

MONITORING REPORT

“300MW Hydro-power Project by JPHL”

Voluntary Carbon Units (VCUs):

1st March 2010 -31st August 2010
(Both days included)

Monitoring Report Version: Version 1.1

Date: 23/10/2010.

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Baspa Hydro-electric Project (BASPA)

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Monitoring report for VERs

1. Title of the project activity

Title: 300MW Hydro-power Project by JHPL

Version: 1.1

Date: 23/10/2010

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 March 2010 to August 2010.

The monitoring report covers the activity from 01/03/2010 till 31/08/2010.

3. Details of the previous issuances:

The project was registered on 26-12-2008.

It has undergone three rounds of verification. The current phase is the fourth round of verification. The verification history is given below.

Description	Date	Time period	Volume of VCU's.
1 st Verification report	26-Dec-08	01-Jan-07 to 30-Sep-08	1919161
2 nd Verification report 1	21-Nov-09	01-Oct-08 to 28-Feb-09	146049
2 nd Verification report 2	21-Nov-09	01-Mar-09 to 31-Aug, 09	702385
3 rd Verification report	24-May-10	01-Sep-09 to 28-Feb-10	306529

4. General description of the project

4.1. Project Activity

The Baspa project is a run-of-the-river hydro-electric power plant with an installed capacity of 300 MW. The diversion barrage of the project is located across river Baspa, at Kuppa in Himachal Pradesh. The power house is located at Karcham village in Kinnaur District. The project activity is an initiative of Jaiprakash Power Ventures Limited (JPVL) (formerly known as Jaiprakash Hydro Power Limited (JHPL)) a part of the Jaypee Group. Jaypee is a well-known business group of India and had entered into agreement with State Government of Himachal Pradesh to implement the project. The purpose of the project activity is to generate electricity using renewable hydro energy and sell it to Himachal Pradesh State Electricity Board (HPSEB).

The project site is located about 210 Kms from Shimla. Shimla is connected to the project site by National Highway-22 (Hindustan Tibet Road). Nearest broad gauge railway station from the project site is Kalka which is about at a distance of 300 Kms from the project site.

Emergent Ventures India Pvt Ltd (EVI) is the project advisor for the VCS project.

4.2. Technical description of the project

The project, being a run-of-river type Hydro-Power project, would generate power by utilizing the water diverted from the flow of river Baspa. The flow in the river Baspa is contributed by several nullahs and khuds and numerous glaciers. The diversion barrage of the project is located across river Baspa, one of the major tributaries of river Satluj, at Kuppa in Himachal Pradesh. Water is diverted from the barrage to the power house through a diversion barrage. Two open sedimentation chambers are used after the diversion barrage to exclude the silt from water used for power generation. The water is passed through a head race tunnel of about 7.95 km long and steel lined pressure shaft (about 845 meters long to create a design head of 702 meters) which is branching into three penstocks for running 3 pelton turbines of 100 MW each. A surge shaft has been constructed between the head race tunnel and the pressure shaft which would be used to regulate the flow.

The power generated is stepped up to 400 KV and is evacuated by two circuits of 400 KV lines for the power station to Jhakri substation, which is about 55 Km from the site. The transmission line from the power station to Jhakri consisting of 121 towers has been installed as a part of the project. From Jhakri, 400 KV transmission system is utilized to evacuate the full output of JPVL (300 MW) hydro electric project.

The geographical location of the power house is between Longitude 78°17.35' East and Latitude 31°50.56' north

5. Monitoring methodology and plan:

The monitoring methodology applied to the project activity is:

Title: “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources”

Reference: Approved consolidated monitoring methodology ACM0002/Version 08, Sectoral Scope: 1, EB- 44

Keeping in line with the Monitoring Methodology, the following parameters are monitored in the specific project situation:

- Net electricity supplied to the state grid by project activity.

- GEF (grid emission factor) of NEWNE grid, the grid to which project activity supplies power. The GEF has been fixed ex-ante in the PDD; value used is 0.805 tCO₂/ MWh¹.

