

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

Title of the project activity	Lohgarh, Chakbhai and Sidhana Mini Hydroelectric Projects
Reference number of the project activity	0327
Version number of the monitoring report	01
Completion date of the monitoring report	03/10/2012
Registration date of the project activity	30/04/2006
Monitoring period number and duration of this monitoring period	Monitoring period : 6 th Duration of monitoring period: 01/08/2011 to 30/09/2012
Project participant(s)	Aqua Power Pvt. Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope : 01 Methodology : AMS I.D Version 07
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	31,454 tCO ₂
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	30,777 tCO ₂



SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Three Mini Hydro electric projects aggregating to 5.20 MW at Lohgarh, Chakbhai and Sidhana on the Bathinda Branch Canal, District Ludhiana, Sangrur and Bathinda respectively in Punjab, India have been set-up. Mini Hydroelectric Project at Lohgarh (2 MW) was commissioned in October, 2005, Chakbhai (2 MW) was commissioned in November 2004 and Sidhana (1.20 MW) was commissioned in October, 2007. The plants are operating successfully.

The purpose of the project activity is to generate electricity by utilizing water flowing through the existing canal system as a renewable energy resource to meet the ever- increasing demand for energy in the region. The development of the project activity contemplates the production of clean hydroelectric power that will contribute to reduce the CO₂ emissions, which would have occurred otherwise, in the absence of these projects.

Lohgarh with total installed capacity of 2.0 MW, Chakbhai 2.0 MW and Sidhana 1.2 MW generate electricity and sell it to the Punjab State Electricity Board (PSEB) through Power Purchase Agreement (PPA) contract.

These projects are low head, canal drop based mini hydroelectric projects (project activity) located on the Bathinda Branch Canal, District Ludhiana, Sangrur and Bathinda respectively in Punjab. The projects are run-off-river renewable hydroelectric generating plants, which include forebay, mechanical intake gates, trashracks, draft tubes, vertical turbine and a powerhouse with its discharge channel and adjoining roads. The projects do not involve any type of displacement, rehabilitation or relocation.

The Projects are generating electricity successfully by converting the potential and kinetic energy of the canal water and the electricity produced is fed into the Punjab State Electricity Board Grid thereby replacing the equivalent amount of electricity produced from Thermal stations and thus reducing green house gas emissions.

A.2. Location of project activity

>> LOHGARH: The project is located on Bathinda branch canal.

Latitude 30° 35' 49.69" N ; Longitude 75° 40' 2.91" E
Town: Raikot
Distt: Ludhiana
State: Punjab
Country: India

CHAK BHAI : The project is located on Bathinda branch canal .

Latitude 30° 34' 38.94" N ; Longitude 75° 29' 54.51" E
Town : Mehal Kalan
Distt.: Barnala
State: Punjab
Country: India



SIDHANA : The project is located on Bathinda branch canal having

Latitude 30° 21' 5.29" N ; Longitude 75° 30' 42.43" E
 Town : Rampura Phul
 Distt.: Bathinda
 State: Punjab
 Country: India

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)
India (host)	Private entity: Aqua Power Pvt. Limited	No

A.4. Reference of applied methodology

Type I- Renewal Energy Projects

Category: I.D.: Renewable electricity generation for a grid

Version: 07

A.5. Crediting period of project activity

Crediting Period for this project activity is 20/11/2004 to 19/11/2014 (fixed)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>> The projects activities were commissioned on dates as mentioned below while it was registered with CDM EB on 30/04/2006.

Sr. No	Name of Project	Date of Commissioning
1.	Chakbhai	November 2004
2.	Lohgarh	October 2005
3.	Sidhana	October 2007

The project promoter has installed all monitoring equipment to monitor the parameters which were described in the registered CDM PDD.

The project activity is in continuous operation since the date of commissioning. No special events or change of equipments have taken place during the current monitoring period.

No events occurred during the current monitoring period which may have affected the applicability of the methodology.

