

“86 MW Hydro Project in Himachal Pradesh”

Monitoring report - VERs

1. Title of the project activity

Title: 86 MW Hydro Project in Himachal Pradesh

Version: Ver 01

Date of completion of the Monitoring Report: 09/04/2007

2. Introduction

The purpose of this monitoring report is to calculate the Greenhouse Gas emission reduction achieved by the above mentioned project activity for the period starting from July 2001 to March 2007.

The monitoring report covers the activity from 05/07/2001 till 31/03/2007.

3. 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

4. Definitions in the report

PDD: Project Design Document

GHG: Greenhouse Gases

IPCC: Intergovernmental Panel on Climate Change

CER: Certified Emissions Reduction

5. General description of the project

5.1. Project Activity

The purpose of the project activity is to generate electricity by using the renewable energy sources (water) for a grid system in the state of 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., a power trading and utility company owned by Government of India, under the power trading agreement. This electricity will be further delivered to HVPNL (Haryana Vidyut Prasar Nigam Limited and MPCL (Madhya Pradesh Power Corporation Ltd.).

The electricity generation facility is installed on Malana Nallah, a tributary of Parbati River. The project activity entails installation of two turbine of capacity 43MW each along with other auxiliary devices implemented at village Jari, Kullu District, Himachal Pradesh. The project activity has the capacity to generate about 370 million units per annum and this estimation is based on 95% power plant availability for a 90% dependable year based on the hydrological data for the last 24 years provided by the Government of Himachal Pradesh.

Malana Power Company Limited (MPCL) is the developer of the project activity, and has been promoted by LNJ Bhilwara group .Its flagship company, Rajasthan Spinning and Weaving Mills Limited (RSWM) is a leading textile mill in India for manufacture of polyester viscose yarn and fabric. The group has registered office in New Delhi. The group has business interest in textile; graphite electrodes oil exploration, sponge iron, financial services and exports. The company has taken all the necessary approvals from Government of Himachal Pradesh (GoHP) for the installation, operation and maintenance of the project and sell the generated electricity.

Emergent Ventures India Pvt Ltd (EVI) is project advisor for the CDM project. VERs will be shared between MPCL and EVI based on an agreement between them.

5.2. Technical description of the project

The project is a grid connected hydel power plant which is run of the river 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 2.8 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 housed in a surface powerhouse. The plant will be generating 370 GWh of energy annually. It will provide a peaking capacity benefit for four hours per day year round for a minimum of 86 MW.

The project consisting of a barrage comprising 3 spillway bays each in the right flank of Malana Nallah to pass 50 year design flood of 614 cumecs at maximum / normal pond level. The head regulator is located on the left bank of Malana Nallah upstream of barrage to divert maximum flow of 26.25 cumecs which includes 25% flushing discharge for the de-silting basin. Three bays have been provided in the head regulator. The de-silting basin has been designed to remove all the silts particles up to 0.2 mm size. A diversion channel is provided downstream of barrage structure to carry the design flood of 614 cumecs. Storage reservoir has the storage capacity of 24.9 ha.m to meet the peaking power requirements. The power release would be diverted into the headrace tunnel through an intake structure located at downstream end of the reservoir. The intake at entry has been provided with a smooth transition to D-shaped headrace tunnel. A trapezoidal shaped trash back structure is provided in front of intake to trap and impede passage of floating debris.

The water discharged is channeled through a 2.85 m wide D- shaped pressure tunnel or head race tunnel which is 2800 m long. At the end of headrace tunnel, a surge shaft has been provided which is 72 m high and has an orifice diameter of 1.4 m to certain the height of surges.

A vertical pressure shaft of 2.5 m diameter followed by a steel lined horizontal pressure tunnel of 2.2 m diameter which runs down the hill slope and bifurcates into two branches of 1.5 m diameter each to feed the two vertical axis type Pelton units. To exploit the net head of 480 meters, a power house has been created with two units of 43 MW each and is also housing the step-up transformer. A 132 KV transmission line then evacuates the power to a place called Sarabhai, approx. 25 km away from the plant and feeds it into the HPSEB network.

