

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

Document Prepared By Malana Power Company Limited

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Table of Contents

1	Project Details.....	4
1.1	Summary Description of Project	4
1.2	Sectoral Scope and Project Type.....	4
1.3	Project Proponent.....	4
1.4	Other Entities Involved in the Project	5
1.5	Project Start Date.....	5
1.6	Project Crediting Period.....	5
1.7	Project Location	5
1.8	Title and Reference of Methodology	7
2	Implementation Status.....	7
2.1	Implementation Status of the Project Activity	7
2.2	Project Description Deviations	7
2.3	Grouped Project.....	7
3	Data and Parameters	7
3.1	Data and Parameters Available at Validation	7
3.2	Data and Parameters Monitored.....	9
3.3	Description of the Monitoring Plan	16
4	Quantification of GHG Emission Reductions and Removals.....	20
4.1	Baseline Emissions	20
4.2	Project Emissions.....	21
4.3	Leakage	21
4.4	Summary of GHG Emission Reductions and Removals	22
5	Additional Information.....	23
5.1	Revision in Monitoring Plan	23
5.2	Outage details.....	23
5.3	Comparison between actual VERs generated v/s VERs estimated in the registered PD.....	23
5.4	Meter Calibration.....	24

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 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.

There is a 10 MW Toss hydro power project in Kullu district which is sharing common transmission line between Malana Yard and Bajaura Substation. It is in line with validated PD. This 10 MW hydro power project is not the part of project activity.

1.2 Sectoral Scope and Project Type

According to the categorisation 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 categorised 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 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.

1.3 Project Proponent

Roles and Responsibilities:

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; May be Renewed twice
- **1st Crediting Period²:** 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.

² As per VCS-2007.1 guidelines

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

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.