6. GHG Emission Calculations

6.1. Project Activity Emissions

A) Emissions from Diesel Consumption (PE_{y1})

There are two 625 KVA capacity DG sets of Cummins India Limited make. The records of diesel consumption are made on a daily basis in the DG operation logbook². This has been included in the project emission calculation from the project activity. Project Emissions from diesel consumption are found using the formula given below.

PE_{y1} is the project emission from diesel consumption.

$$PE_{y1} = Q_{\text{diesel}} \times \ell_{\text{diesel}} \times EF_{\text{diesel}} / 1000$$

Where

Q_{diesel} = Quantity of diesel consumed, litre

ℓ_{diesel} = Density of diesel, 0.860 kg/ litre³

EF_{diesel} = Emission factor of diesel, 3.186 tCO₂e/ tonne⁴ (IPCC Default value)

Month	Diesel consumption (Q _{diesel})	Project Emission (PE _{y1})
Unit	(litres)	(tCO ₂)
Mar-10	8577	23.501
Apr-10	7463	20.448
May-10	5150	14.111
Jun-10	2434	6.669
Jul-10	2502	6.855
Aug-10	2585	7.083
Total	28711	78.667

PE_{y1} = 78.667 tCO₂e

¹ As per the registered VCS PD, CO₂ Emissions Database version 4 -CEA, Downloaded from http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf..

² Submitted to DOE, D.1.Diesel consumption mar-aug 2010, data from the diesel consumption logbook for this verification period.

³ <http://www.iocl.com/Products/DieselSpecifications.pdf>

⁴ Source of IPCC default value: 2006 IPCC guidelines for National GHG Inventories - Table 1.2 for NCV value of diesel, and Table 1.4 for carbon oxidation factor and default carbon content for diesel.

B) Emissions from 22 KV Transmission line (PE_{y2})

The project site at Sholtu is connected via a 22 kV line which supplies power from the HPSEB substation to the site to meet the daily electricity requirements. The reading is measured by the energy meters at the substation and monthly invoices are used to account for the project emissions⁵.

PE_{y2} is the project emission from the 22 kV line which is used for supplying electricity at the site.

$$PE_{y2} = E_{22\text{ kV}} * EF_{\text{grid}} / 1000$$

Where

$E_{22\text{ kV}}$ = Electricity consumed at the site in kWh

EF_{grid} = Grid Emission Factor for NEWNE Grid, 0.805 tCO₂/Mwh (fixed ex ante in PD)

Month	Power consumption ($E_{22\text{ kV}}$)	Project emissions (PE_{y2})
Unit	(Kwh)	(tCO ₂)
Mar-10	1100000	885.500
Apr-10	896000	721.280
May-10	792000	637.560
Jun-10	720000	579.600
Jul-10	706000	568.330
Aug-10	756000	608.580
Total	4970000	4000.850

$$PE_{y2} = 4000.850 \text{ tCO}_2\text{e}$$

C) Emissions from SF6 (PE_{y3})

At the project site the PP stores some quantity of SF6 which may be required to top up the circuit breaker compartments in case of any pressure drop as per the monitoring parameters. The PP monitors the SF6 pressure parameter on the SCADA system to account for abnormalities⁶. In case of any leakage or any abnormality observed in any of the units, the alarm trips on the SCADA system and the PP records the pressure in the various units. The tripping of the alarm is directly related to the pressure conditions of the breaker, bay and feeders at the respective pressures as given below:

Monitoring Parameter	Description	Value
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⁵ Monthly invoices are used to monitor these emissions, submission D.2. 22 kv line bill, has the data that has been used in the estimation of PE_{y2}

⁶ Submitted to DOE D.3. SF6 -SCADA logs and wts of cylinders, forms the basis for the SF6 monitoring.

$P_{BAY VT}$	SF6 gas pressure in the BAY VT	3.05 bar
$P_{breaker}$	SF6 gas pressure in the Breaker	4.95 bar
P_{feeder}	SF6 gas pressure in the Feeder	4.55 bar

The table shows the minimum pressure which must be maintained in the compartments to prevent the alarm from tripping and thus leakage of SF6. The monthly statements maintained by the PP show that no leakage of the gas took place in the current monitoring period. The “no” in the statement indicates that there was no tripping of alarm on a particular day, thus implying that the minimum pressure was maintained in the individual compartments.