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

>>Not Applicable

B.2.2. Corrections

>> Not Applicable

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

>> Not Applicable

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

>> Not Applicable

B.2.5. Changes to start date of crediting period

>> Not Applicable

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

>> Not Applicable

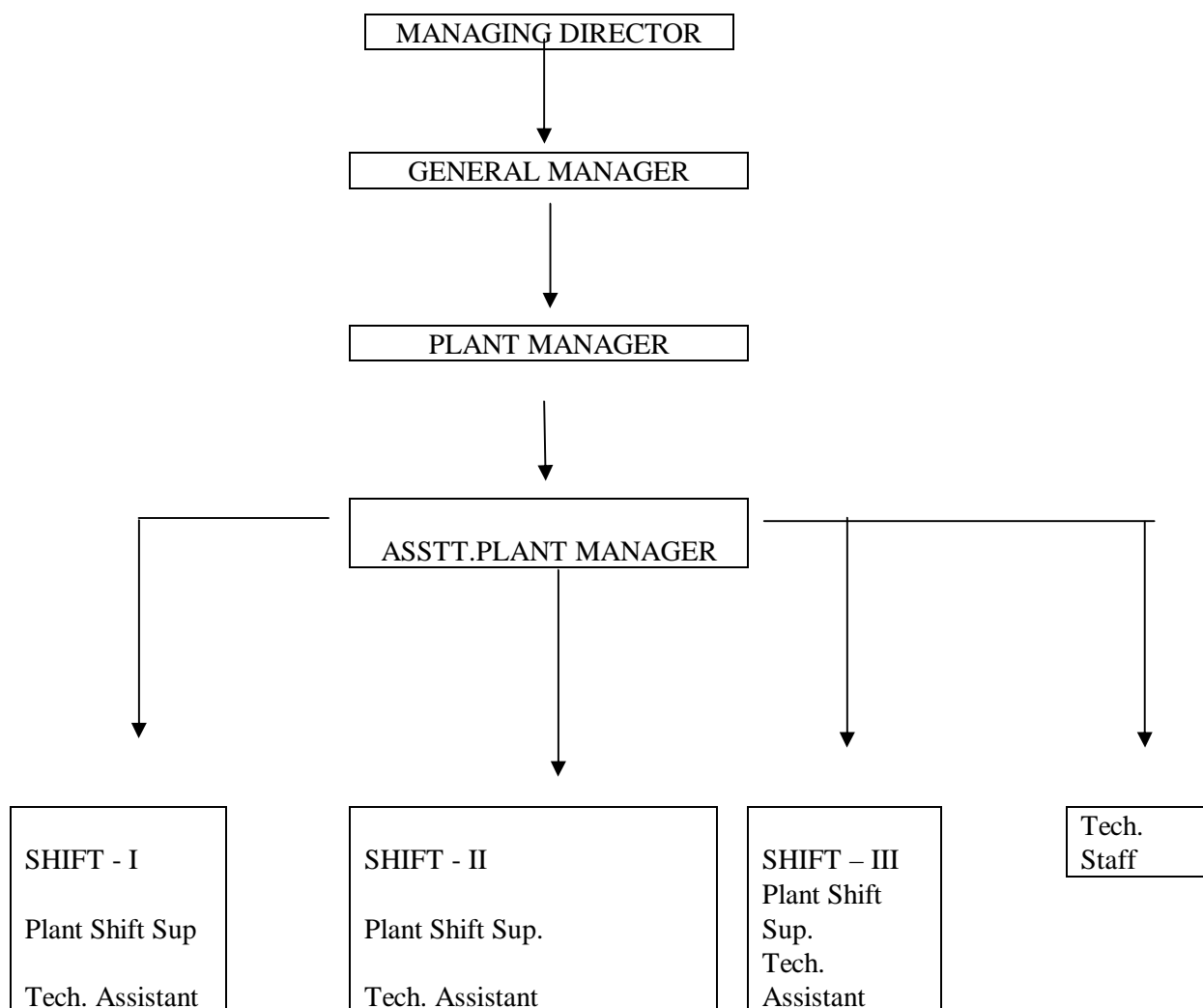
SECTION C. Description of monitoring system

>> For this project activity the monitoring procedure was followed as described below.

