

MONITORING PROJECT TITLE: “86 MW HYDRO PROJECT IN HIMACHAL PRADESH”

Document Prepared By Malana Power Company Limited

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Abbreviations

PSEB	: Punjab State Electricity Board
HPSEB	: Himachal Pradesh State Electricity Board
GHG	: Green House Gases
PTC	: Power Trading Company
NEWNE	: Northern, Eastern, Western, and North-Eastern
HEP	: Hydro Electric Project
ROR	: Run of the River
RMP	: Revised Monitoring Plan
PD	: Project Description
VERs	: Voluntary Emission Reductions
MPCL	: Malana Power Company Limited
CEA	: Central Electricity Authority
QA/QC	: Quality Assurance and Quality Control

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of the project activity is to generate electricity by using the renewable energy source (water) for a grid system at village Jari, Kullu District, Himachal Pradesh, India. The project activity displaces electricity and green house gases (GHG) emissions currently produced by thermal fossil fuel-burning facilities. The generated electricity by the project activity is being exported to the PTC (Power Trading Company) India Ltd.

The project is a grid connected hydel power plant which is run of the river type with a small reservoir. It involved construction of a barrage across Malana Nallah 3 Km downstream of Malana village, a head regulator, a de-silting basin storage reservoir to divert water draft of 21cumecs through a 3.2 Km long headrace tunnel, ending in a 5 m diameter surge shaft. A pressure shaft conveys water through a 2.2 m diameter surface penstock to 2 Pelton turbines, each of capacity 43 MW totaling to 86 MW plant capacity, housed in a surface powerhouse. Generated electricity is fed into NEWNE grid which has been made by synchronizing Northern, Eastern, Western and North Eastern Grids (NEWNE) of India. The total GHG emission reductions in this monitoring period is 6,28,938 tCO₂e.

1.2 Sectoral Scope and Project Type

According to the categorization system of the Clean Development Mechanism, which is part of Green House Gas (GHG) program that has been approved by the VCS board, the project is categorized as:

- **Type I** : Renewable energy projects
- **Category ACM0002:** Consolidated baseline methodology for grid-connected electricity generation from renewable sources
- **Reference** : Consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM-0002, Version: 12.3.0¹, 11th May 2012, EB 67
- **Sectoral Scope** : 01, Energy industries (renewable-/ non-renewable sources)

The specified project is not a part of a grouped project

1.3 Project Proponent

Roles and Responsibilities:

¹ As per revalidated VCS PD, applied methodology version is ACM0002 Version 12.1.0. However, due to editorial change methodology version has been updated by CDM EB from ACM0002 Version 12.1.0 to ACM0002 Version 12.3.0. Hence, updated in the MR which is in line with Para 13 of EB 61 annex 25.

The project proponent is responsible for installation, commissioning and subsequent operation and maintenance of the project. The project proponent is also responsible for monitoring and keeping the records as required for the project activity.

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1.4 Other Entities Involved in the Project

No other entities involved in the project activity.

1.5 Project Start Date

5th July 2001 (commissioning date of the project activity)

1.6 Project Crediting Period

- **Credit Period:** 10 years and 0 month; Renewal twice
- **1st Crediting Period**²: 5th July 2001 – 4th July 2011; (VCU got issued for entire period)
- **2nd crediting period:** 5th July 2011 - 4th July 2021;

1.7 Project Location

The project is located at Jari village in district Kullu of Himachal Pradesh around 25 Km from Bhunter. The Project activity is uniquely identified as Malana Hydro Project in the region. The nearest railway station from the project site is Kiratpur Sahib, about 198 Km from Bhunter. Bhunter has airport and is well connected to Delhi.

Coordinates of the Barrage:

Latitude: 32° 2' 24'' N; Longitude - 77° 15' 4'' E

Coordinates of Power House:

Latitude - 32° 0' 12'' N; Longitude - 77° 14' 30'' E

² As per VCS-2007.1 guidelines

For the project activity the project boundary is from the diversion site to the point of power supply to nearest substation where the project proponent has full control.

