the same, a 947m penstock can be expected to have a loss of 3.7%. This will reduce the efficiency by 1.6% from the values given in the PDD. This decrease can be neglected as it is rather small. Further, the increased penstock length will not have any direct impact on the GHG emissions.

## SECTION C. Description of monitoring system applied by the project

### Monitoring Organization

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the Plant Manager (PM) of Campion II Hydro Power Plant. A team of experienced personnel in various disciplines assists the Shift Engineering Superintendents in plant operation, measurements and management. The primary responsibility of the team is to measure, monitor, and record and report the information on various data items to the Engineer-in-Charge, in accordance with the applicable standards. The responsibility of review, storage and archiving of information in good condition lie with the PM. The PM undertakes periodic verifications and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions. An internal verification report prepares for review by the PM, which submits for verification by an independent entity (DOE). The team including the Engineer-in-Charge appoints by the PM in advance before the start of project operations. The Engineer-in-Charge reports to the PM and seeks guidance in case of conflicts or difficulties in order to maintain the monitoring organization in good spirit.



## Parameter Required Monitoring

This monitoring plan requires monitoring of all parameters indicated in section D.1 of the Monitoring Report. Necessary documents required for verification of the data were maintained for later archiving. Using the power exported to the grid, emission reduction was calculated as illustrated in Section E.2. Emission reduction generated by the project was monitored at regular intervals and reported to the Managing Director.

## Procedures for training of monitoring personnel

The project has employed qualified and experienced persons for plant operation. Basic personnel to deal with monitoring of parameters are Shift Engineering Superintendents. The project has maintained standard log sheets and formats to record the monitoring parameters. The persons were given proper training to maintain the plant records. The Engineer-in-charge of the Plant is the designated person to verify, compile and archive all the monitored data. The parameters monitored during the crediting period were provided in a tabular format to the designated person. The Shift Engineering Superintendents and the Engineer-in-charge of the Plant were provided with necessary training with respect to maintenance of the relevant monitoring records to enable them to carry out the monitoring independently. The training was provided to the monitoring personnel for monitoring of the following parameters:

- Electricity Imported from the grid (kWh)
- Gross electricity exported to the grid (kWh)
- Net electricity supplied to the grid (kWh)

- Periodical calibration of monitoring equipment

## Procedures for documentation and storage

Operations of the hydropower project is overseen by the Shift Engineering Superintendent (ES) of the company. The company has three Shift Engineering Superintendents (ES) for each of the three shifts. The Shift Engineering Superintendent (ES)'s position was occupied by qualified electrical engineers who have obtained necessary training in plant operations, data monitoring, report generation etc. For the smooth operations of the plant, the company had Two Plant Operators (Mechanical and Electrical) and one helper for each of three shifts to help the shift Engineering Superintendent. The Shift Engineering Superintendents recorded the parameters every day during the operation of the plant. Since the project was a hydropower project, only the following energy related data were monitored: Gross Electricity generation, Energy Export and import. The Energy meter readings were taken at the end of each shift at a designated time every day to ensure constant recording frequency of parameter. The recorded parameters were documented every day in the standard logbooks maintained at the plant. The day to day records were verified by Engineer in charge, compiled and documented for preparation of internal verification reports. The net electricity exported to the grid was recorded from the export meter installed within the premises, jointly with the representatives of Ceylon Electricity Board in the last week of each month. This reading was taken as the basis for raising invoice on the CEB for the payment against net electricity exported to the grid. The energy imported from the CEB grid is recorded in the import meter installed by the CEB for billing the project activity for the electricity imported from the CEB grid. These records were maintained by the project proponent at the project site as well as at the head office.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