- i. The Energy exported (kWh) and Energy imported (kWh) at the interconnection point have been measured from the electronic energy meters (i.e. Trivector Meters) installed at the interconnection points at all 3 (three) project schemes.
- ii. The Net saleable energy has been calculated as a difference between energy exported and energy imported. It is based on monthly joint meter readings.
- iii. Monthly joint meter readings were taken at interconnection point and certified by representatives of Aqua Power Private Limited (APPL) and the purchaser i.e. Punjab State Electricity Board (PSEB).
- iv. The joint meter readings were used to raise invoice for sale of net energy to PSEB.
- v. The energy generated has been measured by the energy meters installed at the generation end on an hourly basis.
- vi. The auxiliary energy consumption has been measured by the auxiliary energy consumption meters installed at the plant on an hourly basis.
- vii. The data of the aforesaid parameters are recorded on hourly basis which are summed into a daily reading.
- viii. The Daily readings were aggregated to monthly readings.
- ix. Monthly reports stating the energy exported, energy imported, energy generated and auxiliary energy consumption were prepared by shift-in-charge and verified by plant managers.
- x. The finance department cross checked the data provided by plant managers.

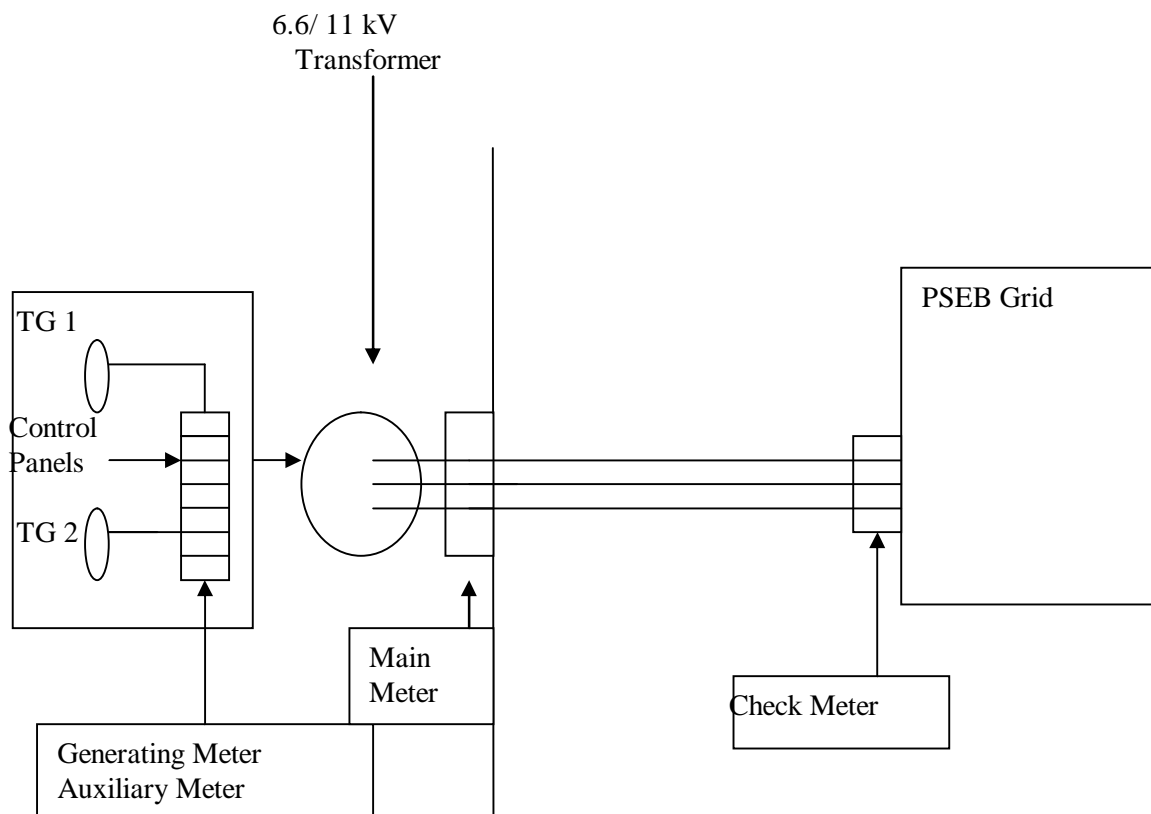
The Organizational structure responsible for monitoring the various parameters as per Monitoring Plan for each site is as below:-





The Hourly data is monitored and recorded in the log books by the Shift Staff comprising of Plant Shift Supervisor and Technical Assistant. The daily data is checked and countersigned by the Assistant Plant Manager. The daily and monthly data is checked and verified by the Plant Manager. The data is audited annually by the auditor of the Company having financial background.