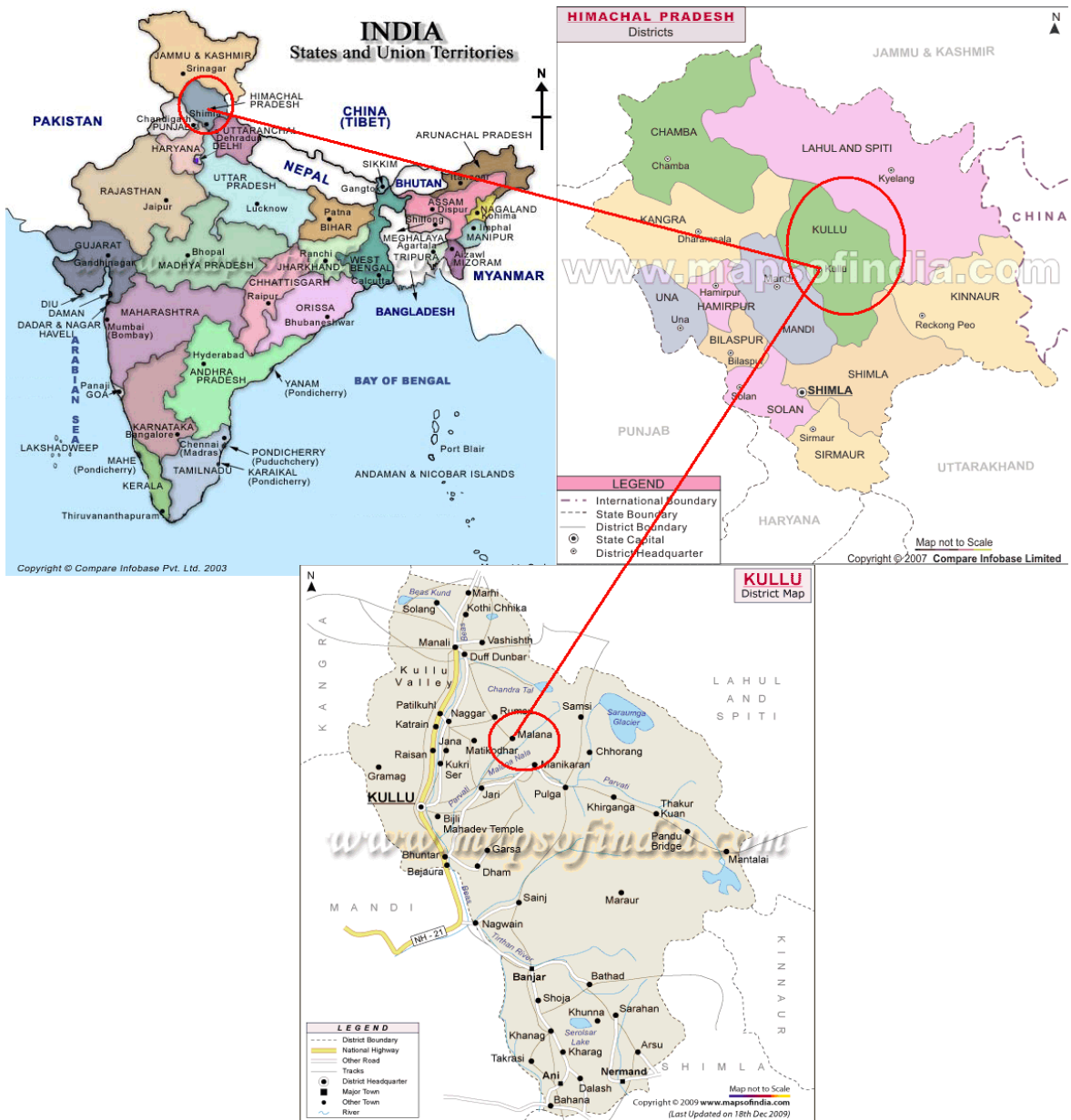


Figure 1: Location of project activity

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 2012⁴, EB 67

Web link: <http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

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.

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.

The outage detail of the project activity is given in the section 5.2 of the monitoring report.

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

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

⁴ <http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

Source of data:	CEA CO ₂ Baseline Database, version 06
Value applied:	0.812
Purpose of the data:	Baseline emission calculation
Any comment:	Latest available value for 2009-10 was used.

Data Unit / 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
Purpose of the data:	Baseline emissions
Any Comment:	CEA CO ₂ Baseline Database for most recent three years at the time of revalidation

Data Unit / 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		
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'.		
Any comment:	<table border="1"> <tr> <td>BM</td><td>0.812</td></tr> </table>	BM	0.812
BM	0.812		

	OM	0.994	
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3.2 Data and Parameters Monitored

Data Unit / 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:	This is a calculated parameter based on continuous monitored parameters
Value monitored:	464733.542
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$EG_y = [EG_{Malana} - EG_{Aux,Malana} - L_{Malana}]$
Any comment:	

Data Unit / 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	Meter installed at the generation point is used to

procedures to be applied:	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:	469766.656 (cumulative value for the monitoring period)
Monitoring equipment:	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the Table 1 under section 5.4
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.
Calculation method:	-
Any comment:	-

Data Unit / 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:	This is a calculated parameter based on the continuous monitored parameters
Value applied:	467704.344
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$EG_{Malana} = (EG_{Gen,Malana} - EG_{Aux,Malana})$

Any comment:	-
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Data Unit / 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 applied:	74170.600
Monitoring equipment:	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the Table 4 under section 5.4
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.
Calculation method:	-
Any comment:	-

Data Unit / 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 applied:	541874.944
Monitoring equipment:	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the Table 2 under section 5.4
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.
Calculation method:	-
Any comment:	-

Data Unit / 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 applied:	2062.312
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$EG_{Aux,Malana} = [EG_{Gen,Malana} + EG_{Toss} - EG_{M\&T}]$
Any comment:	-

Data Unit / 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 applied:	538441.673
Monitoring equipment:	Type : Electricity Meter Accuracy Class of meters : 0.2 % For meter calibration detail, please refer the Table 3 under section 5.4
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.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	L _{Transmission}
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 applied:	3433.271
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$L_{\text{Transmission}} = (EG_{\text{M\&T}} - EG_{\text{Bajaura, M\&T}})$
Any comment:	-

Data Unit / 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:	<i>This is a calculated parameter based on continuous monitored parameter</i>
Value applied:	29,70.802
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$L_{\text{Malana}} = \frac{L_{\text{Transmission}} * EG_{\text{Malana}}}{EG_{\text{MT}}}$
Any comment:	-