Relevant SDG Indicator	SDG 7 – Renewable energy share in the total final energy consumption
Data/parameter:	$EF_{grid,OM,y}$
Unit	tCO <sub>2</sub> /MWh
Description	Operating margin CO <sub>2</sub> emission factor for grid connected power generation in year y.
Source of data	Grid Emission factors published by Sustainable Energy Authority of Sri Lanka (Sri Lanka Energy Balance 2015)
Value(s) applied)	0.6938
Choice of data or measurement methods and procedures	Calculated as per the "Tool to calculate the emission factor for an electricity system" as 3-year generation weighted average. The data are obtained from Grid Emission factors published by Sustainable Energy Authority of Sri Lanka.
Purpose of data	Baseline emissions
Additional comments	N/A

Relevant SDG Indicator	SDG 7 – Renewable energy share in the total final energy consumption
Data/parameter:	$EF_{grid, BM, y}$
Unit	tCO <sub>2</sub> /MWh
Description	Build margin CO <sub>2</sub> emission factor for grid connected power generation
Source of data	Grid Emission factors published by Sustainable Energy Authority of Sri Lanka (Sri Lanka Energy Balance 2015)
Value(s) applied)	0.7490
Choice of data or measurement methods and procedures	The value applied is taken from Grid Emission factors published by Sustainable Energy Authority of Sri Lanka is an official source which is made publicly available. (Through Annual Publication named “Sri Lanka Energy Balance-2016”)
Purpose of data	Baseline emissions
Additional comments	N/A

Relevant SDG Indicator	SDG 7 – Renewable energy share in the total final energy consumption
Data/parameter:	$EF_{grid, CM, y}$
Unit	tCO <sub>2</sub> /MWh
Description	Combined margin CO <sub>2</sub> emission factor for grid connected power generation
Source of data	Grid Emission factors published by Sustainable Energy Authority of Sri Lanka (Sri Lanka Energy Balance 2015)
Value(s) applied)	0.7210
Choice of data or measurement methods and procedures	The value applied is taken from Grid Emission factors published by Sustainable Energy Authority of Sri Lanka is an official source which is made publicly available. (Through Annual Publication named “Sri Lanka Energy Balance-2015”)
Purpose of data	Baseline emissions
Additional comments	N/A

## D.2. Data and parameters monitored

Relevant SDG Indicator	SDG 7 – Renewable energy share in the total final energy consumption	
Data/parameter:	EG <sub>BL,y</sub>	
Unit	MWh/year	
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity (Safeguarding Principle 7 - Climate and Energy)	
Measured/calculated/default	Measured	
Source of data	Separate monthly invoice issued by the CEB to the power developer certifying the receipt of power from the power plant based on the export meter reading and the import of power from the CEB grid based on the import meter reading. The net electricity supplied to the grid is calculated as the difference between the export and import.	
Value(s) of monitored parameter	2017(May to December) 2018 2019(January to February)	2533 4859 287
Monitoring equipment	<p>The electricity exported to the grid is measured by the main meter and check meter installed at the power plant. The electricity imported to the grid is measured by the main meter and check meter installed at the power plant site. Both the readings are recorded monthly at an agreed date and time by both the PP and CEB in the presence of PP representatives and personnel from CEB. Based on the readings, invoices are issued for export and import of electricity separately. The main and check meters are installed and sealed by the CEB. Only main meter readings are taken into account and in case of main meter failure check meter readings is considered for that particular month.</p> <p>Continuous Monitoring Monthly recording</p>	
Measuring/reading/recording frequency:	monthly	
Calculation method (if applicable):		