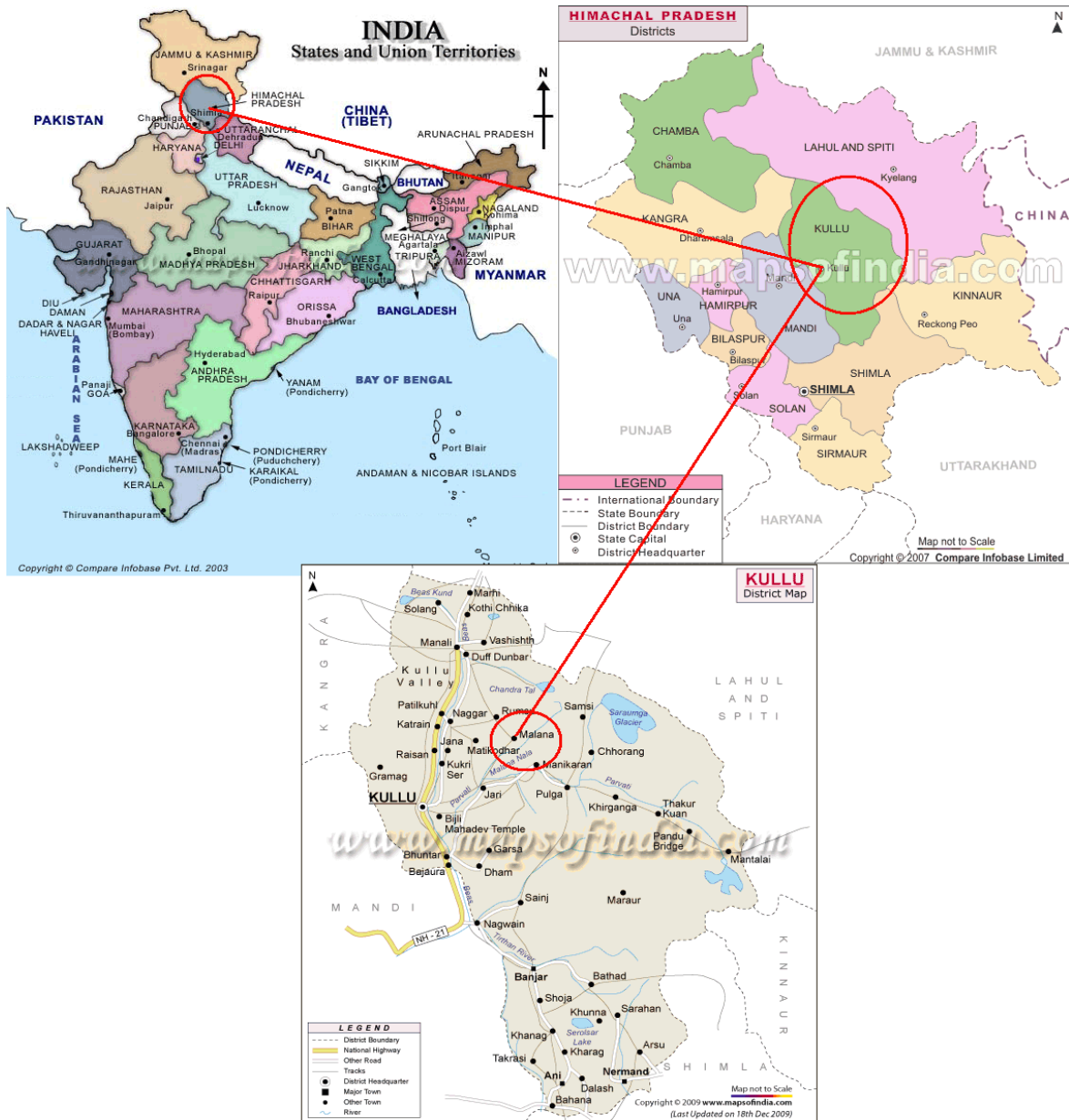


Figure 1: Location of project activity

1.8 Title and Reference of Methodology

Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Reference: Approved consolidated baseline methodology; ACM0002, Version 12.3.0³. 11th May 2012, EB 67

1.9 Other Programs

The net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

The project has been purely taken up as VCS project and has not been applied for any form of environmental credit. The project is registered at VCS with a Project ID 93. The project activity is claiming credits under the VCS program for the crediting period (05/07/2011 to 04/07/2021).

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Unit 2 (43 MW) of project activity was commissioned on 05th July 2001 followed by Unit 1 (43 MW) on 09th July 2001 since then project is operation at full capacity of 86 MW.

Project activity was operation during the current monitoring period as well. Outage details are provided in appendix 1.

There is no exchange of equipment during the monitoring period. There is no event occurred during this monitoring period, which may have impact on the applicability of the methodology as well as emission reduction.