Technical Highlights of Project:

- | | |
|--------------------------|------------------------|
| 1. Capacity of Reservoir | : 2,35,000 cubic meter |
| 2. Diameter of Penstock | : 2.2 meter |

3. Design Discharge : 21 cubic meter/ second
4. Number of Head race tunnel: One 3280 meter Long

Power House Complex

1. Installed Capacity : 86 Mw
2. Size of Power House : 55m X 18.7m X 28.9 m
3. Type of Turbines : Pelton , Vertical Axis
4. Generating Units : 2 Units of 43 MW each
5. Maximum Gross Head : 505 m

5.3. Contact Information

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6. Monitoring methodology and plan:

The project activity meets the applicability criteria of the ‘Approved baseline methodology ACM0002’. The applicability criteria of the ‘Approved monitoring methodology ACM0002’ are identical to those of the ‘Approved baseline methodology ACM0002’. Therefore the project activity has used the ‘Approved monitoring methodology ACM0002’ in conjugation with the ‘Approved baseline methodology ACM0002’ for the project activity.

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

- Net electricity supplied to the state grid by project activity.
- GEF (grid emission factor) of Northern grid, the grid to which project activity supplies power. The GEF is taken from available public source published by

Data being collected in order to monitor the GHG reduction is given in Annex-1

7. Quality Control (QC) and Quality Assurance (QA)

Refer Annex-1

7.1. Calibration/Maintenance of Measuring and Analytical Instruments

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.

7.2. Environmental Impact

There are no negative environmental impacts from the project activity.

8. GHG Calculations

8.1 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. Hence, no formulae are applicable.

8.2 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.

8.3 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, and

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 at the supply points. The net electricity supplied is measured as

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

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

In MWh	Net Generation (to grid)
2001-02	184,767.8
2002-03	333,709.55
2003-04	342,591.16
2004-05	272,535.98
2005-06	336,306.53
2006-07	323,305.27

Grid Emission Factor

As discussed GEF is taken from available public source i.e. CEA published data.

<http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm>

From above source we summarize that

Parameter	Value
OM	0.97
BM	0.53
CM	0.75

There for $EF_y = 0.75 \text{ tCO}_2/\text{MWh}$

Baseline Emissions

Formula for Baseline emissions as discussed is $GEN_i * GEF$ (for a particular year)/1000

2001-02			
Month	Net Generation (KWh)	GEF	BEy
Apr-01	-	0.75	-
May-01	-	0.75	-
Jun-01	-	0.75	-
Jul-01	42,466,327	0.75	31,850
Aug-01	60,304,752	0.75	45,229
Sep-01	29,313,000	0.75	21,985
Oct-01	15,599,304	0.75	11,699
Nov-01	8,881,920	0.75	6,661
Dec-01	6,780,024	0.75	5,085
Jan-02	5,639,616	0.75	4,230
Feb-02	4,791,456	0.75	3,594
Mar-02	10,991,448	0.75	8,244
Total			138,576

2002-03			
Month	Net Generation (KWh)	GEF	BEy
Apr-02	21,476,948	0.75	16,108
May-02	46,647,823	0.75	34,986
Jun-02	49,757,018	0.75	37,318
Jul-02	63,759,367	0.75	47,820
Aug-02	64,377,843	0.75	48,283
Sep-02	36,902,035	0.75	27,677
Oct-02	15,886,398	0.75	11,915
Nov-02	8,815,734	0.75	6,612
Dec-02	6,774,336	0.75	5,081
Jan-03	5,423,256	0.75	4,067
Feb-03	4,686,984	0.75	3,515
Mar-03	9,201,809	0.75	6,901
Total			250,282