QA/QC procedures:	<p>Ceylon Electricity Board (CEB) installed a main meter and if there is a failure of that meter, a backup meter (check meter) reading is taken.</p> <p>Accuracy: Acceptable to CEB - Accuracy class 1 as specified by Ceylon Electricity Board.</p> <p>Calibration of the above meters are done once a year.</p> <p>In cases where the CEB does not initiate meter calibration in line with the 1-year calibration frequency of the main meter, monthly energy reading of the main and check meters is compared from the due date of the calibration of the main meter. Then, lowest out of two readings is taken as the monthly net electricity supplied to the grid during the delayed calibration period. For the period of delayed calibration, the amount of net electricity supplied to the grid will be adjusted according to the guidelines provided in appendix-calibration of CDM validation and verification standard for Project Activities (version 02.0).</p> <p><b>Calibration Details</b></p> <table border="1"> <tr> <td>Accuracy class</td> <td>class 1</td> </tr> <tr> <td>CEB serial No</td> <td>DD2-9205435</td> </tr> <tr> <td>Meter serial No</td> <td>214586122</td> </tr> <tr> <td>Date of Calibration</td> <td>2018-12-28</td> </tr> <tr> <td>Due date of calibration</td> <td>2019-12-27</td> </tr> <tr> <td>Delayed period</td> <td>245 days</td> </tr> </table>	Accuracy class	class 1	CEB serial No	DD2-9205435	Meter serial No	214586122	Date of Calibration	2018-12-28	Due date of calibration	2019-12-27	Delayed period	245 days
Accuracy class	class 1												
CEB serial No	DD2-9205435												
Meter serial No	214586122												
Date of Calibration	2018-12-28												
Due date of calibration	2019-12-27												
Delayed period	245 days												
Purpose of data:	Baseline calculation												
Additional comments:	Net electricity generation will be measured in kWh and converted into MWh												

Relevant SDG Indicator	SDG 8- Annual growth rate of real GDP per employed person
Data/parameter	Quantitative employment and income generation/ Livelihood of the poor
Unit	N/A
Description	No of job created by Campion Energy Service Pvt Ltd and their salary(Safe guarding Principle 6 – Economic Impacts)
Measured/ Calculated/Default	monitored
Source of data	Monthly pay sheets of existing employees throughout the monitoring period (Refer Annex 03)
Value(s) of monitored parameter	10

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Monitoring equipment	N/A
Measuring/reading/recording frequency:	monthly
Calculation method (if applicable):	N/A
QA/QC Procedure	Hardcopies of pay sheets can be monitored and interview with employees
Purpose of data	Monitor SDG
Additional comments	N/A

Relevant SDG Indicator	SDG 13- Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)
Data/parameter	GHG emission reduction
Unit	tCO <sub>2</sub> e
Description	GHG emission reduction of electricity generation using renewable energy sources by replacing fuel oil and diesel based generating sources (Safeguarding Principle 7 – Climate and Energy)
Measured/calculated/default	Calculated
Source of data	<p>Separate monthly invoice issued by the CEB to the power developer certifying the receipt of power from the power plant based on the export meter reading and the import of power from the CEB grid based on the import meter reading.</p> <p>The net electricity supplied to the grid is calculated as the difference between the export and import.</p> <p>Grid Emission factors published by Sustainable Energy Authority of Sri Lanka (Sri Lanka Energy Balance 2015)</p>

Value(s) of monitored parameter	<table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">2017(May to December)</td> <td style="text-align: right;">2533</td> </tr> <tr> <td style="text-align: right;">2018</td> <td style="text-align: right;">4859</td> </tr> <tr> <td style="text-align: right;">2019(January to February)</td> <td style="text-align: right;">287</td> </tr> </table> <p>Operating margin CO<sub>2</sub> emission factor for grid connected power generation in year y = 0.6938 tCO<sub>2</sub>e/ MWh          Build margin CO<sub>2</sub> emission factor for grid connected power generation = 0.7490 tCO<sub>2</sub>e/ MWh          Combined margin CO<sub>2</sub> emission factor for grid connected power generation= 0.7210 tCO<sub>2</sub>e/ MWh</p>	2017(May to December)	2533	2018	4859	2019(January to February)	287
2017(May to December)	2533						
2018	4859						
2019(January to February)	287						
Monitoring equipment	<p>The electricity exported to the grid is measured by the main meter and check meter installed at the power plant.</p> <p>The electricity imported to the grid is measured by the main meter and check meter installed at the power plant site.</p> <p>Both the readings are recorded monthly at an agreed date and time by both the PP and CEB in the presence of PP representatives and personnel from CEB.</p> <p>Based on the readings, invoices are issued for export and import of electricity separately.</p> <p>The main and check meters are installed and sealed by the CEB. Only main meter readings are taken into account and in case of main meter failure check meter readings is considered for that particular month.</p> <p>Continuous Monitoring Monthly recording</p> <p>(Sri Lanka Energy Balance 2015) is referred</p>						
Measuring/reading/recording frequency:	monitoring period						
Calculation method (if applicable):	calculated by using "AMS-I.D. Grid Connected renewable electricity generation" (Version 18),						
QA/QC procedures:	Calibration of meters are done by CEB						
Purpose of data	To claim carbon credits and monitor SDG						
Additional comment	N/A						