2.2 Deviations

2.2.1 Methodology Deviations

No deviation is taken during the current monitoring period

2.2.2 Project Description Deviations

No deviation is taken during the current monitoring period

2.3 Grouped Project

The specified project is not a part of a grouped project

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	EF _{BM, grid, y}
Data unit	tCO ₂ /MWh
Description	The Build Margin emission factor for year 2009-10 of NEWNE

³ As per revalidated VCS PD, applied methodology version is ACM0002 Version 12.1.0. However, due to editorial change methodology version has been updated by CDM EB from ACM0002 Version 12.1.0 to ACM0002 Version 12.3.0. Hence updated in the MR which is in line with Para 13 of EB 61 annex 25.

	grid
Source of data	CEA CO ₂ Baseline Database, version 06
Value applied:	0.812
Justification of choice of data or description of measurement methods and procedures applied	Calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Purpose of the data	Baseline emission calculation
Comments	Latest available value for 2009-10 was used.

Data / Parameter	EF _{OM,grid, y}
Data unit	tCO ₂ /MWh
Description	The Operating Margin emission factor of NEWNE grid
Source of data	CEA CO ₂ Baseline Database, version 06
Value applied:	0.994
Justification of choice of data or description of measurement methods and procedures applied	Calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Purpose of the data	Baseline emissions
Comments	CEA CO ₂ Baseline Database for most recent three years at the time of revalidation

Data / Parameter	EF _{CM,grid, y}
Data unit	tCO ₂ /MWh
Description	The Emission factor of the NEWNE grid
Source of data	Calculated as the weighted average of the build margin emission factor and operating margin emission factor (with 50/50 weights to OM and BM)
Value applied:	0.858
Justification of choice of data or description of	Calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

measurement methods and procedures applied					
Purpose of the data	The values are taken from the database developed by Central Electricity Authority (CO ₂ Baseline database for the Indian power sector, Version 6.0). The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'.				
Comments	<table border="1"> <tr> <td>BM</td><td>0.812</td></tr> <tr> <td>OM</td><td>0.994</td></tr> </table>	BM	0.812	OM	0.994
BM	0.812				
OM	0.994				

3.2 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Net Electricity supplied to the NEWNE grid by the project activity during the year y
Source of data	Meters installed at three locations, at generation point, plant sent out point and at Bajaura Substation, accurately monitors electricity supplied to the grid. Joint Meter readings taken at all three stations have been used to achieve the parameter EG _y .
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	-
Value monitored:	733,049.16
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emission
Calculation method	
Comments	This is calculated value and formula for the same is given below under section of calculation method.

Data / Parameter	EG _{Gen,Malana}
Data unit	MWh
Description	Energy generated by Malana Hydro Power project at the Generation point.
Source of data	Joint Meter Reading (JMR) by State Electricity Board (SEB)
Description of measurement methods and procedures to be applied	Meter installed at the generation point is used to record this parameter. SEB take the reading on monthly basis and issue the JMR.
Frequency of monitoring/recording	Monitoring Frequency : Continuous Recording Frequency : Monthly
Value monitored:	741,509.632 (cumulative value for the monitoring period)
Monitoring equipment	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the appendix 2.
QA/QC procedures to be applied	Meters are maintained by state electricity board. These meters are calibrated once in three year and the records maintained by state electricity department.
Purpose of the data	Calculation of Baseline emissions
Calculation method	-
Comments	-

Data / Parameter	EG _{Malana}
Data unit	MWh
Description	Energy supplied by the Malana Hydro Power Project to the Malana transmission line at Malana Yard.
Source of data	Calculated
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	As per actual data
Value monitored:	739,133.255

Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emissions
Calculation method	
Comments	-

Data / Parameter	EG _{Toss}
Data unit	MWh
Description	The units/ Energy supplied by the Toss Hydro Power Project to the Malana transmission line at Malana Yard.
Source of data	Monthly meter readings issued by HPSEB
Description of measurement methods and procedures to be applied	Meter installed at the Malana yard is used to record this parameter
Frequency of monitoring/recording	Monitoring Frequency : Continuous Recording Frequency : Monthly
Value monitored:	151,457.817
Monitoring equipment	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the appendix 2.
QA/QC procedures to be applied	Meters are maintained by state electricity board. These meters are annually calibrated and the records maintained by state electricity department.
Purpose of the data	Calculation of Baseline emission
Calculation method	-
Comments	

Data / Parameter	EG _{M&T}
Data unit	MWh

Description	Total Energy sent out both Malana and Toss hydro power project to the Malana transmission line at Malana yard.
Source of data	Joint Meter Reading (JMR) by SEB
Description of measurement methods and procedures to be applied	Meter installed at the Malana yard is be used to record this parameter.
Frequency of monitoring/recording	Monitoring Frequency : Continuous Recording Frequency : Monthly
Value monitored:	890,591.072
Monitoring equipment	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the appendix 2
QA/QC procedures to be applied	Meters are maintained by state electricity board. These meters are annually calibrated and the records maintained by state electricity department.
Purpose of the data	Calculation of Baseline emission
Calculation method	-
Comments	