Data Unit / Parameter:	L_{Toss}
Data unit:	MWh
Description:	Share of losses of Toss hydro power project
Source of data:	Calculated
Description of measurement methods and	This is calculated value and formula for the same

procedures to be applied:	is given below under section of calculation method.
Frequency of monitoring/recording:	<i>This is a calculated paramter</i>
Value applied:	4,62.469
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	$L_{Toss} = \frac{L_{Transmission} * EG_{Toss}}{EG_{MT}}$
Any comment:	-

Data Unit / 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 applied:	Measured from topographical surveys, maps, satellite pictures, etc
Frequency of monitoring/recording:	Yearly
Value applied:	18250
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / 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 commissioning certificate
Frequency of monitoring/recording:	Yearly
Value applied:	86,000,000
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

3.3 Description of the 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 meet 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.

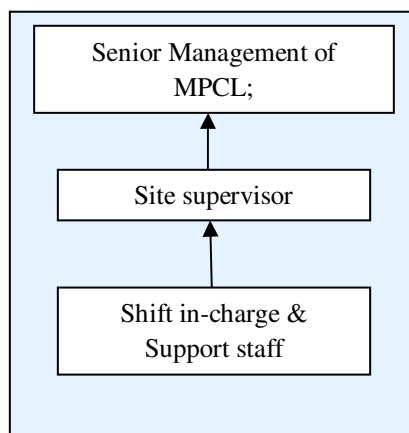


Figure 2: Project Management Plan

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 Bajaura substation by Malana and Toss combined is measured by meter at Bajaura 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 0.2s 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-

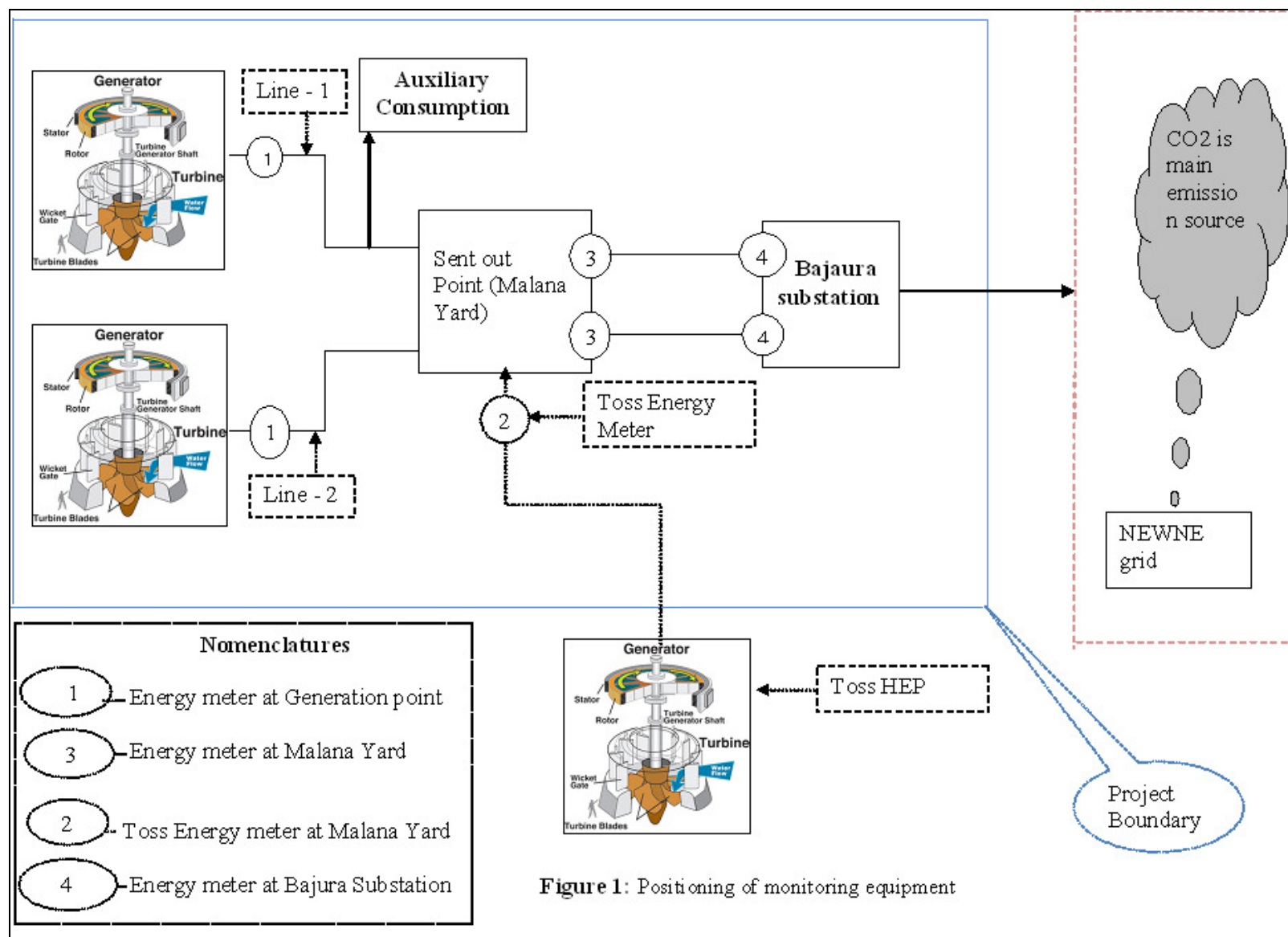
After verification of the data and due diligence on correctness if required an annual report on monitoring and estimations is maintained and record to this effect is maintained for verification.