Relevant SDG Indicator	SDG 8 - Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status
Data/parameter	Quality of employment
Unit	N/A
Description	Staff was trained by generating awareness of health and safety. (Safeguarding Principle 3 – Community Health, Safety and Working Conditions)
Measured/calculated/default	Monitored
Source of data	Regular training certificates provided by Campion Energy Service Pvt Ltd
Value(s) monitored parameter	10 employees were participated to training program. (Refer annex 01)
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once per verification period
Calculation method (if applicable):	N/A
QA/QC procedures:	Interview with employees
Purpose of data	Monitor SDG
Additional comments	N/A

### D.3. Implementation of sampling plan

N/A

## SECTION E. Calculation of SDG outcomes

### E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

Delayed period of calibration = from 27/04/2018 to 28/12/2018

According to the calibration report (Annex 06),

Assuming energy generation in three phases are balanced

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Average error = 0.077%

Maximum permissible error = 0.50% (Accuracy class of the meter is 0.5s)

Due to, Average error < Maximum permissible error,

Consider Maximum permissible error as the correction error according to the VVS version 2.

Subtract calibration error within delayed calibration period

Month	Electricity Output (EG <sub>gross,y</sub> )	Number of dates operate with Error	Error in electricity output(kWh)	Net Electricity Output (EG <sub>gross,y</sub> ) with considering error	Electricity Consumed By Grid (E <sub>imported</sub> )	Error in electricity import (kWh)	Net Electricity Consumed By Grid (E <sub>imported</sub> )	Net Output (EG <sub>BL,y</sub> )	Emission Reduction (tCO <sub>2e</sub> )
2017									
From May - 12	245657		0	245657	46.928	0	46.928	245610.1	177.0849
June	296537		0	296537	10	0	10	296527	213.796
July	119023		0	119023	66	0	66	118957	85.768
August	168912		0	168912	55	0	55	168857	121.7459
September	296472		0	296472	12	0	12	296460	213.7477
October	390508		0	390508	17	0	17	390491	281.544
November	455973		0	455973	12	0	12	455961	328.7479
December	560750		0	560750	6	0	6	560744	404.2964
Total for 2017(May to December)	2533832		0	2533832	224.928	0	224.928	2533607	1826.731
2018									
January	255277		0	255277	6	0	6	255271	184.0504
February	175795		0	175795	9	0	9	175786	126.7417
March	194489		0	194489	14	0	14	194475	140.2165
April	385514	3	192.757	385321.2	24	0.012	24.012	385297.2	277.7993
May	534210	31	2671.05	531539	30	0.15	30.15	531508.8	383.2178
June	511328	30	2556.64	508771.4	7	0.035	7.035	508764.3	366.8191
July	347943	31	1739.72	346203.3	5	0.025	5.025	346198.3	249.6089
August	444661	31	2223.31	442437.7	6	0.03	6.03	442431.7	318.9932
September	344614	30	1723.07	342890.9	5	0.025	5.025	342885.9	247.2207
October	721086	31	3605.43	717480.6	11	0.055	11.055	717469.5	517.2955
November	630480	30	3152.4	627327.6	2	0.01	2.01	627325.6	452.3018
December	333150	28	1504.55	331645.5	2	0.009	2.009032	331643.4	239.1149
Total for 2018	4878547		19368.9	4859178	121	0.351	120.649	4859057	3503.38
2019									
January	151421		151421	151421	11	0	11	151410	109.1666
February	136436.6		136437	136436.6	24.75	0	24.75	136411.8	98.35294