Data / Parameter	EG _{Aux,Malana}
Data unit	MWh
Description	Auxiliary consumption by Malana hydro power project
Source of data	Calculated
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	-
Value monitored:	2,376.377

Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emission
Calculation method	
Comments	-

Data / Parameter	EG Bajoura, M&T
Data unit	MWh
Description	Energy injected at Bajoura substation by both Malana and Toss hydro power project
Source of data	Joint Meter Reading issued by SEB
Description of measurement methods and procedures to be applied	Meter installed at the Bajaura Substation is used to record this parameter.
Frequency of monitoring/recording	Monitoring Frequency : Continuous Recording Frequency : Monthly
Value monitored:	883,390.472
Monitoring equipment	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the appendix 2
QA/QC procedures to be applied	Meters are maintained by state electricity board. These meters are annually calibrated and the records maintained by state electricity department.
Purpose of the data	Calculation of Baseline emission
Calculation method	-
Comments	

Data / Parameter	L _{Transmission}
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Data unit	MWh
Description	Total transmission losses between Malana yard and Bajoura substation
Source of data	Calculated
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	-
Value monitored:	7,200.600
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emission
Calculation method	
Comments	

Data / Parameter	L _{Malana}
Data unit	MWh
Description	Share of losses of Malana hydro power project
Source of data	Calculated
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	-
Value monitored:	6,084.098
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emission

Calculation method	
Comments	

Data / Parameter	L _{Toss}
Data unit	MWh
Description	Share of losses of Toss hydro power project
Source of data	Calculated
Description of measurement methods and procedures to be applied	This is calculated value and formula for the same is given below under section of calculation method.
Frequency of monitoring/recording	-
Value monitored:	1,116.502
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of Baseline emission
Calculation method	
Comments	

Data / Parameter	A _{PJ}
Data unit	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Project site
Description of measurement methods and procedures to be	Measured from topographical surveys, maps, satellite pictures, etc

applied	
Frequency of monitoring/recording	Yearly
Value monitored:	18,250
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	-
Calculation method	-
Comments	

Data / Parameter	Cap _{PJ}
Data unit	W (Watt)
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Determine the installed capacity based on recognized standards
Frequency of monitoring/recording	Yearly
Value monitored:	86,000,000
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	-
Calculation method	-
Comments	

3.3 Monitoring Plan

Project Management Plan:

A team is constituted with participation from relevant departments. People are trained on CDM concept and monitoring plan. This team is responsible for data collection and archiving. This team meets

periodically to review CDM project activity check data collected, emissions reduced etc. On a weekly basis, the monitoring reports is checked and discussed by the seniors and team members/managers. In case of any irregularity observed, it is being informed to the concerned person for necessary actions. On monthly basis, these reports are forwarded at the management level.

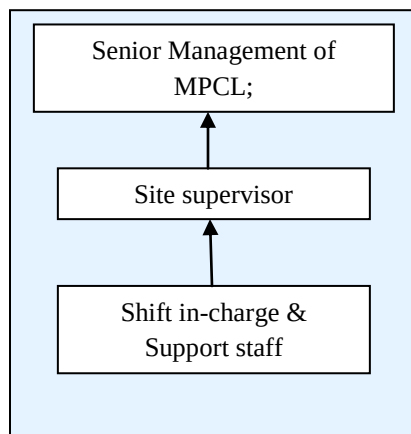


Figure 2: Project Management Plan

Senior Management of MPCL/Technical Head: Overall responsibility of compliance with the CDM monitoring plan.

Site Supervisor: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation

Shift In-charge: Responsibility of daily report generation

Data Monitoring:

The methodology requires monitoring of the following:

- Electricity generation from the project activity;

Energy supplied to Grid

The energy supplied to grid is measured using electricity meters located at Bajaura substation. The net electricity supplied is measured as

$$EG_y = \text{Total Generation} - \text{Auxiliary Consumption} - \text{Transmission Losses}$$

In the current practice another hydro electric power project (Toss) was allowed to utilise the Malana –Bus for sending out the generated electricity. A common meter is now being used to measure the electricity being sent out by Malana and Toss collectively at Malana Yard.

Since there is a common meter for measuring the electricity sent out from Malana Bus Bar hence now the calculation of auxiliary consumption and transmission losses are based on combined energy sent out & combined energy injected at Bajaura Sub Station. The calculation for auxiliary consumption and transmission losses for Malana HEP is described in the section 3.2 of the MR. Calculation is based on the authenticated Letter issued by HPSEB, 12 October, 2009.

