

**MONITORING REPORT FORM (F-CDM-MR)**  
**Version 02.0****MONITORING REPORT**

<b>Title of the project activity</b>	9MW Neria Hydroelectric project, Karnataka, India
<b>Reference number of the project activity</b>	1549
<b>Version number of the monitoring report</b>	01
<b>Completion date of the monitoring report</b>	18/05/2012
<b>Registration date of the project activity</b>	09/10/2008
<b>Monitoring period number and duration of this monitoring period</b>	<b>Monitoring Period : 02</b> <b>Duration:</b> 01/11/2009 to 01/09/2011 (First and last days included)
<b>Project participant(s)</b>	M/s Boruka Power Corporation Limited
<b>Host Party(ies)</b>	India
<b>Sectoral scope(s) and applied methodology(ies)</b>	<b>Sectoral scope :</b> 1: Energy Industry (renewable - / non-renewable sources) <b>Methodology :</b> AMS-I.D. ver. 10 – Grid connected renewable electricity generation
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	34,203
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	37,539

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

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Bhoruka Power Corporation Limited (BPCL) has implemented small hydropower project with two identical generating units of 4.5 MW each totaling to 9.0 MW. The project is situated near Dharmasthala in Dakshina Kannada District of Karnataka state, India. The project is conceived as a run of the river hydroelectric project and hence no storage facility such as dam is envisaged in the project design. The main purpose of the project activity is generation of electricity using hydro potential available in river Neria, a tributary of river Netravathi, for a grid system Karnataka Power Transmission Corporation Ltd. (KPTCL) through sustainable means without causing any negative impact on the environment and to contribute to climate change mitigation efforts.

The project activity comprises diversion structure, power canal, fore bay, penstock, power house and power evacuation system. The powerhouse comprises two synchronous generators of capacity 4.5 MW each coupled to two numbers of horizontal 'S' type full kaplan turbines. The generated voltage at the generator terminals is 11 kV which will be stepped-up to 33 kV to match the nearest substation voltage level.

The project has been completed and both the units were synchronized with KPTCL grid on 27/07/2006.

The present monitoring period is chosen from 01/11/2009 to 01/09/2011. The net electricity supplied to the state grid by the project activity is 43.8498 GWh and the net emission reductions are 37,539 tCO<sub>2</sub>e for the present monitoring period.

**A.2. Location of project activity**

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Country	:	India
District/ State	:	Dakshina Kannada, Karnataka.
Village/ Taluk	:	Dharmasthala, Belthangady
Geographical location	:	12°56'07.20"N (Latitude) and 75° 22'53.87"E (longitude).

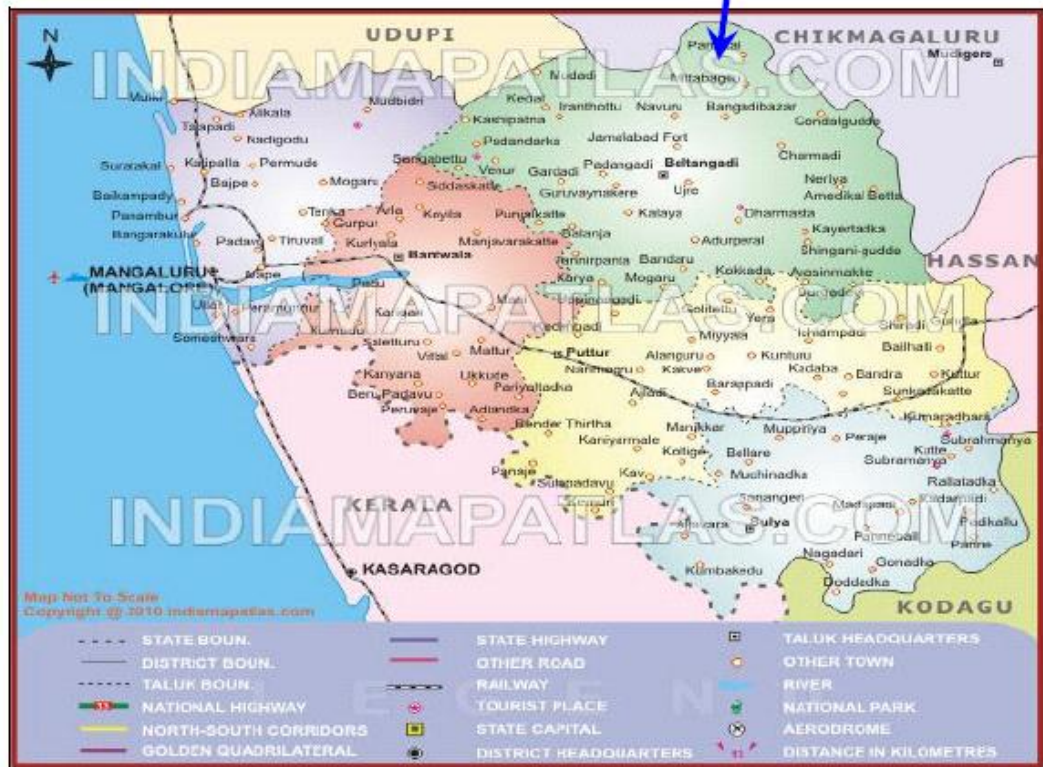
Physical location of the project activity is marked in maps shown below:-