Internal audits of CDM project compliance-

A CDM audit is be 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.

Positioning of energy meters:

Line diagram showing all relevant monitoring point is shown in the below diagram:



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)
Jul-11 (From 5 th to 31 st July)	55296.424	0.858	47444
Aug-11	70828.112	0.858	60770
Sep-11	47285.689	0.858	40571

Oct-11	20303.266	0.858	17420
Nov-11	10887.726	0.858	9341
Dec-11	8103.323	0.858	6952
Jan-12	6212.951	0.858	5330
Feb-12	5323.849	0.858	4567
Mar-12	11609.906	0.858	9961
Apr-12	16724.168	0.858	14349
May-12	24917.506	0.858	21379
Jun-12	40689.099	0.858	34911
Jul-12	69893.844	0.858	59968
Aug-12	76657.679	0.858	65772
Total	464733.542	0.858	398735

- For conservative estimation of emission reductions, values have been rounded down.

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 Summary of GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y - L_y$$

BE_y = Baseline Emissions as calculated in Section 5.3

PE_y = Project émissions = 0

L_y = Leakages = 0

So $ER_y = BE_y$

Emission Reductions

Period	Emission Reductions, (tCO ₂ e)
From 5 th July -11 to Dec -11	182498
Jan-12 to Aug -12	216237

Monthly breakup of emission reductions: Month	Emission Reductions, (tCO ₂ e)
Jul-11(From 5 th to 31 st July)	47444
Aug-11	60770
Sep-11	40571
Oct-11	17420
Nov-11	9341
Dec-11	6952
Jan-12	5330
Feb-12	4567
Mar-12	9961
Apr-12	14349
May-12	21379
Jun-12	34911
Jul-12	59968

Aug-12	65772
Total	398735

Hence, total emission reductions of 398735 tCO₂e are achieved by project activity from 5th July 2011 to 31st August 2012.

5 ADDITIONAL INFORMATION

5.1 Revision in Monitoring Plan

Monitoring of electricity is as per the registered VCS PD. So RMP is not applicable to the project activity.