Gross generation at Malana is being measured by meter at generation point. The source of values taken for this parameter is the Joint Meter Reading (JMR). Energy sent out by Toss is measured by meter at the Toss incoming line, the meter readings are recorded and maintained by HPSEB. The total energy sent out by Malana and Toss combined is measured by meter at Malana Bus, the source for these values is the JMR. The total energy injected at Bajoura substation by Malana and Toss combined is measured by meter at Bajoura substation. Auxiliary consumption and the share of transmission loss by Malana are calculated as per formula given in section 3.2. The total energy injected by Malana at Bajaura substation is calculated by subtracting the auxiliary consumption and Malana's share of transmission loss from the Gross generation by Malana.

Completeness-

For Electricity generation data: The project activity install the latest state-of-art monitoring and control equipment that measure, record, report, monitor and control various key parameters. Real time data collection happen using these control systems. An hourly log of data also prepared by the shift in-charge. A daily report of aggregation of these data also prepared. Parameters monitored are the total power generated, power exported to the grid and auxiliary power consumed (other parameters like head availability, grid issues; frequency etc is also maintained hourly in the log).

Reliability-

For electricity generation data: automatic control meters for power generation and exports is regularly maintained. The regular plant operating & maintenance procedures are also include process of regular meter testing, calibration & maintenance. All these meters are calibrated & tested before installation and the calibration of meters is done once in three year at Government of India certified Lab

Actual power generation data is also metered using power output meter at the substation. The billing invoices for the power sold and meter readings could be used to validate the data accuracy.

Frequency-

The measurement is recorded and monitored on a continuous basis. An hourly log is prepared by the shift in-charge. At the end of the day, hourly data is aggregated in a daily report. The meters to be provided are of 0.2 % accuracy class.

Training-

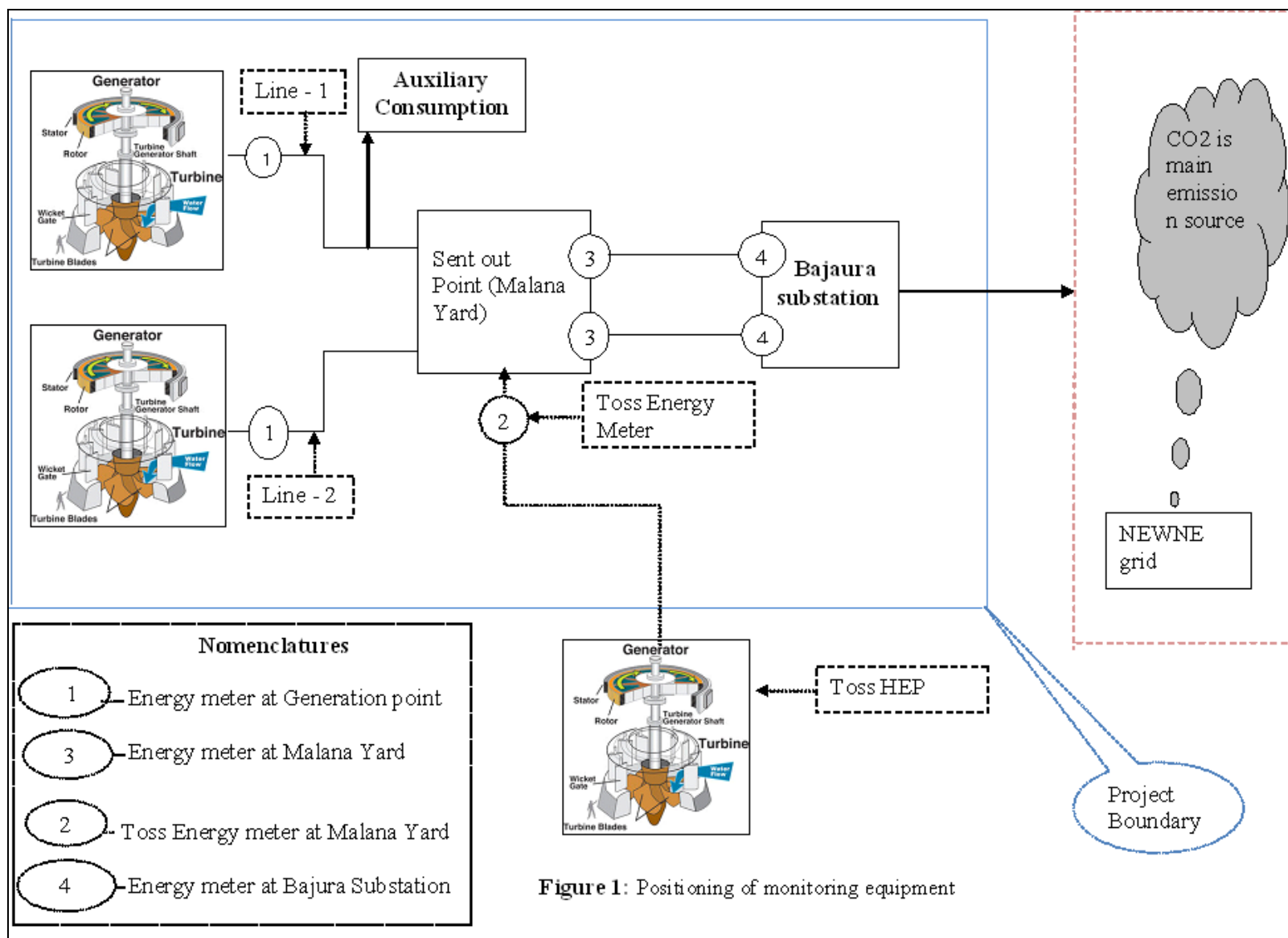
Training needs have been identified in project document; however the group is already operating a plant in Manikaran valley & experienced staff is available for plant O&M.