Map 1 : Location of Karnataka state in India



Map 2 : Location of Gulbarga district in state Karnataka



Map 3 : Location of hydro power project in Belthangady taluk of Dakshina kannada district

**A.3. Parties and project participant(s)**

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host): India	M/s Bhoruka Power Corporation Limited	Yes

**A.4. Reference of applied methodology**

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Methodology : [AMS-I.D.](#) Grid connected renewable electricity generation (Version 10)

Tool : Tool for the demonstration and assessment of Additionality (Version 04)

**A.5. Crediting period of project activity**

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Type : Fixed  
 Start date : 09/10/2008  
 Crediting Period : 09/10/2008 to 08/10/2018

**SECTION B. Implementation of project activity****B.1. Description of implemented registered project activity**

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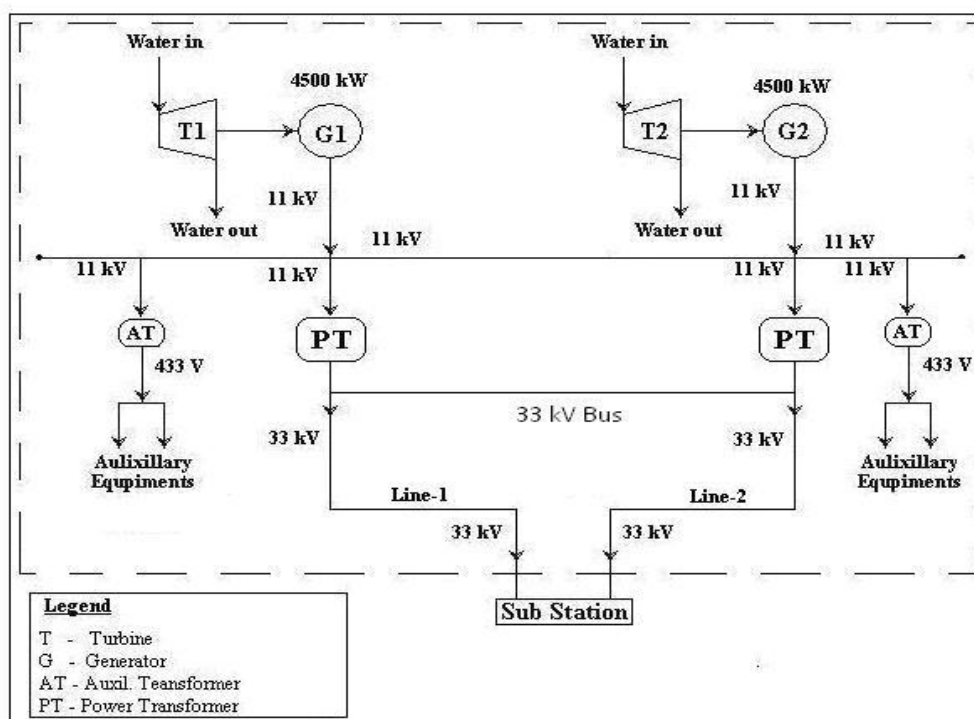
The project is conceived as a run of the river hydroelectric project and hence no storage facility such as dam is envisaged in the project design. Bhoruka Power Corporation Limited (BPCL) has implemented small hydropower project with two identical generating units of 4.5 MW each totaling to 9.0 MW.

The project commissioned and successfully synchronization on 27/07/2006 and is in operation to till date.

The technology or power generation process using hydro resources is converting the potential energy available in the water flow into mechanical energy using hydro turbines and then to electrical energy using alternators. The generated power will be transformed to match the nearest grid sub-station for proper interconnection and smooth evacuation of power.

