

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 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. This electricity is further delivered to Punjab State Electricity Board (PSEB) which falls under NEWNE grid.

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.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 01, Energy industries (renewable-/ non-renewable sources)

The specified project is not a part of a grouped project

Type I : Renewable energy projects

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; Renewal twice
- **1st Crediting Period¹:** 5th July 2001 – 4th July 2011;

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' 24'' 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.

¹ As per VCS-2007.1 guidelines

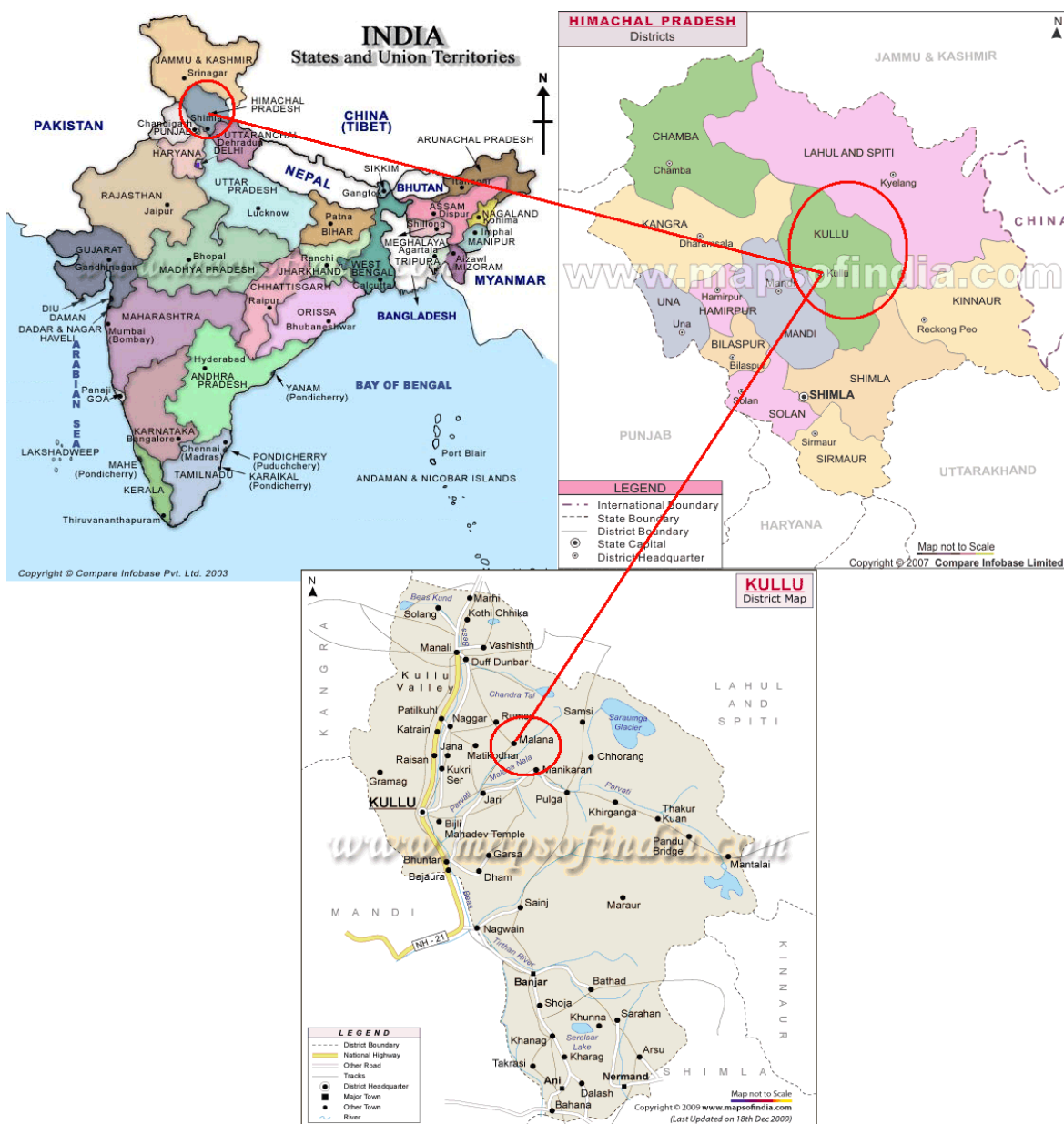


Figure 1: Location of project activity

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 06, Sectoral Scope: 1, 19/05/2006².