Report generation on monitoring-

After verification of the data and due diligence on correctness if required an annual report on monitoring and estimations is maintained and record to this effect is maintained for verification.

Internal audits of VCS project compliance-

A VCS audit is carried out to check the correctness of procedures and data monitored by the internal auditing team entrusted for the work. Report on internal audits done, faults found and corrective action taken is maintained and kept for external auditing.



4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

“The baseline is the MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in tCO₂equ/MWh) calculated in a transparent and conservative manner as:

$$BE_y = EF_y \times EG_y$$

Where,

BE_y: Baseline emissions due to displacement of electricity during year y in tons of tCO₂e

EG_y: Electricity supplied to the grid by the project activity during the year y in MWh,

EF_y: CO₂ baseline emission factor for the electricity displaced due to the project activity in during the year y in tons CO₂/MWh.

Grid Emission Factor

The GEF is fixed ex-ante in the PD as given below:

Parameter	Value
OM	0.994
BM	0.812
CM	0.858

Therefore, EF_y = 0.858 tCO₂/MWh

Baseline Emissions

Formula for Baseline emissions as discussed is EG_y * EF_y

Month	Net Generation (EG _y) (MWh)	Emission Factor (EF _y) (tCO ₂ /MWh)	Baseline emissions (BE _y) (tCO ₂ e) ⁴
Sep-12	48548.93	0.858	41654
Oct-12	17014.72	0.858	14598
Nov-12	9388.04	0.858	8054

⁴ Rounded down values

Month	Net Generation (EG _v) (MWh)	Emission Factor (EF _v) (tCO ₂ /MWh)	Baseline emissions (BE _v) (tCO ₂ e) ⁴
Dec-12	7195.02	0.858	6173
Jan-13	5642.12	0.858	4840
Feb-13	5507.48	0.858	4725
Mar-13	7156.06	0.858	6139
Apr-13	13809.55	0.858	11848
May-13	29993.14	0.858	25734
Jun-13	55340.92	0.858	47482
Jul-13	73071.79	0.858	62695
Aug-13	50179.18	0.858	43053
Sep-13	36517.42	0.858	31331
Oct-13	20865.78	0.858	17902
Nov-13	9326.20	0.858	8001
Dec-13	7147.91	0.858	6132
Jan-14	6025.54	0.858	5169
Feb-14	5225.00	0.858	4483
Mar-14	7864.96	0.858	6748
Apr-14	14017.12	0.858	12026
May-14	29138.61	0.858	25000
Jun-14	53986.36	0.858	46320
Jul-14	74361.85	0.858	63802
Aug-14	64261.69	0.858	55136
Sep-14	37627.93	0.858	32284

Month	Net Generation (EG _v) (MWh)	Emission Factor (EF _v) (tCO ₂ /MWh)	Baseline emissions (BE _v) (tCO ₂ e) ⁴
Oct-14	17533.28	0.858	15043
Nov-14	8576.62	0.858	7358
Dec-14	5060.66	0.858	4342
Jan-15	6380.63	0.858	5474
Feb-15	6284.64	0.858	5392
Total	733049.16		628938

4.2 Project Emissions

Since, the proposed project activity is a renewable energy project which generates electricity using hydro power; no anthropogenic emissions by sources of greenhouse gases within the project boundary are identified.