5.2 Outage Details

Month	Shutdown period (in hours)		Reason
	Unit 1	Unit 2	
Jul-11	01:16	01:13	Grid Failure
Aug-11	02:07	02:01	Grid Failure
Sep-11	01:15	00:42	Grid Failure
Apr-12	01:46	00:00	Grid Failure
May-12	00:14	00:17	Grid Failure
Jun-12	00:19		Main Inlet Valve Closed suddenly
Jul-12	12:55	13:59	Northern Grid Failure
Aug-12	02:12	01:33	Grid Failure

5.3 Comparison between Actual VERs Generated v/s VERs Estimated in the Registered PD

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 05/07/2011 to 31/08/2012 or say 424 days	320070
Actual VERs during the current monitoring period 05/07/2011 to 31/08/2012	398735

Difference between estimated VERs in PD and actual generated VERs (tCO ₂ e) for the current monitoring period 05/07/2011 to 31/08/2012	78665
% Difference in estimated VERs in PD and actual generated VERs for the current monitoring period	28.55%

Difference between estimated VERs in PD and actual generated VERs (tCO₂e) is 78665 (28.55%) on yearly basis. This difference is due to higher PLF achieved during the current monitoring period which is primarily because of two peak season (July-August) covered during current verification period.

Comparing the emission reductions of the immediate one year (Sep 11- Aug 11), the actual emission reductions are 5.44 % higher then what has been estimated for the complete year. The actual emission reductions for the complete one year (Sep 11 – Aug 11) are 290521 as compares to estimated emission reductions 275532. Higher number of emission reduction could be attributed to higher PLF of the project activity during the monitoring period.

5.4 Meter Calibration

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.

Table 1: Calibration Details of Trivector Meters installed at Malana Generation End:

Main/Check	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid up to
Main Meter	Line-1	KRB00279	04.05.2011	28.03.2011	27.03.2012
		KRB00 281	02.03.2012	17.01.2012	16.01.2013
	Line-2	KRB00280	04.05.2011	28.03.2011	27.03.2012
		KRB00 282	02.03.2012	18.01.2012	17.01.2013
Check Meter	Line-1	KRB00 281	09.03.2011	22.02.2011	21.02.2012
		AB0013A	31.12.2011	14.11.2011	13.11.2012
	Line-2	KRB00 282	09.03.2011	23.02.2011	22.02.2012
		AB0014A	31.12.2011	18.11.2011	17.11.2012

Table 2: Calibration Details of Trivector Meters installed at Malana Transmission end:

Main/Check	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid up to
Main Meter	Line-1	AB0008A	09.03.2011	22.02.2011	21.02.2012
		AB000 1A	31.12.2011	17.11.2011	16.11.2012
	Line-2	AB0012A	09.03.2011	22.02.2011	21.02.2012
		AB000 3A	31.12.2011	17.11.2011	16.11.2012
Check Meter	Line-1	AB0009A	09.03.2011	23.02.2011	22.02.2012
		AB000 2A	31.12.2011	16.11.2011	15.11.2012
	Line-2	AB0011A	04.05.2011	29.03.2011	28.03.2012
		AB000 5A	02.03.2012	17.01.2012	16.01.2013

Table 3: 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 up to
Main Meter	Line-1	AB0005A	09.03.2011	23.02.2011	22.02.2012
		AB000 4A	31.12.2011	15.11.2011	14.11.2012
	Line-2	AB0010A	04.05.2011	29.03.2011	28.03.2012
		AB000 8A	02.03.2012	17.01.2012	16.01.2013
Check Meter	Line-1	AB0006A	04.05.2011	29.03.2011	28.03.2012
		AB000 7A	02.03.2012	16.01.2012	15.01.2013
	Line-2	KRB09865	04.05.2011	28.03.2011	27.03.2012
		AB000 9A	02.03.2012	16.01.2012	15.01.2013

Table 4: Toss HEP Energy Meters

Main/Check	Make	Meter Sr. No.	Calibration Valid from	Calibration Valid up to
Main Meter	Secure Meter	KAU99438	04.04.2011	04.03.2012
	L&T	09142987	23.03.2012	22.03.2013
Check Meter	Secure Meter	KAU99437	04.04.2011	04.03.2012
	L&T	09142630	23.03.2012	23.03.2013

Spare meters have been kept to replace with installed meters while doing calibration or failures of meters. Detail of the meters is provided below:

Spare Trivector Meters at Malana Power plant:

S.N.	Meter Serial No.
1	KRB00279
2	KRB00280
3	AB0006A
4	AB0010A
5	AB0011A
6	KRB09865