Equipment Specifications	
<b><u>Turbine:-</u></b>	<b><u>Generator:-</u></b>
Type : 'S' type horizontal full kaplan	Qty : 02
Quantity : 02 in number.	Make : T.D Power Systems Pvt. Ltd
Capacity : 4808.21 kW	Type : Horizontal Synchronous
Rated Discharge : 30 Cumecs/ unit	Rated capacity : 4500 kW
Rated Head : 17.5 Mtr.	Speed : 750 rpm
	Voltage : 11 kV
	Power Factor : 0.85
	Frequency : 50 Hz

Detailed technical process diagram of the project activity is furnished below:-



## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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No temporary deviations occurred to monitoring plan

### B.2.2. Corrections

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No corrections have been applied for in relation to this monitoring period.

### B.2.3. Permanent changes from registered monitoring plan or applied methodology

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The monitoring plan has been revised and same is approved by executive board on 24/08/2011. The details are available at UNFCCC website.

<http://cdm.unfccc.int/Projects/DB/DNV-CUK1200571481.71/view>

### B.2.4. Changes to project design of registered project activity

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There have been no changes to project design of this project activity.

### B.2.5. Changes to start date of crediting period

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There was no post-registration change to the start date of the crediting period.

### B.2.6. Types of changes specific to afforestation or reforestation project activity

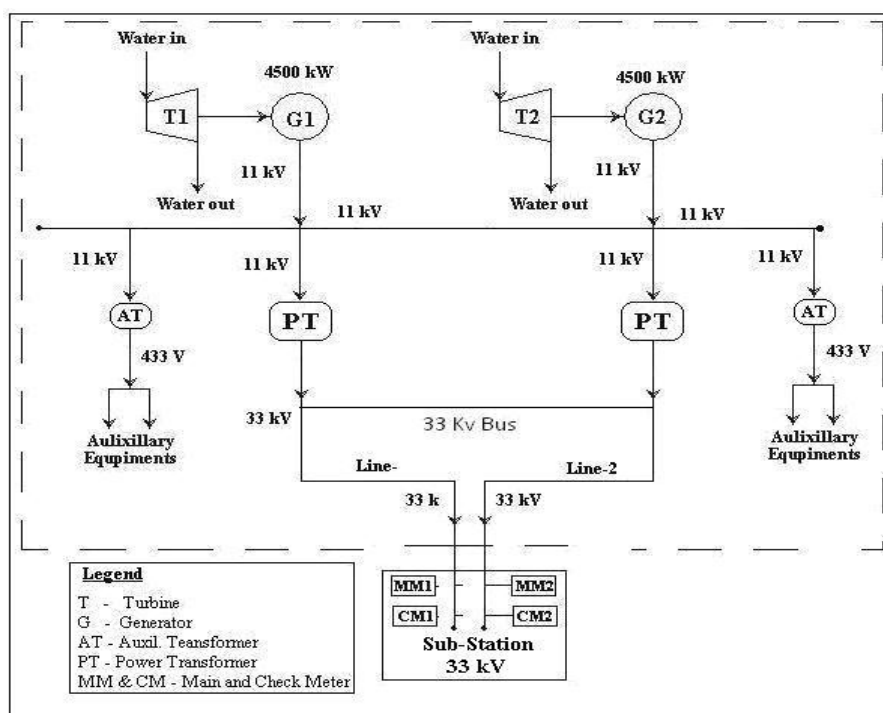
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This project activity is not an afforestation or reforestation project activity.

## SECTION C. Description of monitoring system

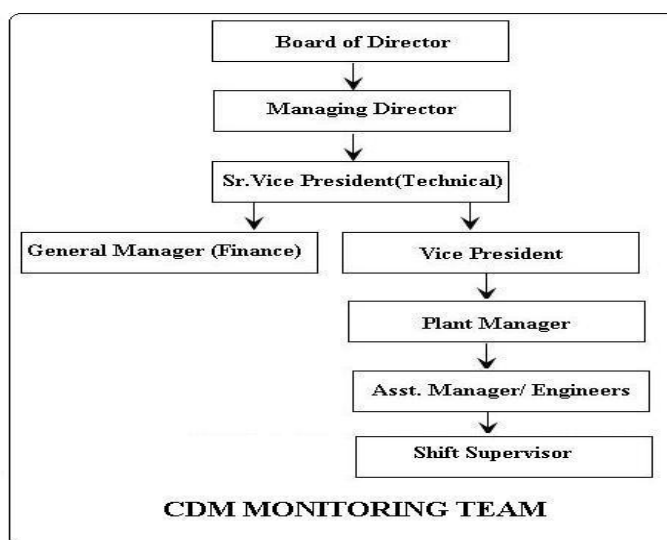
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The project was provided with the monitoring equipments which were described in the registered CDM-PDD and the line diagram for the monitoring parameters are furnished below:-