Hence

$$PE_y = 0$$

4.3 Leakage

No anthropogenic greenhouse gases by sources outside the project boundary that are significant, measurable and attributable to the project activity are identified. Hence, no leakage is considered from the project activity. In addition, project proponents confirm that the renewable energy technology is not equipment transferred from another activity. Hence, no leakage calculation is required.

Therefore, as specified in ACM0002, project participants do not need to consider leakage. Hence, $L_y=0$.

4.4 Net GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y - L_y$$

BE_y = Baseline Emissions

PE_y = Project émissions = 0

L_y = Leakages = 0

So ER_y = BE_y

Months	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
Sep-12	41654	0	0	41654
Oct-12	14598	0	0	14598
Nov-12	8054	0	0	8054
Dec-12	6173	0	0	6173
Jan-13	4840	0	0	4840
Feb-13	4725	0	0	4725
Mar-13	6139	0	0	6139
Apr-13	11848	0	0	11848
May-13	25734	0	0	25734
Jun-13	47482	0	0	47482
Jul-13	62695	0	0	62695
Aug-13	43053	0	0	43053
Sep-13	31331	0	0	31331
Oct-13	17902	0	0	17902
Nov-13	8001	0	0	8001
Dec-13	6132	0	0	6132
Jan-14	5169	0	0	5169
Feb-14	4483	0	0	4483
Mar-14	6748	0	0	6748
Apr-14	12026	0	0	12026
May-14	25000	0	0	25000
Jun-14	46320	0	0	46320
Jul-14	63802	0	0	63802

Months	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
Aug-14	55136	0	0	55136
Sep-14	32284	0	0	32284
Oct-14	15043	0	0	15043
Nov-14	7358	0	0	7358
Dec-14	4342	0	0	4342
Jan-15	5474	0	0	5474
Feb-15	5392	0	0	5392
Total	628938	0.00	0.00	628938

Hence, total emission reductions of 628,938 tCO₂e are achieved by project activity from 01 September 2012 to 28th February 2015.

VER Comparison

Description	Values (tCO ₂ e)
VERs estimated in Registered PD for 12 months	275532
Estimated VERs as per the registered PD for the verification period 01/09/2012 to 28/02/2015 or say 911 days	687697
Actual VERs during the current monitoring period 01/09/2012 to 28/02/2015	628938
Difference between estimated VERs in PD and actual generated VERs (tCO ₂ e) for the current monitoring period 01/09/2012 to 28/02/2015	58759
% Difference in estimated VERs in PD and actual generated VERs for the current monitoring period	-8.54%

APPENDIX 1: OUTAGE DETAILS

Month	Date	Shutdown period (in hours)		Reason
		Unit 1	Unit 2	
Sep-12	07/09/2012	0:43	0:41	Grid Failure
	08/09/2012	0:31	0:28	Grid Failure
Oct-12	16/10/2012	1:52		Grid Failure
Jan-13	10/01/2013		0:08	Grid Failure
May-13	02/05/2013	0:22		Grid Failure
	16/05/2013		0:15	Grid Failure
	28/05/2013	0:57		Grid Failure
Jun-13	01/06/2013	0:19	0:22	Grid Failure
	14/06/2013	0:14	0:18	Grid Failure
		0:24	0:19	Grid Failure
	23/06/2013	1:44		Wooden block got stuck in nozzle no.1
	25/06/2013	31:27		Gen.Transformer-2 Buchholz stage -2 Operated
	27/06/2013		0:07	Grid Failure
Jul-13	28/06/2013		5:02	Leakage of Oil from R-phase bushing of Gen.Transformer-2
	07/07/2013	0:23	0:20	Grid Failure
	23/07/2013	1:23	1:34	Grid Failure
	24/07/2013	0:14	0:08	Grid Failure
	30/07/2013	0:11	0:15	Grid Failure
Aug-13	31/07/2013	0:27	0:30	Grid Failure
	02/08/2013	0:19	0:22	Grid Failure
		0:04	0:08	Grid Failure
	04/08/2013	0:35	0:25	Grid Failure
	06/08/2013	0:16	0:18	Grid Failure
		0:15	0:18	Grid Failure
		6:04	0:16	Grid Failure
	07/08/2013		4:36	Grid Failure
	16/08/2013	0:27	0:07	Grid Failure
	21/08/2013	0:21	0:23	Grid Failure
Nov-13	23/08/2013	3:52	1:46	Grid Failure
			1:27	Grid Failure
Nov-13	12/11/2013		0:19	Grid Failure
Dec-13	12/12/2013	0:26		Grid Failure
Jan-14	06/01/2014	0:17		Grid Failure
	16/01/2014	0:35		Grid Failure