Annual readings of pressure are taken at bay, breaker and feeder using the Digital pressure indicator (DPI). These were taken on 4th November 2009, during the 3rd Verification period. In case of no abnormality being report from the pressure system the next reading will be taken around 4th November 2010, annual recording procedure. The pressure in all three – bay, feeder and breaker, was much above the required limit. Thus, this again proves that there was no need for SF-6 top ups during this verification period.

PE_{y3} is the project emission on account of leakage of SF6 from the circuit compartments.

$$PE_{y3} = Q_{SF6} \times GWP_{SF6}$$

Where

Q_{SF6} = Quantity of SF6 topped up from cylinders into circuit breaker compartments; tonnes

GWP_{SF6} = Global Warming Potential of SF6 (23900)

The SF6 cylinders were installed at the site during the commissioning of the project by Alstom.

As indicated in the PD, an electronic balance has been installed on site in March 2009.

SN	Weight of SF6 in cylinder before this verification period	Weight of SF6 in cylinder after this verification period	Weight of SF6 consumed	Project Emissions from SF6 consumption (PE_{y3})
	Kg	kg	tonnes	(tCO2)
1	592.2	592.2	0.00000	0.000
2	39.4	39.4	0.00000	0.000
3	38.4	38.4	0.00000	0.000
4	41.7	41.7	0.00000	0.000
5	41.8	41.8	0.00000	0.000
Total	753.5	753.5	0.00000	0.000

There is no change in weight of gas in cylinders through this verification period and the SF6 alarm log shows that no top up was needed in this verification period.

Since, in the current monitoring period of the project activity, the PP was not required to top up the compartments with SF6, hence

$PE_{Y3} = 0.000 \text{ tCO}_2\text{e}$

Total Project Emissions:

$$PE_{Y1} + PE_{Y2} + PE_{Y3} = 78.667 + 4000.850 + 0.000 = 4079.517 \text{ tCO}_2$$

6.2 Leakages (L_y)

As per the methodology, *the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). Project participants do not need to consider these emission sources as leakage in applying this methodology.*

Hence project participants do not need to consider leakage in applying this methodology.

Thus $L_y = 0$

6.3 Baseline Emissions (BE_y)

$$BE_y = EF_y \times EG_y$$

Where

BE_y : Baseline emissions due to displacement of electricity during year y in tons of CO_2

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

EF_y : CO_2 baseline emission factor for the electricity displaced due to the project activity was fixed ex ante in the PD as 0.805 tonne CO_2/MWh .

Energy supplied to Grid (EG_y)

The energy supplied to grid is measured using electricity meters installed at the grid interconnection point at Jhakri sub-station. The net electricity delivered to the grid is based on the JMR readings taken in the presence of the plant personnel and HPSEB official⁷.

Monthly power generation details are given below. In order to maintain a conservative estimate, we have considered Net power export after reducing 0.2% permissible meter error from the electricity exported to grid and adding 0.2% meter error to the electricity imported from the grid.

⁷Pg 1-6 of Submitted to DOE -D.4. JMR. This is the reference for estimating net electricity exported to the grid by the project.

Month	Power Exported to grid*	Power Import from grid*	Power Export (after deducting 0.2%)	Power Import (after adding 0.2%)	Net power exported to grid (EG _y)
Unit	(MWh)	(MWh)	(MWh)	(MWh)	(MWh)
Mar-10	36560.00	80.00	36486.88	80.16	36406.72
Apr-10	62410.00	90.00	62285.18	90.18	62195
May-10	154740.00	0.00	154430.52	0	154430.52
Jun-10	204210.00	0.00	203801.58	0	203801.58
Jul-10	242750.00	10.00	242264.5	10.02	242254.48
Aug-10	233460.00	10.00	232993.08	10.02	232983.06
Total	934130.00	190.00	932261.74	190.38	932071.36

*Power exported to grid by the power plant is imported by the grid and the power imported by the power plant is exported by the grid.