The Diagram showing all relevant monitoring points has been displayed as below:



SECTION D. Data and parameters

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

Data/Parameter	Grid Emission Factor
Unit	kg of CO ₂ / kWh
Description	The Grid Emission Factor has been calculated as the weighted average of the operating Margin Emission Factor (EF _{OM}) and the Build Margin Emission Factor (EF _{BM}).
Source of data	Northern Region Grid's emission from Central Electricity Authority
Value(s) applied	0.942
Purpose of data	Baseline emission calculations
Additional comment	This parameter is fixed ex-ante for the full crediting period

**D.2. 1 Data and parameters monitored**

Data/Parameter	Energy exported		
Unit	kWh		
Description	Energy Exported to grid		
Measured/Calculated/Default	Measured		
Source of data	Main meters		
Value(s) of monitored parameter	32,720,330 (Chakbhai: 14,303,700, Lohgarh:12,049,850 and Sidhana: 6,366,780)		
Monitoring equipment	Baseline emissions		
Measuring/Reading/Recording frequency	Lohgarh	Chakbhai	Sidhana
	Electronics Bidirectional meter (L& T) S. No.11059669 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 16.03.2011 to 15.09.2011 26-08-2011 to 25.02.2012 24.02.2012 to 23.08.2012 22.08.2012 to 21.02.2013	Electronics Bidirectional meter (L& T) S. No.04187462 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 10.05.2011 to 09.11.2011 07.11.2011 to 06.05.2012 17.04.2012 to 16.10.2012	Electronics Bidirectional meter (L& T) S. No.05271089 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 05.03.2011 to 04.09.2011 31.08.2011 to 02.03.2012 29.02.2012 to 28.08.2012 17.08.2012 to 16.02.2013
Calculation method (if applicable)	Monthly		
QA/QC procedures	Not Applicable		
Purpose of data	<p>The power exported by Aqua Power Private Limited is monitored and recorded on the basis of reading of the Main Meter. The same is cross checked with the Check Meter installed before feeding electricity produced by the project into the Grid. Joint Meters reading are based on the Main Meter reading for the export and import of the electricity to and from the Grid.</p> <p>The principles of Frequency, Data recording and Reliability as mentioned in the PDD are strictly adhered to. The Main Meter and Check Meter are test checked for accuracy every six months by the team of Punjab State Electricity Board.</p> <p>The Meters installed at generation end are also test checked for accuracy every six months.</p>		
Additional comment			

**D2.2 Data and parameters monitored**

Data/Parameter	Energy imported		
Unit	kWh		
Description	Energy imported from grid		
Measured/Calculated /Default	Measured		
Source of data	Main meters		
Value(s) of monitored parameter	48,130 (Chakbhai: 10,890, Lohgarh: 13,020 and Sidhana: 24,220)		
Monitoring equipment	Baseline emissions		
Measuring/Reading/Recording frequency	Lohgarh Electronics Bidirectional meter (L& T) S. No.11059669 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 16.03.2011 to 15.09.2011 26-08-2011 to 25.02.2012 24.02.2012 to 23.08.2012 22.08.2012 to 21.02.2013	Chakbhai Electronics Bidirectional meter (L& T) S. No.04187462 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 10.05.2011 to 09.11.2011 07.11.2011 to 06.05.2012 17.04.2012 to 16.10.2012	Sidhana Electronics Bidirectional meter (L& T) S. No.05271089 accuracy: $\pm 0.5\%$ Calibration Frequency- 6 month Date of Calibration Date Valid Upto 05.03.2011 to 04.09.2011 31.08.2011 to 02.03.2012 29.02.2012 to 28.08.2012 17.08.2012 to 16.02.2013
Calculation method (if applicable)	Monthly		
QA/QC procedures	Not Applicable		
Purpose of data	The Main and Check Meters installed are bidirectional Tri -Vector Meters capable of recording energy exported and energy imported. The same are test checked for accuracy every six months. The data of the Main Meter is checked / compared with the data of the Check Meter.		
Additional comment			

**D2.3 Data and parameters monitored**

Data/Parameter	Net saleable energy
Unit	kWh
Description	Net saleable energy to grid
Measured/Calculated/Default	Calculated
Source of data	Log book/main meter
Value(s) of monitored parameter	32,672,200 (Chakbhai: 14,292,810, Lohgarh: 12,036,830 and Sidhana: 6,342,560)
Monitoring equipment	Baseline emissions
Measuring/Reading/Recording frequency	As this is calculated, this section is not applicable for this monitoring parameter.
Calculation method (if applicable)	Monthly
QA/QC procedures	Energy exported – Energy imported
Purpose of data	<p>Net Saleable energy is the net exported energy which is the difference of energy exported and energy imported. Joint Meters reading are taken from the Main and Check Meter every month to arrive at Net Saleable energy.</p> <p>The Main and Check Meters are tested for accuracy every six months.</p>
Additional comment	