²http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BW759ID58ST5YEEV6WUCN5744MN763

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.

2.2 Deviations from the Monitoring Plan

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 _y
Data unit:	tCO ₂ /MWh
Description:	CO ₂ baseline emission factor for the electricity displaced due to the project activity
Source of data:	Based on CEA published data, ex-ante fixed
Value applied:	0.75
Purpose of the data:	Baseline
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	EG _y
Data unit:	MWh
Description:	The units supplied by the project activity (hydel power project) to the Northern, Eastern, Western and North-Eastern (NEWNE) grid during a year.

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 EGy.
Description of measurement methods and procedures to be applied:	Data is electronically archived by <i>shift-incharge</i> . The log sheets in original are also maintained at the site. The <i>Assistant Manager (Electrical)</i> takes due care in cross checking the data and in proper archiving of the data both in soft and hard forms. Finally data is cross-checked by the <i>General Manager</i> , MPCL.
Frequency of monitoring/recording:	Monitoring frequency : Continuous Recording Frequency : Hourly log and Monthly aggregated report
Value monitored:	182349.215 (cumulative value for the monitoring period)
Monitoring equipment:	Type : Energy Meter Accuracy Class : 0.2 % Further information about meter calibration is given in section 5.4 of the monitoring report
QA/QC procedures to be applied:	Electricity meters are properly maintained with regular testing and calibration schedules developed as per the technical specification requirements to ensure accuracy. Electricity supply data to the grid could also be cross-checked with the invoices for sale of electricity to the consumers.
Calculation method:	<i>Refer section 4.1</i>
Any comment:	

As per revision in monitoring plan, in addition to EG_y (Net electricity supplied by project activity), EG_{y, Toss} (Electricity supplied by Toss Hydro Electric Project (HEP) to the Malana transmission line) has to be monitored.

Data Unit / Parameter:	EG_{y, Toss}
Data unit:	MWh
Description:	The units/ Energy supplied by the Toss Hydel Power Project (HEP)
Source of data:	Monthly meter readings issued by Himachal Pradesh State Electricity Board (HPSEB).
Description of measurement methods and procedures to be applied:	Data is electronically archived by <i>shift-incharge</i> . The log sheets in original are also maintained at the site. The <i>Assistant Manager (Electrical)</i> takes due care in cross checking the data and in proper archiving of the data both in soft and hard forms. Finally data is cross-checked by the <i>General Manager</i> , MPCL.
Frequency of monitoring/recording:	Monitoring frequency : Continuous Recording Frequency : Hourly log and Monthly aggregated report
Value monitored:	40896.473(cumulative value for the monitoring period)
Monitoring equipment:	Type : Energy Meter Accuracy Class : 0.2 % Further information about meter calibration is given in section 5.4 of the monitoring report
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. Accuracy Class of meters : 0.2%
Calculation method:	<i>Refer section 4.1</i>
Any comment:	

3.3 Description of the Monitoring Plan

The project activity meets the applicability criteria of the 'Approved baseline methodology ACM0002/Version 06'. The applicability criteria of the 'Approved monitoring methodology ACM0002' are identical to those of the 'Approved baseline methodology ACM0002/Version 06'. Therefore the project activity has used the 'Approved monitoring methodology ACM0002/Version 06' in conjunction with the 'Approved baseline methodology ACM0002/ Version 06' for the project activity.

In keeping with the Monitoring Methodology, the following parameter is to be monitored in the specific project situation:

- Net electricity supplied to the state grid by project activity.
- Electricity supplied by Toss Hydro Electric Project (HEP) to the Malana Associate Transmission System (ATS) at Malana Bus Bar.

Monitoring details of project activity:

In this project the emissions reductions depend on following factors.