Grid Emission Factor (EF_y)

GEF has been fixed Ex-ante in the PD at 0.805 tCO₂/ MWh⁸ and the same has been used in calculation of emission reductions in this Monitoring Report.

Baseline Emissions (BE_y)

Baseline emissions are calculated as the electricity produced multiplied by the grid emission factor.

Month	Net power exported to grid (EG _y)	Emission Factor (EF _{grid,CM,y})	Baseline Emissions (BE _y)
(Unit)	(MWh)	(tCO ₂ /MWh)	(tCO ₂)
Mar-10	36406.72	0.805	29307.410
Apr-10	62195	0.805	50066.975
May-10	154430.52	0.805	124316.569
Jun-10	203801.58	0.805	164060.272
Jul-10	242254.48	0.805	195014.856
Aug-10	232983.06	0.805	187551.363
Total	932071.36	0.805	750317.445

6.4. Emission Reductions (ER_y)

$$ER_y = BE_y - PE_{y1} - PE_{y2} - PE_{y3} - L_y$$

⁸ As per the registered VCS PD, CO₂ Emissions Database version 4 -CEA, Downloaded from http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf..

Month	Baseline Emissions (BE _Y)	Project Emissions from DG set (PE _{Y1})	Project Emissions from 22 kV line (PE _{Y2})	Project Emissions from SF6 (PE _{Y3})	Leakage (L _Y)	Emission Reductions (ER _Y)	Emission Reductions (ER _Y) rounded down
Unit	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)
Mar-10	29307.410	23.501	885.500	0.000	0.000	28398.409	28398
Apr-10	50066.975	20.448	721.280	0.000	0.000	49325.247	49325
May-10	124316.569	14.111	637.560	0.000	0.000	123664.898	123664
Jun-10	164060.272	6.669	579.600	0.000	0.000	163474.003	163474
Jul-10	195014.856	6.855	568.330	0.000	0.000	194439.671	194439
Aug-10	187551.363	7.083	608.580	0.000	0.000	186935.701	186935
Total	750317.445	78.667	4000.850	0.000	0.000	746237.928	746235

Thus the total Emission Reduction of **746235 tCO₂** (rounded-off to the lower value for a conservative estimate) is achieved by the project activity from 1st March 2010 to 31st August 2010, inclusive of both days. Thus, **746235 VCU**s are generated in this period.

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

7.1. Calibration/Maintenance of Measuring and Analytical Instruments

Electricity meters – two main meters and two check meters, are maintained with regular testing and calibration schedules to ensure accuracy. The electricity supplied to the grid is cross-checked with the JMRs for export of electricity to HPSEB. A set of four spare meters are also present at the site. These four meters are calibrated and used alternately every year. The 22 kV transmission line meter which measures the import to the Sholtu site is maintained regularly by HPSEB. All other instruments which form a part of the monitoring of the project are also regularly tested.

7.1.1. Monitoring Parameter - EG_y

Details of the calibrated meters (both check meters and main meters) for the verification period from 1st March, 2010 to 31st August, 2010⁹.

Date of testing	Serial No	Make	Main/ Check	Testing Centre	Meter Usage Pattern
08 July 2009	UPU 01237	M/s Secure Meter	Main – Line 1	Power Grid Corporation of India	From July 2009 to July 2010
08 July 2009	UPU 01235	M/s Secure Meter	Check – Line 1	Power Grid Corporation of India	From July 2009 to July 2010
07 July 2009	UPU 01238	M/s Secure Meter	Main – Line 2	Power Grid Corporation of India	From July 2009 to July 2010
07 July 2009	UPU 01236	M/s Secure Meter	Check – Line 2	Power Grid Corporation of India	From July 2009 to July 2010
07 July 2010	GEC 04052	M/s Secure	Main – Line 1	Power Grid	From July 2010

⁹ Submission D.5. Meter calibration certificates includes details of calibration of all meters.

