

MONITORING REPORT

Monitoring Period
01.11.2004 to 31.03.2007
(Both days included)

Version 01/06.06.2007

Project 0578: Deoband bagasse based Co-generation Power Project

Project Site:

Deoband Village, Saharanpur District , Uttar Pradesh

Triveni Engineering & Industries Limited (TEIL)

15-16, Sector 16-A

8th Floor, Express Trade Towers

Noida ,

Uttar Pradesh - 201301

Email: ssinha@ho.trivenigroup.com

Table of contents

S.No.	Content	Page
1.	Current Status of the Project	3
2.	Statement to what extent the Project has been implemented as planned	4
3.	Statement to the sustainability development with the project activity	6
4.	Parameters being monitored as per the monitoring plan	7
5.	Electricity generation and fuel consumption data	11
6.	Monitored parameters	13
7.	Emission reduction	17
8.	Measures to ensure the Results / uncertainty analysis	18
9.	Roles and responsibilities	19

Current Status of the Project

The bagasse based Co-generation Power Project has been successfully commissioned by Triveni Engineering & Industries Limited (TEIL) at Deoband Village, Saharanpur District, Uttar Pradesh, and is operational since November 2004.

The major equipments commissioned in the project activity are as follows:

Boiler details

Description	1nos. water tube
Steam generating capacity (tons per hour)	120
Steam pressure (kg/cm ²)	87
Steam temperature (° C)	515

Turbine details

Description	1no. extraction cum condensing turbine
Power (kW)	22000
Steam inlet pressure (kg/cm ²)	84

Statement to what extent the Project has been implemented as planned

The Project has been completed as planned and described in the Project Design Document (PDD).

Reference : <http://cdm.unfccc.int>

The plant is in operation continuously (with outages – forced & planned) since November 2004. The plant is using the available sugar mill generated bagasse and bought bagasse which was available surplus in the market as a fuel for the co-generation. The project activity uses a portion of the steam and electricity to run its own cane crushing facility and cogeneration plant and exports surplus power to the UPPCL.

Monitoring Period

The Monitoring Period is chosen from 01.11.2004 to 31.03.2007 (both days included).

Statement to the sustainable development with the project activity

- The project activity has resulted in providing employment opportunities to for the local people.
- The project activity contributes in conserving the fossil fuel like coal which can now be utilized for other useful purposes.
- By generating clean power, project activity has helped to eliminate an equivalent amount of carbon dioxide emissions which would have been otherwise generated due to power generation at grid.

Parameters being monitored as per the monitoring plan

The following parameters are monitored on regular basis:

Parameter	Monitoring method	Instrument used	Recording frequency	QA/QC	Calibration	% accuracy level
Quantity of Biomass transported (tones)	Quantity of biomass transported on trucks has been measured on a weigh bridge, provided with suitable scale to measure the weight	Weigh bridge	Continuous	The details of the number of trucks carrying the bagasse, quantity of bagasse in each truck are recorded in a log book on a regular basis.	Calibrated periodically as per standard procedures by accredited third party agencies.	
Average return trip distance between biomass fuel supply site and project site. (km)	Mean value of km travelled by trucks is recorded	Distance meters	Continuous	Regular recording of the distance of transportation of each truck is done in the log book.		
Number of truck trips for biomass	Number of truck trips are	-	Continuous	Regular recording of the distance		

transportation	measured and recorded in log books			of transportation of each truck is done in the log book.		
Average CO ₂ emission factor for transportation of biomass with trucks (tCO ₂ /Km)	National data is chosen		Annually			
Net quantity of electricity generated in the project plant during the year (MWh)	Net quantity of electricity produced is been monitored by energy meters of class 0.2	Energy meters	Continuous		Calibrated periodically as per standard procedures by accredited third party Agencies.	99.5
Total quantity of electricity generated at the project site (Including the project	Total quantity of electricity produced has been monitored by energy	Energy meters	Continuous		Calibrated periodically as per standard procedures by accredited third party Agencies.	99.5

plant and any other plant at site existing at the start of the project activity) (MWh)	meters of class- 0.2					
Net quantity of heat generated from firing biomass in the project plant (MWh)	Net quantity of heat can be calculated from monitored parameters.	Flow meter	Continuous		All Meters are calibrated by accredited external third party, periodically	99
Quantity of biomass type combusted in the project plant (tonne)	Quantity of biomass type combusted in the project plant is measured on weigh bridge.	Weigh bridge	Continuous			99.5
Net calorific value of biomass	Net Calorific value of biomass has been	Bomb calorimeter			Calibrated periodically as per standard procedures	

	measured in accredited labs.				by accredited third party agencies.	
Thermal energy efficiency	Thermal energy efficiency is calculated from the heat input (from biomass combustion) and the enthalpy of the steam					