1. Electricity supplied by project activity to the grid during a year.
2. The ex-ante fixed Grid Emission Factor for northern region grid. Now Northern region grid has been synchronized with NEWNE grid by Central Electricity Board, Government of India

Frequency-

The electricity generation, electricity sent out and the electricity injected at the substation are measured on continuous basis and hourly logs are prepared by the shift in-charge. At the end of the day, hourly data is aggregated in a daily report.

Report generation on monitoring-

Following reports/ records are available for electricity generation, electricity sent out and electricity injected at the substation.

Hourly log- These are the hourly logbooks maintained by the shift in charge.

Daily report- These are the report prepared by compiling the hourly logbook

Monthly Joint Meter Reading- Monthly JMR of the month contains meter readings of whole month at 3 locations, viz, (i) generation point, (ii) Malana yard (Sent Out point) and (iii) the substation at Bajaura.

Data Archiving and Control-

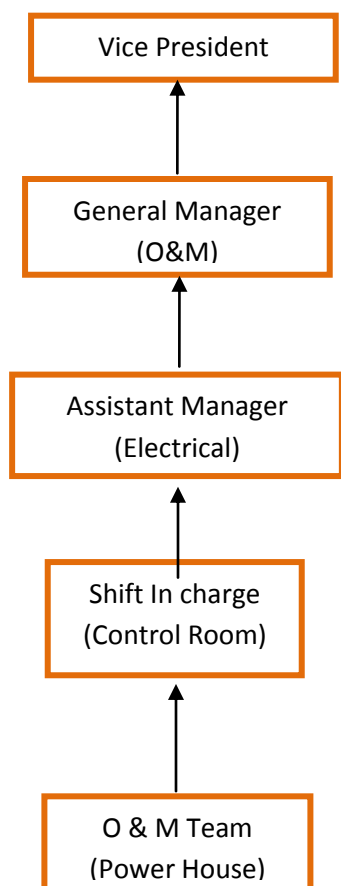
Data is electronically archived by *shift-in-charge*. The log sheets in original are also maintained at the site. The *Assistant Manager (Electrical)* takes due care in cross checking the data and in proper archiving of the data both in soft and hard forms. Finally data is cross-checked by the *General Manager, MPCL*.

Reliability-

All the meters are of 0.2 accuracy class and are calibrated on annual basis.

The data on generation and export are regularly cross checked for any anomalies. The monthly JMR are taken by both the HPSEB and MPCL personnel.

An organogram regarding the hierarchy of monitoring and data QA/QC



Monitoring Details of Toss HEP:

Frequency-

Electricity supplied to Malana transmission line at Malana Yard is measured on continuous basis and hourly logs are prepared by the shift in-charge employed by HPSEB. At the end of the day, hourly data is aggregated in a daily report.

Report generation on monitoring-

Following reports are available on monitoring station:

Hourly log- These are the hourly logbooks maintained by the shift in charge

Daily report- These are the report prepared by compiling the hourly logbook

Monthly report- Monthly report prepared and issued by HPSEB

Data Archiving and Control-

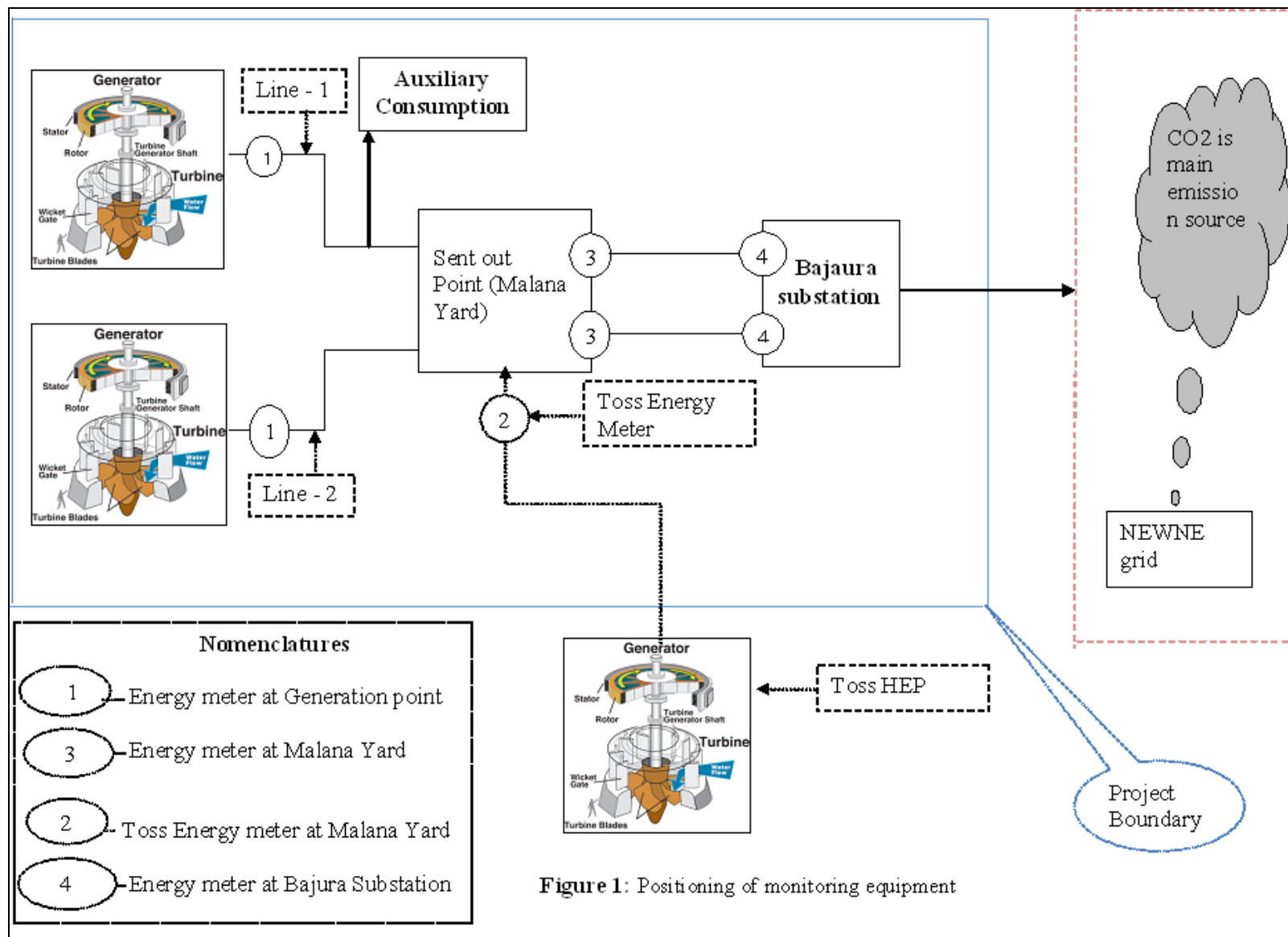
The log sheets in original are also maintained at the site. Data generated from Toss HEP is collected and archived electronically at Malana project site by shift-in charge. The Assistant Manager (Electrical) of MPCL takes due care in cross checking the data and in proper archiving of the data both in soft and hard forms. Finally data is cross-checked by the General Manager, MPCL.

Reliability-

To ensure the accuracy of meter readings, all the meters are calibrated on annual basis. The data on generation and export are regularly cross checked for any anomalies.

Internal audits of CDM project compliance-

A CDM 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 are 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.

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

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

Effective from 11th August 2009, Injection of Toss Hydro Electric Project (HEP) power was allowed in Malana Associate Transmission System (ATS) at Malana Bus Bar. 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 as follow.

Sr. No.	Particulars	Tool for measurement	Source
1	Malana Generation Point	Meter at Malana	Actual from JMR Reading
2	Energy sent out by Toss HEP	Meter in Toss incoming line	Readings Being recorded by HPSEB
3	Total Energy sent out by Malana and	Meter at Malana BUS	Actual from JMR