### CDM Monitoring Team

A CDM team has been formed in Bhoruka Power Corporation Limited (BPCL) for monitoring and verification of all the monitoring parameters as per the guidelines formulated by the management of BPCL. Qualified and trained people monitor the parameters and emission reduction calculations. BPCL is the sole agency responsible for implementation and monitoring of the project activity. The monitoring organisation structure is shown below:-



**Board of Directors**

The Board of directors is responsible for entire monitoring plan. They will review the reports submitted by Managing director.

**Managing Director:**

The Managing Director will examine the reports generated by Vice president (Technical) He will in particular take note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to standards.

**Vice President (technical):**

Vice president is responsible for all the technical aspects. He examines the reports generated by Vice president (O&M) and General Manager (Finance) He is responsible for registration, monitoring, measurement, reporting and reviewing of the data of the CDM activity. He will undertake periodic verification and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions.

**Vice president (O&M):**

Vice president is responsible for Operation and maintenance of running plants. He is assisted by Plant manager. He will examine the reports generated by the Plant Manager with respect to the monthly electricity generation, export, import and annual emission reduction calculations as per the monitoring plan. He is also responsible for reviewing of the data regarding GHG emissions submitted by Plant manager.

**Plant manager:**

Plant manager monitors activities of GHG and preparation of necessary reports, for review by the management, the responsibilities rest with concerned plant manager. He is also responsible for storage and archiving of information in good condition also lies with Plant Manager. He also examines the reports generated by the shift Supervisor with respect to the monthly electricity generation, export, import and annual emission reduction calculations as per the monitoring plan. The calibration of the meters installed will be taken care by him as per the monitoring plan.

**Shift Supervisor:**

Shift Supervisor is responsible for recording the electricity meter readings at project site on daily basis. He will also responsible to take note of net export power to grid, plant shut down times, if any etc. The monthly reports will be generated and submitted to the Plant manager for verification

The generated energy is measured by two main metres and two check metres. Calibration of the metres is carried out by KPTCL as per the PPA, every quarter. The meters are deemed to be working satisfactorily if the errors are within the meter specifications of 0.2s accuracy class.

**Emergency Procedures**

The project has necessary provisions for emergency preparedness so that any unforeseen events such as fire etc. could be averted. The provisions include fire fighting systems, standby features for critical items etc.

**Methods of data transfer and archiving policy:**

The electricity exported to grid and electricity imported from the grid recorded at grid substation, which is under the control of KPTCL. The electrical energy was measured using calibrated meters and recorded at the KPTCL Sub-station. Records of measurements were used for verification of emissions reductions. Sales bills / receipts were used for cross verification of electricity to / from grid as an alternative proof of the electricity exported to the grid. All the data monitored under the monitoring plan will be kept in electronic form and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later.

**SECTION D. Data and parameters****D.1. Data and parameters fixed ex ante or at renewal of crediting period**

<b>Data/Parameter</b>	EF <sub>y</sub>
<b>Unit</b>	tCO <sub>2</sub> /GWh
<b>Description</b>	CO <sub>2</sub> emission factor for the regional grid system
<b>Source of data</b>	Central Electricity Authority (CEA)
<b>Value(s) applied</b>	857 (Ex –ante approach)
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	---

**D.2. Data and parameters monitored**

<b>Data/Parameter</b>	EG <sub>export,y</sub>
<b>Unit</b>	GWh
<b>Description</b>	Electricity exported to the grid by the project during the year y
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Joint Meter readings (Form-B)
<b>Value(s) of monitored parameter</b>	44.046005 (The month wise Electricity Export details are provided in spread sheet)
<b>Monitoring equipment</b>	Main Meter and Check Meter
<b>Measuring/Reading/Recording frequency</b>	Recorded monthly using calibrated meters and aggregated annually.
<b>Calculation method (if applicable)</b>	---
<b>QA/QC procedures</b>	Meters will be calibrated every calendar quarter as per power purchase agreement.
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	---