		Meter		Corporation of India	to July 2011
08 July 2010	GEC 04054	M/s Secure Meter	Check – Line 1	Power Grid Corporation of India	From July 2010 to July 2011
08 July 2010	UPU 01762	M/s Secure Meter	Main – Line 2	Power Grid Corporation of India	From July 2010 to July 2011
08 July 2010	UPU 01763	M/s Secure Meter	Check – Line 2	Power Grid Corporation of India	From July 2010 to July 2011

As a practise the installed meters are replaced every year successively with the set of spare calibrated meters in the presence of the PP and HPSEB Board personnel. The meters were replaced on 10th July 2010 for both Line 1 and 2 as shown in the table above.

A comparison of readings taken by the main and check meter for the current period is presented below:

Comparison of readings from the Main and Check meter:

Exports from power-plant/ imports by grid.¹⁰

Month	Meter No.: Main Meter Line 1	Main meter Reading-Import by grid (Line 1)	Meter No.: Check Meter Line 1	Check meter Reading-Import by grid (Line1)	Difference	% Difference	Meter No.: Main Meter Line 2	Main meter Reading-Import (Line 2) by grid	Meter No.: Check Meter Line 2	Check meter Reading-Import by grid (Line2)	Difference	% Difference
Unit		(GWh)		(GWh)	(GWh)	(%)		(GWh)		(GWh)	(GWh)	(%)
Mar-10	UPU 01237	10.26	UPU 01235	10.26	0.00	0.00%	UPU 01238	26.30	UPU 01236	26.31	-0.01	-0.04%
Apr-10	UPU 01237	31.12	UPU 01235	31.12	0.00	0.00%	UPU 01238	31.29	UPU 01236	31.28	0.01	0.03%
May-10	UPU 01237	76.78	UPU 01235	76.77	0.01	0.01%	UPU 01238	77.96	UPU 01236	77.97	-0.01	-0.01%
Jun-10	UPU 01237	101.45	UPU 01235	101.43	0.02	0.02%	UPU 01238	102.76	UPU 01236	102.77	-0.01	-0.01%
Jul-10	UPU 01237+ GEC04 052	120.73	UPU 01235+ GEC04 054	120.72	0.01	0.01%	UPU 01238+ UPU 01762	122.02	UPU 01236 + UPU 01763	122.03	-0.01	-0.01%
Aug-10	GEC 04052	116.43	GEC 04054	116.42	0.01	0.01%	UPU 01762	117.03	UPU 01763	117.03	0.00	0.00%

Imports from power-plant/ Exports by grid¹¹.

¹⁰ Submission D. 4. JMR, pgs 6-13 includes details of readings recorded on main and check meter. These details are used for this estimate

¹¹ Submission D. 4. JMR, pgs 6-13 includes details of readings recorded on main and check meter. These details are used for this estimate

Month	Meter No.: Main Meter Line 1	Main meter Reading-Import by grid (Line 1)	Meter No.: Check Meter Line 1	Check meter Reading-Import by grid (Line1)	Difference	% Difference	Meter No.: Main Meter Line 2	Main meter Reading-Import (Line 2) by grid	Meter No.: Check Meter Line 2	Check meter Reading-Import by grid (Line2)	Difference	% Difference
Unit		(GWh		(GWh	(GWh	(%)		(GWh		(GWh	(GWh	(%)
Mar-10	UPU 01237	0.05	UPU 01235	0.05	0.00	0.00%	UPU 01238	0.03	UPU 01236	0.03	0.00	0.00%
Apr-10	UPU 01237	0.09	UPU 01235	0.09	0.00	0.00%	UPU 01238	0.00	UPU 01236	0.00	0.00	0.00%
May-10	UPU 01237	0.00	UPU 01235	0.00	0.00	0.00%	UPU 01238	0.00	UPU 01236	0.00	0.00	0.00%
Jun-10	UPU 01237	0.00	UPU 01235	0.00	0.00	0.00%	UPU 01238	0.00	UPU 01236	0.00	0.00	0.00%
Jul-10	UPU 01237+ GEC04 052	0.01	UPU 01235+ GEC04 054	0.00	0.01	100.00 %	UPU 01238+ UPU 01762	0.00	UPU 01236 + UPU 01763	0.00	0.00	0.00%
Aug-10	GEC 04052	0.01	GEC 04054	0.01	0.00	0.00%	UPU 01762	0.00	UPU 01763	0.01	-0.01	- 100.00 %

The discrepancy between the main and check meter is less than 0.2% (the permissible error for these meters) for nearly all meter reading.