May-14	10/05/2014	0:12	0:14	Grid Failure
	23/05/2014	0:45	0:45	Grid Failure
Jun-14	26/06/2014	0:15		Grid Failure(Fault in PLCC Panel at Bajaura S/s)
		0:09		
		0:30		Hydrolic Overspeed Operated
	27/06/2014	1:11		Hydrolic Overspeed Operated
	28/06/2014	0:06		Grid Failure
		0:09	0:20	
Jul-14	09/07/2014	0:19	0:22	Grid Failure
Aug-14	06/08/2014	0:11	0:07	Grid Failure
	13/08/2014	0:15	0:20	Grid Failure
	28/08/2014	3:38	3:40	Heavy Rock slide from Malana-2 Pressure shaft
Oct-14	13/10/2014		0:08	Grid Fluctuation
Dec-14	14/12/2014 to 20/12/2014	168:00	168:00	Loss of generation due to heavy snowfall and un availability of MALANA -BAJAURA Transmission line & Bajaura -Kangoo ,HPSEB Transmission line(15 Dec. to 20 Dec.-14)
Jan-15	09/01/2015	0:13		Hydrolic Overspeed Operated
Feb-15	07/02/2015		1:14	Grid Failure
	22/02/2015		0:10	Low grid voltage

APPENDIX 2: METER CALIBRATION DETAILS

Electricity meters are properly maintained with regular calibration schedules to ensure accuracy. Data on electricity supplied to the grid could also be cross-checked with the invoices for sale of electricity to the consumers. The meters installed are of accuracy class 0.2 and are calibrated on annual basis.

Calibration Details of Trivector Meters installed at Malana Generation End:

Main/Check	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid upto	Remarks
Main Meter	Gen.-1	KRB00 281	02.03.2012	17.01.2012	16.01.2013	
		AB0013A	24.12.2012	27.11.2012	26.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
		KRB00 282	23.06.2014	24.08.2013	23.08.2014	
	Gen.-2			19.08.2014	18.08.2015	Online Calibration on 19.08.2014
		KRB00 282	02.03.2012	18.01.2012	17.01.2013	
		AB0014A	24.12.2012	27.11.2012	26.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
Check Meter	Gen.-1			19.08.2014	18.08.2015	Online Calibration on 19.08.2014
		AB0013A	31.12.2011	14.11.2011	13.11.2012	
		KRB00280	09.11.2012	01.10.2012	01.10.2013	
		KRB00281	16.01.2013	03.01.2013	03.01.2014	
	Gen.-2			23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
		AB0014A	31.12.2011	18.11.2011	17.11.2012	
		KRB00279	09.11.2012	03.09.2012	03.09.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014

Calibration Details of Trivector meters installed at Malana Transmission end

Main/Check	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid upto	Remarks
Main Meter	Line-1	AB000 1A	31.12.2011	17.11.2011	16.11.2012	
		AB000 6A	09.11.2012	03.10.2012	03.10.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
	Line-2	AB000 3A	31.12.2011	17.11.2011	16.11.2012	
		AB000 11A	09.11.2012	05.10.2012	05.10.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
Check Meter	Line-1	AB000 2A	31.12.2011	16.11.2011	15.11.2012	
		AB000 10A	09.11.2012	04.10.2012	04.10.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
	Line-2	AB000 5A	02.03.2012	17.01.2012	16.01.2013	
		AB000 4A	24.12.2012	29.11.2012	28.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
		AB000 5A	23.06.2014	24.08.2013	23.08.2014	
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014

Calibration Details of Trivector Meters installed at Malana Receiving End (Bajaura Substation)

Main/Check	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid upto	Remarks
Main Meter	Line-1	AB000 4A	31.12.2011	15.11.2011	14.11.2012	
		KRB09865	09.11.2012	03.10.2012	03.10.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
	Line-2	AB000 8A	02.03.2012	17.01.2012	16.01.2013	
		AB000 12A	24.09.2012	18.01.2012	17.01.2013	
		AB000 2A	24.12.2012	29.11.2012	28.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
Check Meter	Line-1	AB000 7A	02.03.2012	16.01.2012	15.01.2013	
		AB000 1A	24.12.2012	27.11.2012	26.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014
	Line-2	AB000 9A	02.03.2012	16.01.2012	15.01.2013	
		AB000 3A	24.12.2012	29.11.2012	28.11.2013	
				23.08.2013	22.08.2014	Online Calibration on 23.08.2013
				19.08.2014	18.08.2015	Online Calibration on 19.08.2014

Calibrated Spare Trivector Meters

Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid upto
AB0013A		19.08.2014	18.08.2015
AB0007A		19.08.2014	18.08.2015