<b>Data/Parameter</b>	EG <sub>imports,y</sub>
<b>Unit</b>	GWh
<b>Description</b>	Electricity import to the project activity during the year y
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Joint Meter readings (Form-B).
<b>Value(s) of monitored parameter</b>	0.196246 (The month wise Electricity Import details are provided in spread sheet)
<b>Monitoring equipment</b>	Main Meter and Check Meter
<b>Measuring/Reading/Recording frequency</b>	Measured monthly using calibrated meters and aggregated annually.
<b>Calculation method (if applicable)</b>	---
<b>QA/QC procedures</b>	Meters will be calibrated every calendar quarter as per power purchase agreement.
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	---

<b>Data/Parameter</b>	EG <sub>y</sub>
<b>Unit</b>	GWh
<b>Description</b>	Net electricity supplied to the grid by the project
<b>Measured/Calculated/Default</b>	Calculated
<b>Source of data</b>	The electricity exported to grid and electricity imported from the grid values are taken from Joint Meter readings (Form-B).
<b>Value(s) of monitored parameter</b>	43.8498 (The month wise Net Electricity Supply details are provided in spread sheet)
<b>Monitoring equipment</b>	---
<b>Measuring/Reading/Recording frequency</b>	---
<b>Calculation method (if applicable)</b>	The net electricity supplied to the grid is calculated as difference between the electricity exported to the grid and electricity imported from the grid to the project. $EG_y = EG_{\text{export},y} - EG_{\text{imports},y}$
<b>QA/QC procedures</b>	Sale records can be used to cross check.
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	---

<b>Data/Parameter</b>	$F_{i,y}$
<b>Unit</b>	litres
<b>Description</b>	Quantity of fossil fuel type i combusted in the project plant during year y
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Log book
<b>Value(s) of monitored parameter</b>	1,245.5 (The month wise Diesel Consumption details are provided in spread sheet)
<b>Monitoring equipment</b>	Glass gauge provided on the storage tank
<b>Measuring/Reading/Recording frequency</b>	The diesel consumed by the DG set is measured and recorded daily in a log book maintained at project site.
<b>Calculation method (if applicable)</b>	---
<b>QA/QC procedures</b>	The data recorded will be cross checked against the fuel purchase receipts.
<b>Purpose of data</b>	Calculation of project emissions
<b>Additional comment</b>	---

### D.3. Implementation of sampling plan

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Data and parameters monitored described in Section D.2 above are not determined by a sampling approach.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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The baseline emissions are calculated based on the net energy provided to the grid (in GWh/year) and an emission factor for the displaced grid electricity (in tCO<sub>2</sub>/GWh).

$$BE_y = EG_y * EF_y$$

Where,

$EG_y$  = The net electricity exported to the grid system during the year y

$EF_y$  = The emission factor of the grid to which the project exports electricity.

The baseline emission factor in year y is calculated as the simple average of the OM and BM emission factors, i.e. OM and BM are each weighted with 50%. As noted above, the resulting Combined Margin is fixed ex ante for the duration of the crediting period: The project has been considered the validated baseline emission factor (Ex-ante) i.e. 857 tCO<sub>2</sub>/GWh and the same is used as the constant baseline emission factor for the project activity during the crediting period.

### E.2. Calculation of project emissions or actual net GHG removals by sinks

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As the project is equipped with diesel generator to meet the emergency requirements of power house etc., emissions out of usage of fossil fuel (diesel) are being accounted as project emissions by using the following equation.

$$PE_y = F_{i,y} \times COEF_i$$

Where,

$PE_y$  : Project emissions from combustion of fossil fuel (diesel for DG set) in the project activity during the year y

$F_{i,y}$  : Quantity of fossil fuel type i combusted (DG set) during the year y

$COEF_i$  : Carbon dioxide emission coefficient of the fuel type

$$F_{i,y} = 1,245.5 \text{ Liters} * 0.845 \text{ kg/liter}$$

(Density of diesel 0.845 kg/Ltr. as per Society of Indian Automobile Mfgs<sup>1</sup>.)

$$F_{i,y} = 1,052.44 \text{ kg} \text{ ----- (Eq-1)}$$

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i$$

Where,

$NCV_i$  : Net calorific value of diesel (43 TJ/Gg as per IPCC 2006<sup>2</sup>, Volume-2, Table-1.2 @ 95% Confidence interval upper limit value is considered)