Total for 2019 (up to February)	287857.6		287858	287857.6	35.75	0	35.75	287821.8	207.5195
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## E.2. Calculation of project value or estimation of project situation of each SDG outcome

According to AMS-I.D. Grid Connected renewable electricity generation" (Version 18), monitoring consists of metering the electricity generated by the renewable technology. In the Champion II Mini-hydro power project, Measurement results are cross-checked with records for sold electricity.

As per the AMS 1.D. Version 18, the emission reduction of this project was calculated using following procedure.

### Emission Reductions:

The emission reduction by the project activity is denoted by,

$$ER_y = BE_y - PE_y - LE_y$$

Where,

$ER_y$  - Emission reduction per annum by project activity in tCO<sub>2</sub> e/year

$BE_y$  - Baseline emissions in tCO<sub>2</sub>e/year

$PE_y$  - Project emissions in tCO<sub>2</sub>e/year

$LE_y$  - Leakage in ton of tCO<sub>2</sub>e/year

Since there was no leakage emission and project emission anticipated from the Hydropower Project, so the Emission reduction is,  $ER_y = BE_y$

### Baseline Emission

As per the guidance provided in AMS I.D Version 17 (point 11) for this project the baseline emissions are the product of electrical energy baseline  $EG_{BL,y}$  expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor as;

$$BE_y = EG_{BL,y} * EF_{CO_2, grid,y}$$

$BE_y$	Baseline Emissions in year $y$ (t CO <sub>2</sub> )
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year $y$ (MWh)
$EF_{CO_2, grid, y}$	CO <sub>2</sub> emission factor of the grid in year $y$ (t CO <sub>2</sub> /MWh)

The net electricity supplied to the grid was calculated by the following formula:

$$EG_{BL,y} = EG_{gross} - E_{imported}$$

Two energy meters are measuring the gross electricity exported to the grid ( $EG_{gross}$ ), as well as the electricity imported from the grid ( $E_{imported}$ ).

### E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

	Net electricity supplied to the grid (MWh) $EG_{BL,y}$	Emission Reductions (tCO <sub>2</sub> )- $BE_y$
2017(May to December)	2,533.61	1,827
2018	4,859.06	3,503
2019(January to February)	287.82	208
<b>Total</b>	<b>7,680.49</b>	<b>5,538</b>

### E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
SDG 7	0 MWh	7,680.49 MWh	7,680.49 MWh

### E.5. Comparison of actual value of outcomes with estimates in approved PDD

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
Quality of employment - SDG 8	People in rural areas are not very familiar with health and safety in relation to their places of work. Therefore, new staff will be trained by generating awareness of health and safety.	There was health and safety training program conducted for the employees on 22-05-2018. Certificates of participation at the program were handed over to all participated employee.
Quantitative employment and income generation – SDG 8	No of Job created- more than 0	10
Access to affordable and clean energy services – SDG 7	4,179 MWh annual	4,267 MWh annual
Livelihood of the poor – SDG 8	No of job created- more than 0	10

## E.6. Remarks on difference from estimated value in approved PDD

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Emission reduction during the monitoring period is higher (88 tCO<sub>2</sub>, 2%) than the estimated value in the PDD. It was achieved by increasing 123 MWh energy generation against estimated figure. That is not a significant increment.

Reason - Annual catchment rainfall is higher than the value in PDD

## SECTION F. Stakeholder inputs and legal disputes

## Gold Standard®

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

>>N/A

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

>>N/A

F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period

>>N/A