**D2.4 Data and parameters monitored**

Data/Parameter	Energy generated		
Unit	kWh		
Description	Gross energy generated		
Measured/Calculated/Default	Measured		
Source of data	Generation Meters		
Value(s) of monitored parameter	33,495,030 (Chakbhai: 14,589,806, Lohgarh12,393,594 and Sidhana: 6,511,630)		
Monitoring equipment	Baseline emissions		
Measuring/Reading/Recording frequency	Lohgarh	Chakbhai	Sidhana
	Make: Minsun Digital Power Meter 882-332 Unit1:6851013 Unit 2:68B0512 Accuracy (+)1% Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012	Make: Minsun Digital Power Meter 882-332 Unit 1: 6851001 Unit 2 : 6790517 Accuracy (+)1% Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012	Make: Enercon EM 6400 66927/3665-0605 Accuracy (+)1 % Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012
Calculation method (if applicable)	Hourly		
QA/QC procedures	Not Applicable		
Purpose of data	The reading of the Energy generated are taken from the meters installed at generation end. These are test checked for accuracy every six months.		
Additional comment			

**D2.5 Data and parameters monitored**

Data/Parameter	Auxiliary energy consumption		
Unit	kWh		
Description	Auxiliary energy consumed for running the plant		
Measured/Calculated/Default	Measured		
Source of data	Auxiliary Meters		
Value(s) of monitored parameter	388,706 (chakbhai:129,125, Lohgarh: 148,842, and Sidhana: 110,739)		
Monitoring equipment	Baseline emissions		
Measuring/Reading/Recording frequency	Lohgarh Make: Enercon 56248/1285-3404 Accuracy (±)1% Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012	Chakbhai Make: Enercon E 64/1640-903 Accuracy (±)1% Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012	Sidhana Make: Enercon 148153/13538-1608 Accuracy (±)0.5% Frequency of calibration- 6 month Date of calibration Date Valid Upto 13.05.2011 to 12.11.2011 12.11.2011 to 11.05.2012 03.05.2012 to 02.11.2012
Calculation method (if applicable)	Hourly		
QA/QC procedures	Not Applicable		
Purpose of data	Auxiliary Energy Consumption readings are recorded at the Auxiliary meters installed in the panel. These are test checked for accuracy every six months		
Additional comment			

D.3. Implementation of sampling plan

>> Not Applicable

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

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

>>

Sl. No.	Description	Formula	Unit	Value
A	Energy exported		kWh	32,720,330
B	Energy imported		kWh	48,130
C	Net Saleable Energy	C=A-B	kWh	32,672,200
D	Carbon Emission Factor as per the baseline adopted		kg CO ₂ /kWh	0.942
E	Baseline Emissions	E=(C*D) / 1,000	ton CO₂	30,777

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

>>

No project emissions are associated with the project activity during this monitoring period. This is also in line with the PDD and methodology.

E.3. Calculation of leakage

>>

As the energy generating equipment is not transferred from another activity or the existing equipment is also not transferred to another activity, leakage is not considered. The same is in line with the methodology and the registered PDD.

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 _{2e})	Project emissions or actual net GHG removals by sinks (tCO _{2e})	Leakage (tCO _{2e})	Emission reductions or net anthropogenic GHG removals by sinks (tCO _{2e})
Total	30,777	NIL	NA	30,777

**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 ₂ e)	31,454	30,777

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

>>

The actual emission reductions during this monitoring period are less than estimated value in the registered PDD for the equivalent time period

History of the document

Version	Date	Nature of revision
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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance		

**Annexure – I**

The month-wise data on energy generated is given in Table 1 below: This monthly data is based on the hourly reading taken at the meters installed at the Generation end.