	Toss HEP		Reading
4	Auxiliary Consumption by Malana HEP	Calculations $= (1 + 2 - 3)$	Readings at 1,2,&3
5	Energy sent out by Malana	Calculations $= (1 - 4)$	Readings at 1,2
6	Energy Injected at Bajoura substation	Meter at Bajoura substation	Actual from JMR Reading
7	Transmission losses up to Bajoura substation (Total)	Calculations $= (6 - 3)$	
8	Share of Losses of Malana HEP	Calculations $= [\text{Total losses (7)} \times \text{Power sent out by Malana (5)}] / [\text{Total power sent out by Malana} + \text{Toss (3)}]$	
9	Share of Losses of Toss HEP	Calculations $= [\text{Total losses (7)} \times \text{Power sent out by Toss (2)}] / [\text{Total power sent out Malana} + \text{Toss (3)}]$	
10	Energy Injected by Malana HEP at Bajoura Substation	Calculations $= [\text{Malana Generation (1)} - \text{Auxiliary Consumption by Malana (4)} - \text{Share of losses Malana (8)}]$	

Reference: Authenticate Letter issued by HPSEB, 12 October, 2009

Annual power generation details are as follows (all figures in KWh)

Month	Gross generation (KWh)	Auxiliary Consumption (KWh)	Transmission Loss (KWh)	Energy Supplied to Grid EG_y (kWh)
Oct-10	23,570,368	31,552.00	173,929.50	23,364,886.50
Nov-10	12,976,512	25,778.67	69,825.00	12,880,908.33
Dec-10	8,911,456	19,452.84	49,507.69	8,842,495.47
Jan-11	6,944,672	17,251.84	33,587.73	6,893,832.43
Feb-11	1,474,272	4,574.00	7,472.09	1,462,225.91
Mar-11	11,737,920	17,836.00	77,601.67	11,642,482.33
Apr-11	19,348,512	11,580.25	145,406.17	19,191,525.58
May-11	42,162,400	83,364.00	331,913.27	41,747,122.73
Jun-11	57,004,960	79,748.00	601,476.64	56,323,735.36
Total (in KWh)	184,131,072	291,137.60	1,490,719.76	182,349,214.64

Grid Emission Factor

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

Parameter	Value
OM	0.98
BM	0.53
CM	0.75

Therefore, $EF_y = 0.75 \text{ tCO}_2/\text{MWh}$

Baseline Emissions

Formula for Baseline emissions as discussed is $EG_y * EF_y$

Month	Net Generation (EGy) (MWh)	Emission Factor (EFy) (tCO ₂ /MWh)	Baseline emissions (BEy) (tCO ₂ e)
Oct-10	23,364.887	0.75	17,523.665
Nov-10	12,880.908	0.75	9,660.681
Dec-10	88,42.495	0.75	6,631.872
Jan-11	6,893.832	0.75	5,170.374
Feb-11	1,462.226	0.75	1,096.669
Mar-11	11,642.482	0.75	8,731.862
Apr-11	19,191.526	0.75	14,393.644
May-11	41,747.123	0.75	31,310.342
Jun-11	56,323.735	0.75	42,242.802
Total	182,349.215	0.75	136,761.911

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 emissions = 0

L_y = Leakages = 0

So $ER_y = BE_y$

Emission Reductions

For the conservative estimation of emission reductions, Value of each month has been rounded down.

Month	Emission Reductions, (tCO ₂ e)
Oct-10	17,523
Nov-10	9,660
Dec-10	6,631
Jan-11	5,170

Feb-11	1,096
Mar-11	8,731
Apr-11	14,393
May-11	31,310
Jun-11	42,242
Total	136,756

Hence, total emission reductions of 136,756 tCO₂e are achieved by project activity from 01st October 2010 to 30th June 2011.

5 ADDITIONAL INFORMATION

5.1 Revision in Monitoring Plan

Current monitoring plan is according to Revised Monitoring Plan (RMP) dated 07/12/ 2009

5.2 Outage Details

Month	Shutdown period (in hours)		Reason
	Unit 1	Unit 2	
Oct-10	00:13	00:16	Grid fail
Nov-10	01:00	02:00	Problem in Electronic Hydro Governor Panel & problem in AVR Panel.
Dec-10	00:00	00:00	-
Jan-11	00:00	00:00	-
Feb-11	480:00	480:00	Planned shutdown for replacement of Penstock protection valve and Grouting work at Adit-II
Mar-11	00:00	00:00	-
Apr-11	00:00	00:00	-
May-11	00:12	00:14	Grid fail
Jun-11	01:42	01:08	Grid fail

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	273849
Estimated VERs as per the registered PD for the verification period 01/10/2010 to 30/06/2011 or say 273 days	204824
Actual VERs during the current monitoring period 01/10/2011 to 30/06/2010	136756
Difference between estimated VERs in PD and actual generated VERs (tCO ₂ e) for the current monitoring period 01/10/2010 to 30/06/2011	68068
% Difference in estimated VERs in PD and actual generated VERs for the current monitoring period	24.86%

Difference between estimated VERs in PD and actual generated VERs (tCO₂e) is 68068 (-24.86%) on yearly basis. The difference is due to poor PLF achieved during the current monitoring period which is primarily because of non monsoon period covered during current verification 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.

