

86 MW Hydro Project in Himachal Pradesh

Monitoring Report- Fourth VER Verification (Total Emission Reductions- 181223 tCO₂e)

Monitoring Period: 01/04/2009 to 30/9/2009 (Inclusive of both days)

Version: 2.0

Date: 09/11/2009

**Malana Power Company Limited
Bhilwara Towers, A-12, Sector -1
Noida-201301
Uttar Pradesh
India**

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1.0 Project Details

The purpose of the project activity is to generate electricity by using the renewable energy sources (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.

1.1 Technology Description

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 with Northern, Eastern, Western and North Eastern Grids (NEWNE) of India.

2.0 Reference

Methodology: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” Reference: Approved consolidated baseline methodology; ACM0002/Version 06, Sectoral Scope: 1, 19 May 2006.

The project is a Renewable Energy project with maximum output capacity of 86 MW

Project Design Document: “86 MW Hydro Project in Himachal Pradesh”

Version: 2, Dated: 25/12/2006

History of Issuance

Issuance	Period Covered	VCUs issued
First	05/07/2001 – 31/03/2007	1,344,912
Second	01/04/2007 – 31/03/2008	252,069
Third	01/04/2008 – 31/03/2009	266,898
Fourth	01/04/2009 – 30/09/2009	181,223 (Calculated under Current Verification)

3.0 Monitoring methodology and 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 conjugation 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.

4.0 Quality Control (QC) and Quality Assurance (QA)

Monitoring details

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 /generated for electricity generation, electricity sent out and electricity injected at the substation.

Hourly log- these are the hourly logbooks maintained by the shift incharge

Daily report- These are the report prepared compiling 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-incharge*. 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.

As described in PDD the following data values shall be monitored to calculate the emission reductions.

Data / 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 particular year.
Source of data used:	Joint Meter Readings
Value applied:	241634
Justification of the choice of data or description of measurement methods and procedures actually applied :	Meters installed at three locations, at generation point, plant sent out point and at Bajaura Substation, accurately monitors electricity supplied to the grid . 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 is also cross-checked with the invoices for sale of electricity to the consumers by Assistant Manager (Electrical) and General Manager.
QA / QC procedure applied	These meters are maintained by state electricity board. These meters are annually calibrated and the records maintained by state electricity department.
Any comment:	

4.1 Calibration/Maintenance of Measuring and Analytical Instruments

Electricity meters are properly maintained with regular testing and 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.

5.0 GHG Calculations

5.1 Project Activity 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.

5.2 Leakages

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.

5.3 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:

The weighted average emissions (in tCO₂equ/MWh) of the current generation mix.

$$BE_y = EF_y \times EG_y$$

Where,

BE_y: Baseline emissions due to displacement of electricity during year y in tons of CO₂

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

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

During the current Monitoring Period 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. Before commissioning of Toss project the electricity measurements used to be taken as mentioned in the table below:

Sr. No.	Particulars	Tool for measurement	Source
1	Malana Generation	Meter-at-Malana	Actual from JMR Reading
2	Total Energy sent out by Malana	Meter at Malana - BUS	Actual from JMR Reading
3	Auxiliary Consumption by Malana HEP	Calculations =(1-2)	Readings at 1&2
4	Energy Injected at Bajaura (Net Electricity Exported)	Meter-at- Bajaura	Actual from JMR Reading
5	Transmission losses up to Bajaura	Calculations =(2-4)	Reading at 2&4

Toss project started utilising the Malana Bus Bar from 10th August 2009 onwards. Since there was a common meter for measuring the electricity sent out from Malana Bus Bar hence now the calculation of Auxilliary consumption and transmission losses are based on combined energy sent out & combined energy injected at Bajaura Sub Station. The calculation for Auxilliary consumption and transmission losses for Malana HEP is described in the table below:.

Sr. No.	Particulars	Tool for measurement	Source
1	Malana Generation point	Meter-at-Malana	Actual from JMR Reading
2	Energy sent out by Toss (Toss incoming line is at the Malana yard)	Meter in Toss incoming line	Readings Being recorded by HPSEB
3	Total Energy sent out by Malana and Toss	Meter at Malana - BUS	Actual from JMR Reading
4	Auxiliary Consumption by Malana	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 Bajaura	Meter-at- Bajaura	Actual from JMR Reading
7	Transmission losses up to Bajaura (Total)	Calculations =(6-3)	
8	Share of losses –Malana	Calculations =[Total losses (7) x Power sent out by Malana (5)] / [Total power sent out Malana +Toss (3)]	
9	Share of losses -Toss	Calculations =[Total losses(7) x Power sent out by Toss(2) / [Total power sent out Malana +Toss (3)]	
10	Energy injected by Malana at Bajaura Substation	Calculations = [Malana Generation (1) – Auxiliary	

Reference: 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 by Malana is calculated as per formula no. 4 in the table above. The share of transmission loss for Malana is calculated as formula no. 8 in the table above. 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.