2003-04			
Month	Net Generation (KWh)	GEF	BEy
Apr-03	19,712,232	0.75	14,784
May-03	33,994,152	0.75	25,496
Jun-03	58,195,296	0.75	43,646
Jul-03	68,511,528	0.75	51,384
Aug-03	65,486,952	0.75	49,115
Sep-03	45,455,256	0.75	34,091
Oct-03	17,280,648	0.75	12,960
Nov-03	9,805,284	0.75	7,354
Dec-03	6,723,936	0.75	5,043
Jan-04	4,306,536	0.75	3,230
Feb-04	2,104,920	0.75	1,579
Mar-04	11,014,416	0.75	8,261
Total			256,943

2004-05			
Month	Net Generation (KWh)	GEF	BEy
Apr-04	14,765,112	0.75	11,074
May-04	26,860,536	0.75	20,145
Jun-04	33,803,136	0.75	25,352
Jul-04	50,128,056	0.75	37,596
Aug-04	57,392,928	0.75	43,045
Sep-04	32,362,776	0.75	24,272
Oct-04	15,446,880	0.75	11,585
Nov-04	9,482,616	0.75	7,112
Dec-04	7,404,048	0.75	5,553
Jan-05	6,436,008	0.75	4,827
Feb-05	5,866,488	0.75	4,400
Mar-05	12,587,400	0.75	9,441
Total			204,402

2005-06			
Month	Net Generation (KWh)	GEF	BEy
Apr-05	23,792,616	0.75	17,844
May-05	30,875,832	0.75	23,157
Jun-05	49,121,136	0.75	36,841
Jul-05	73,747,800	0.75	55,311
Aug-05	69,999,696	0.75	52,500
Sep-05	48,483,792	0.75	36,363
Oct-05	18,643,320	0.75	13,982
Nov-05	10,201,176	0.75	7,651
Dec-05	7,417,224	0.75	5,563
Jan-06	4,023,936	0.75	3,018
Feb-06	-	0.75	-
Mar-06	-	0.75	-
Total			252,230

2006-07			
Month	Net Generation (KWh)	GEF	BE_y
Apr-06	9,070,272	0.75	6,803
May-06	39,270,024	0.75	29,453
Jun-06	33,793,128	0.75	25,345
Jul-06	70,244,208	0.75	52,683
Aug-06	71,836,272	0.75	53,877
Sep-06	41,736,888	0.75	31,303
Oct-06	18,092,664	0.75	13,569
Nov-06	9,544,392	0.75	7,158
Dec-06	7,680,528	0.75	5,760
Jan-07	6,325,272	0.75	4,744
Feb-07	5,072,112	0.75	3,804
Mar-07	10,639,512	0.75	7,980
Total			242,479

8.4 Emission Reductions

$$ER_y = BE_y - PE_y - L_y$$

BE_y = Baseline Emissions as calculated in Section 8.3

PE_y = Project emissions = 0

L_y = Leakages = 0

In MWh	Emission Reductions
2001-02	138,576
2002-03	250,282
2003-04	256,943
2004-05	204,402
2005-06	252,230
2006-07	242,479
Total	1,344,912.3

So a total Emission Reduction of = **1,344,912 tCO₂** is achieved by Project activity from July 2001 to Mar 2007.

Annex-1

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 Grid Emission Factor for northern region grid.

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

Data / Parameter:	GEN_{i,y}
Data unit:	MWh
Description:	The units supplied by the project activity (hydel power project) to the NR grid during a particular year.
Source of data used:	Meters installed at the project site would accurately monitor electricity supplied to the grid. Invoice details of these sales to various customers could also be used for cross-checking the data.
Value applied:	Tabulated in Section 8.3
Justification of the choice of data or description of measurement methods and procedures actually 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.
QA / QC procedure applied	These meters are maintained by state electricity board. These meters are regularly calibrated and the records maintained by state electricity department. Copies of same have been provided.
Any comment:	

Data / Parameter:	GEF_y
Data unit:	tCO ₂ equ/MWh
Description:	Emissions per MWh of energy supplied to grid by grid sources.
Source of data used:	CEA Website.
Value applied:	0.75
Justification of the choice of data or description of measurement methods and procedures actually	The value used is from a published source i.e. Central Electricity Authority (CEA).

applied :	
QA / QC procedure applied	-
Any comment:	-

Annex -2

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