For the records of Jul-10 export by grid (import in power plant) on line 1, and the Aug-10 import by grid (Export by power plant) on line 2, The small discrepancy (0.01 reading difference) between the main and check meters is because only two decimal points are recorded on the GWh displaying meter and this may result in a rounding-off error.

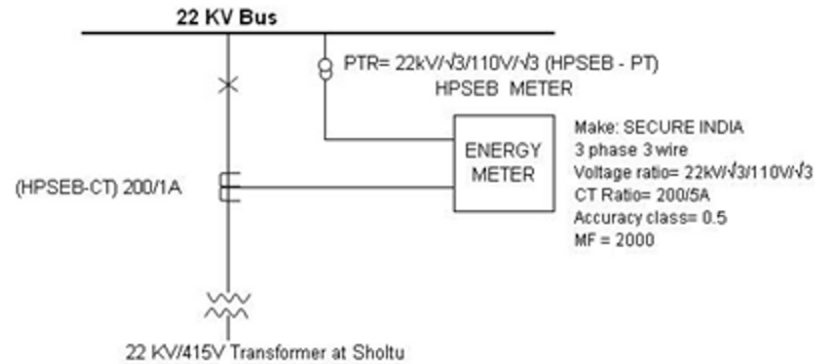
Corroboration of the import by grid- meter readings, in these months (both readings are recorded by the same meter) and the validity of the calibration for this period show that there is no real error on the meters. This is also the finding of the state electricity board representative, as indicated and signed in the JMR for July 2010 and August 2010.

Thus, it may be concluded that the meters are within the permissible limits of error. However, for a conservative estimate of reductions, 0.2% of electricity is added to net export by grid and 0.2% of electricity is deducted from net import by grid in calculating the emission reductions.

7.1.2. Monitoring parameter E 22 kV

Meter number of 22 kV line at substation is HPS00409 513029 and is maintained by HPSEB.

**66/22 KV Nathpa Substation of H. P. State Electricity Board
Metering arrangement**



Diagrammatic representation of the 22kV line.

The meter (HPS00409 513029) has been in place for all previous verifications and for this verification period.

7.1.3 Monitoring parameter Q_{SF6} :

The PP has installed an electronic balance for weighing the cylinders. The balance was calibrated on 15-April-2010¹².

7.1.4. Monitoring parameters $P_{BAY VT}$, $P_{breaker}$, P_{feeder}

Digital Pressure indicator (DPI)

The digital Pressure Indicator (DPI 705IS) is a hand held instrument which is used to measure SF6 gas pressure in various compartments periodically. The correctness is checked by calibrating the instrument.

The instrument was calibrated on 6th May, 2009 and was found to be within its error limits¹³. The instrument detail is given below:

Type Number	DPI-705IS
Manufacturer	Druck Limited
Range	0-20 bars g
Serial Number	70549240

¹² Submission D.6. Electronic weighing balance calibration certificate.

¹³ Pg 3 of submission D.7. DPI calibration certificate- 6th May, 2009.

A new instrument has been purchased. Its details are given below:

Type Number	DPI-705
Manufacturer	Druck Limited
Least count	0.001bar
Serial Number	70553534/10-07

Readings will be taken by this instrument for this year¹⁴(2010-2011).

The existing instrument (serial number 70549240) will then be used from the period 2011to 2012.

¹⁴ This meter is also calibrated and is ready for use in the forthcoming year, pg 1-2 of Submission D.7. pg 1-2

Annexure-1 Definitions in the report

PD: Project Document

GHG: Greenhouse Gases

IPCC: Intergovernmental Panel on Climate Change

SEB: State Electricity Board

VCS: Voluntary Carbon Standard

VCU: Voluntary Carbon Unit