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

Month	Gross generation (MWh)	Auxiliary Consumption (MWh)	Transmission Loss (MWh)	Energy Supplied to Grid EG _y (MWh)
April-09	12089	49	68	11972
May -09	25073	90	143	24840
June -09	37933	117	263	37553
July -09	64200	184	601	63415
Aug-09	64080	176	601	63303
Sept-09	40956	130	275	40551
Total	244330	745	1951	241634

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 $GEN_i * GEF$

Month	Energy Supplied to Grid (MWh)	Grid Emission Factor (tCO ₂ /MWh)	Baseline emissions (tCO ₂ e)
April-09	11972	0.75	8,979
May-09	24840	0.75	18,630
June-09	37553	0.75	28,164
July-09	63415	0.75	47,561
August-09	63303	0.75	47,476
September-09	40551	0.75	30,413
Total	241634		181,223

5.4 Emission Reductions

$$ER_y = BE_y - PE_y - L_y$$

BE_y = Baseline Emissions as calculated in Section 5.3

PE_y = Project emissions = 0

L_y = Leakages = 0

Emission Reductions

Month	Emission Reductions (tCO ₂ e)
April-09	8,979
May -09	18,630
June -09	28,164
July -09	47,561
Aug-09	47,476
Sept-09	30,413
Total	181,223

Hence, total Emission Reductions of **181,223 tCO₂e** are achieved by Project activity from 01st April 2009 to 30th September 2009.

6. Outage Details

Malana HEP was shut down at various times during monitoring period because of various reasons as stated in below table.

Outage Details			
Month	Shutdown period (in hours)		Reason
	Unit 1	Unit 2	
Apr-09			
May-09		0:16	Grid Failure
Jun-09	0:20	0:32	24 V DC Battery charger failure
Jul-09	0:42	0:42	Grid Failure
	2:43	1:44	Tunnel Intake Trash Rack Choke
Aug-09	0:21	0:18	Grid Failure
Sep-09			

7. Meter Calibration

Installed Place	MAKE	Meter Serial No.	Date of Calibration
Malana Generation Point	Secure Meter	KRB00280	24.07.2009
	Secure Meter	KRB00282	27.07.2009
	Secure Meter	AB0013A	09.04.2009
	Secure Meter	AB0014A	09.04.2009
Malana Transmission point (Sent Out)	Secure Meter	AB0001A	09.04.2009
	Secure Meter	AB0002A	09.04.2009
	Secure Meter	AB0003A	09.04.2009
	Secure Meter	AB0004A	09.04.2009
Bajaura Substation Point	Secure Meter	AB0008A	16.07.2009
	Secure Meter	AB0009A	16.07.2009
	Secure Meter	AB0007A	12.06.2009
	Secure Meter	AB0005A	24.07.2009

Six spare meter has been kept to replace with installed meters while doing calibration or failures of meters. Detail of the meters are provided below:

Calibration Details of Spare (Emergency) Trivector Meters at Malana Power plant .

	Replaced (old) Meter Serial No.	Caliberation Valid upto	Replacement Date		New Meter Serial No.	Calibration Valid from	Calibration Valid upto
1	KRB00279	10.08.2009	09.08.2009	1	KRB00279	06.10.2009	06.10.2010
2	AB0012A	10.08.2009	08.08.2009	2	AB0012A	06.10.2009	06.10.2010

Calibration Details of Spare Trivector Meters at Malana Power plant .

	Replaced (old) Meter Serial No.	Caliberation Valid upto	Replacement Date	Remarks
1	KRB00281	10.08.2009	09.08.2009	These meters will be calibrated annually
2	AB0010A	10.08.2009	08.08.2009	
3	AB0011A	10.08.2009	08.08.2009	
4	AB0006A	16.01.2009	01.05.2009	

8. Comparison between actual VERs generated v/s VERs estimated in the registered PDD

Annual VERs estimated in registered PDD	272849
As per registered PDD number of ERs for the period of 6 months	136424 VERs
Actual VERs generation during monitoring for the period of 6 months	181223 VERs
Difference in estimated ERs in PDD and actual generated ERs for monitoring period	44799 VERs (+32.8%)
Actual VERs generated in a year (October, 2008 to September, 2009)	47959(Oct 2008 –Mar 2009)+181223 (Apr 2009- Sep 2009) = 229182
Difference in estimated ERs in PDD and actual generated ERs on Yearly basis	(- 43667) (-16%)
Reason for the variation	The amount of VERs claimed in the validated PDD and actual VERs generated in the current monitoring period have the difference of +32.8% which is due to better

	PLF achieved between June to September. These four months account 65 to 70 % of total electricity generation of every year (Reference: 2nd, 3rd and 4th Monitoring Period ER sheets). This better PLF is due to peak flow of water in Monsoon Season (June-September) which adds up the water coming from Himalayan valley catchment area into the river consequently leads to bulk of electricity generation. While in winter season PLF remains low due to slow ice melting rate which leads to lower electricity generation. But Summation of VERs for entire one year (October, 2008 to September, 2009) have the difference of -16.0% as compared with the estimations in the validated PDD. Hence the actual emission reduction by the project is less than the estimated reductions on ground.
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Annex -1

Contact details:

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Annex -2

Remaining findings/Issues from previous verifications

One FAR (FAR I1) was raised during the third verification. The explanation and the accounting of the same has been provided below:

FAR: In the context of CAR 1¹ the frequency of calibration of the energy meters shall be defined by the project participant and it shall be verified during the next periodic verifications.

Reply by PP: The calibration frequency would be annual and the calibration certificates of all energy meters would be made available to DOE for verification.

Accounting FAR in the current Monitoring period: Calibration frequency of the energy meters have been maintained on annual basis by the PP and the calibration certificates have been made available to the DOE. Six spare meter has been kept to replace with installed meters while doing calibration or failures of meters. Calibration certificates are kept in record to check the frequency of calibration of Meters.

¹ Raised during the 3rd verification; refer verification report number 53206509-09/166 dated 26 May 2009