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	Remark
Main Meter	Gen.-1	AB0013A	08/06/2010	06/05/2010	05/05/2011	Replaced by KRB00279 on 04/05/2011
		KRB00279	04/05/2011	28/03/2011	27/03/2012	
	Gen.-2	AB0014A	08/06/2010	10/05/2010	09/05/2011	Replaced by KRB00280 on 04/05/2011
		KRB00280	04/05/2011	28/03/2011	27/03/2012	
Check	Gen.-1	KRB00279	08/04/2010	15/03/2010	14/03/2011	Replaced by KRB00281 on

Meter						09/03/2011
		KRB00281	09/03/2011	22/02/2011	21/02/2012	
	Gen.-2	KRB00280	26/07/2010	09/07/2010	08/07/2011	Replaced by KRB00282 on 09/03/2011
		KRB00282	09/03/2011	23/02/2011	22/02/2012	

Calibration Details of Trivector Meters installed at Malana Transmission end:

Main/C heck	End	Meter Sr. No.	Installation Date	Calibration Valid from	Calibration Valid up to	Remark
Main Meter	Line-1	AB0010A	08/04/2010	12/03/2010	11/03/2011	Replaced by AB0008A on 09/03/2011
		AB0008A	09/03/2011	22/02/2011	21/02/2012	
	Line-2	AB0006A	08/04/2010	15/03/2010	14/03/2011	Replaced by AB0012A on 09/03/2011
		AB0012A	09/03/2011	22/02/2011	21/02/2012	
Check Meter	Line-1	AB0011A	08/04/2010	12/03/2010	11/03/2011	Replaced by AB0009A on 09/03/2011
		AB0009A	09/03/2011	23/02/2011	22/02/2012	
	Line-2	AB0012A	20/10/2009	6/10/2009	05/10/2010	Replaced by AB0007A on 04/10/2011
		AB0007A	04/10/2010	16/09/2010	15/09/2011	Replaced by AB0011A on 04/05/2011
		AB0011A	04/05/2011	29/03/2011	28/03/2012	

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	Remark
Main Meter	Line-1	KRB09865	27/08/2010	12/03/2010	11/03/2011	Replaced by AB0005A on 09/03/2011
		AB0005A	09/03/2011	23/02/2011	22/02/2012	
	Line-2	AB0003A	08/06/2010	10/05/2010	09/05/2011	Replaced by AB0010A on 04/05/2011
		AB0010A	04/05/2011	29/03/2011	28/03/2012	
Check Meter	Line-1	AB0002A	08/06/2010	11/05/2010	10/05/2011	Replaced by AB0006A on 04/05/2011
		AB0006A	04/05/2011	29/03/2011	28/03/2012	
	Line-2	AB0004A	08/06/2010	06/05/2010	05/05/2011	Replaced by KRB 09865 on 04/05/2011
		KRB09865	04/05/2011	28/03/2011	27/03/2012	

Toss HEP Energy Meters

Main/Check	Make	Meter Sr. No.	Calibration Valid from	Calibration Valid up to	Remark
Main Meter	L&T Meter	09142987	28/01/2010	27/01/2011	Replaced by KAU99438 on 04/04/2011
	Secure Meter	KAU99438	04/04/2011	03/04/2012	
Check Meter	L&T Meter	09142630	28/01/2010	27/01/2011	Replaced by KAU99437 on 04/04/2011
	Secure Meter	KAU99437	04/04/2011	03/04/2012	

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	AB0001A
2	AB0002A
3	AB0003A
4	AB0004A
5	AB0007A
6	AB00013A
7	AB00014A