Table 1: Energy Generation (kWh)

Billing Month	Year	Chakbhai	Lohgarh	Sidhana	Total
August	2011	1,109,660	986,818	0	2,096,478
Sept.	2011	370,820	229,185	0	600,005
Oct.	2011	875,235	73,3070	9,190	1,617,495
Nov.	2011	885,240	727,836	457,700	2,070,776
Dec.	2011	614,380	593,817	20,110	1,228,307
Jan	2012	969,740	759,367	406,200	2,135,307
Feb	2012	1,080,460	1,050,816	750,520	2,881,796
Mar	2012	1,542,070	1,216,495	857,520	3,616,085
Apr	2012	390,530	415,666	238,610	1,044,806
May	2012	1,274,330	1,055,867	661,610	2,991,807
June	2012	1,249,730	1,056,717	683,110	2,989,557
July	2012	1,490,530	1,261,874	829,700	3,582,104
August	2012	1,465,810	1,247,616	832,210	3,545,636
Sept.	2012	1,271,271	1,058,450	765,150	3,094,871
Total		14,579,806	12,393,594	6,511,630	33,495,030

Annexure II

The month-wise data on auxiliary energy consumption is given in Table 2 below: This monthly data is based on the hourly reading taken at the Auxiliary meters installed at the Panel.

Table 2: Auxiliary Energy Consumption

Billing Month	Year	Chakbhai	Lohgarh	Sidhana	Total
August	2011	9,802	12,670	3,381	25,853
Sept.	2011	7,879	6,144	2,732	16,755
Oct.	2011	8,284	11,551	3,427	22,945
Nov.	2011	8,640	13,054	9,700	31,394
Dec.	2011	8,026	9,884	3,108	21,018
Jan	2012	9,998	11,520	9,414	30,932
Feb	2012	6,954	10,790	12,041	29,785
Mar	2012	8,270	10,402	11,689	30,361
Apr	2012	4,852	4,976	4,970	14,791
May	2012	10,401	10,293	10,413	31,107
June	2012	11,488	11,606	9,978	33,072
July	2012	11,799	12,706	12,285	36,790
August	2012	11,,416	12,398	10,078	33,892
Sept.	2012	11,316	10,848	7,840	30,004
Total		129,125	148,842	110,739	388,706

The Gross energy generated data and auxiliary Energy consumption data is not used for calculation of emission reductions as the calculations of emission reductions is based on Net Saleable Energy i.e. the difference of Energy exported and Energy imported.

**Annexure III****Power Generation:**

Month-wise data on Net Saleable Energy for the monitoring period is given in Table 3 below.

As per the Project Design Document, Emission reductions are to be calculated based on the energy exported minus energy imported during shut-down and start-ups by the power plant.

Table 3: Net Saleable Energy (kWh)

Billing Month	Year	Energy Exported				Energy Imported				Net Saleable Energy
		Chakbhai	Lohgarh	Sidhana	Total	Chakbhai	Lohgarh	Sidhana	Total	
August	2011	1,087,150	959,430	0	2,046,580	440	800	3,400	4,640	2,041,940
Sept.	2011	362,240	222,370	0	584,610	4,720	4,530	2,640	11,890	572,720
Oct.	2011	858,470	710,380	8,900	1,577,750	620	900	4,520	6,040	1,571,710
Nov.	2011	868,340	703,730	443,920	2,015,990	10	130	380	520	2,015,470
Dec.	2011	600,680	572,820	19,280	1,192,780	280	700	4,500	5,480	1,187,300
Jan	2012	949,900	734,120	394,100	2,078,120	130	180	2,260	2,570	2,075,550
Feb	2012	1,059,720	1,017,020	732,560	2,809,300	60	80	180	320	2,808,980
Mar	2012	1,515,890	1,183,110	838,900	3,537,900	40	50	200	290	3,537,610
Apr	2012	383,620	404,920	233,800	1,022,340	3,590	3,360	2,600	9,550	1,012,790
May	2012	1,249,390	1,031,080	648,160	2,928,630	190	610	1,500	2,300	2,926,330



June	2012	1,224,000	1,031,350	668,460	2,923,810	230	500	1,020	1,750	2,922,060
July	2012	1,461,500	1,230,300	811,480	3,503,280	260	440	540	1,240	3,502,040
August	2012	1,437,480	1,216,990	816,220	3,470,690	210	450	340	1,000	3,469,690
Sept.	2012	1,245,320	1,032,230	751,000	3,028,550	110	290	140	540	3,028,010
Total		14,303,700	12,049,850	6,366,780	32,720,330	10,890	13,020	24,220	48,130	32,672,200