$EF_{CO_2,i}$  :  $CO_2$  emission factor of Diesel (74.1 t  $CO_2$ /TJ as per IPCC 2006<sup>3</sup>, Volume-2, Table-1.4 @ 95% Confidence interval upper limit value is considered)

$OXID_i$  : Oxidation factor of the coal (1 as per IPCC 2006 default value).

$$\begin{aligned} COEF_i &= 43.3 \times 74.8 \times 1 \\ &= 3,238.84 / 10^6 \\ &= 0.00323 \text{ tCO}_2/\text{kg} \text{ ----- (Eq-2)} \end{aligned}$$

Hence,

$$PE_y = (Eq-1) * (Eq-2)$$

$$PE_y = 4 \text{ tCO}_2. \text{ (After rounding up conservatively)}$$

### E.3. Calculation of leakage

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Leakage is not considered from the project activity.

<sup>1</sup> <http://www.siamindia.com/scripts/Diesel.aspx>

<sup>2</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2\\_Volume2/V2\\_1\\_Ch1\\_Introduction.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)

<sup>3</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2\\_Volume2/V2\\_1\\_Ch1\\_Introduction.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)

#### E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO <sub>2</sub> e)
01/11/2009 to 01/12/2009	1,096.00	0.05	0.00	1,095.95
01/12/2009 to 01/01/2010	501.09	0.15	0.00	500.94
01/01/2010 to 01/02/2010	216.82	0.04	0.00	216.78
01/02/2010 to 01/03/2010	15.25	0.06	0.00	15.19
01/03/2010 to 01/04/2010	-14.91	0.16	0.00	-15.07
01/04/2010 to 01/05/2010	-16.03	0.71	0.00	-16.74
01/05/2010 to 01/06/2010	-18.17	0.18	0.00	-18.35
01/06/2010 to 01/07/2010	1,676.38	0.07	0.00	1,676.31
01/07/2010 to 01/08/2010	4,124.14	0.11	0.00	4,124.03
01/08/2010 to 01/09/2010	5,283.15	0.07	0.00	5,283.08
01/09/2010 to 01/10/2010	4,670.91	0.08	0.00	4,670.82
01/10/2010 to 01/11/2010	3,338.02	0.10	0.00	3,337.92
01/11/2010 to 01/12/2010	2,456.08	0.25	0.00	2,455.82
01/12/2010 to 01/01/2011	843.55	0.05	0.00	843.50
01/01/2011 to 01/02/2011	281.01	0.05	0.00	280.96
01/02/2011 to 01/03/2011	48.21	0.26	0.00	47.95
01/03/2011 to 01/04/2011	-11.57	0.10	0.00	-11.67
01/04/2011 to 01/05/2011	-16.71	0.11	0.00	-16.83
01/05/2011 to 01/06/2011	-16.99	0.42	0.00	-17.40
01/06/2011 to 01/07/2011	3,093.56	0.16	0.00	3,093.40
01/07/2011 to 01/08/2011	4,756.99	0.14	0.00	4,756.85
01/08/2011 to 01/09/2011	5,272.48	0.08	0.00	5,272.40
<b>Total</b>	<b>37,579.24</b>	<b>3.41</b>	<b>0.00</b>	<b>37,575.83</b>
<b>Considered Emissions</b>	<b>37,579</b>	<b>4</b>	<b>0</b>	<b>37,575</b>

Total baseline emissions : 37,579 tCO<sub>2</sub>e  
 Total project emissions (DG set) : 4 tCO<sub>2</sub>e  
 Leakage : 0 tCO<sub>2</sub>e  
 Emissions due to delay calibration : 36 tCO<sub>2</sub>e  
 Total emission reductions : 37,539 tCO<sub>2</sub>e

**E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD**

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO <sub>2</sub> e)	34,203*	37,539

\* As per registered CDM-PDD the estimated net emission reductions per year (i.e., 365 days) is 18,633 tCO<sub>2</sub>. Whereas the present MR is considered for 22 months (i.e 670 days). Therefore, the estimated net emission reductions for this monitoring period is calculated as  $(18,633/365)*670 = 34,203$  tCO<sub>2</sub>

**E.6. Remarks on difference from estimated value in registered PDD**

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The net emission reduction for the reported period is 9.86% more than the estimated in the registered PDD. The reasons for the excess net electricity generations are:-

- Excess rainfall in the catchments area of river
- Power generation during the lean / off season



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**History of the document**

<b>Version</b>	<b>Date</b>	<b>Nature of revision</b>
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Form <b>Business Function:</b> Issuance		