Electricity generation and fuel consumption data

Month	From Existing Units (KWh)								Co-gen Plant (KWH)		
	Generation (KWh)						Auxiliary consumption	Net Generation	Total Generataion	Auxiliary consumption	Net Generation
	T1	T2	T3	T4	T5	Total					
Nov '04	890,520	863,160	-	2,166,138	1,929,200	5,849,018	462,072	5,386,946	-	-	-
Dec '04	699,480	753,720	-	2,179,190	2,037,672	5,670,062	464,945	5,205,117	10,460,000	1,107,550	9,352,450
Jan '05	90,000	193,980	-	923,078	1,507,584	2,714,642	464,204	2,250,438	10,672,000	1,072,313	9,599,687
Feb '05	159,840	37,200	-	841,932	1,560,468	2,599,440	465,300	2,134,140	13,970,000	1,406,670	12,563,330
Mar '05	618,780	8,160	-	2,106,572	2,049,372	4,782,884	856,136	3,926,748	15,609,000	1,569,000	14,040,000
Apr '05	186,720	-	-	828,464	810,472	1,825,656	177,089	1,648,567	15,048,000	1,429,100	13,618,900
May '05	-	-	-	-	-	-	-	-	5,918,000	501,000	5,417,000
Jun '05	-	-	-	-	-	-	-	-	-	-	-
Jul '05	-	-	-	-	-	-	-	-	-	-	-
Aug '05	-	-	-	-	-	-	-	-	-	-	-
Sept '05	-	-	-	-	-	-	-	-	-	-	-
Oct '05	-	-	-	17,602	92,976	110,578	15,481	95,097	3,766,000	511,100	3,254,900
TOTAL	2,645,340	1,856,220	-	9,062,976	9,987,744	23,552,280	2,905,227	20,647,053	75,443,000	7,596,733	67,846,267
Nov '05	-	162,780	-	1,096,940	1,636,544	2,896,264	463,402	2,432,862	13,928,000	9,286,000	4,642,000
Dec '05	-	526,560	-	949,676	1,872,728	3,348,964	465,506	2,883,458	15,711,000	1,663,600	14,047,400
Jan '06	-	19,800	-	833,092	1,711,580	2,564,472	464,169	2,100,303	14,868,000	1,532,000	13,336,000
Feb '06	78,720	349,740	-	799,942	1,555,008	2,783,410	464,829	2,318,581	14,665,000	1,481,000	13,184,000
Mar '06	-	640,920	-	917,306	1,768,052	3,326,278	465,679	2,860,599	16,410,000	1,637,000	14,773,000
Apr '06	24,240	285,420	-	502,554	1,049,412	1,861,626	309,030	1,552,596	15,629,000	1,521,000	14,108,000
May '06	-	-	-	-	-	-	-	-	15,721,700	1,416,000	14,305,700
Jun '06	-	-	-	-	-	-	-	-	3,109,000	284,000	2,825,000
Jul '06	-	-	-	-	-	-	-	-	-	-	-
Aug '06	-	-	-	-	-	-	-	-	-	-	-
Sept '06	-	-	-	-	-	-	-	-	-	-	-
Oct '06	-	-	-	60,658	207,376	268,034	31,092	236,942	1,304,000	215,020	1,088,980
TOTAL	102,960	1,985,220	-	5,160,168	9,800,700	17,049,048	2,663,708	14,385,340	111,345,700	19,035,620	92,310,080

Nov '06	379,620	-	-	1,301,162	1,482,902	3,163,684	465,062	2,698,622	14,220,000	1,547,600	12,672,400
Dec '06	675,800	-	-	1,490,212	1,798,796	3,964,808	463,883	3,500,925	15,638,000	1,617,600	14,020,400
Jan '07	107,580	-	-	1,151,410	1,739,452	2,998,442	464,759	2,533,683	15,993,000	1,565,800	14,427,200
Feb '07	337,140	-	-	274,906	1,407,644	2,019,690	464,529	1,555,161	14,415,000	1,475,000	12,940,000
Mar '07	495,120	-	-	1,414,947	1,644,136	3,554,203	465,601	3,088,602	15,925,000	1,660,676	14,264,324
TOTAL	1,995,260	-	-	5,632,637	8,072,930	15,700,827	2,323,832	13,376,995	76,191,000	7,866,676	68,324,324

where

T1 - 3MW turbine

T2 - 3MW turbine

T3 - 1.50MW turbine

T4 - 1.50MW turbine

T5 - 1.25MW turbine

T6 - 22MW Project turbine

Monitored parameters

Biomass Quantity transported				
	Quantity	Distance to & fro	Truck Nos.	Total distance
	(Tons)	KM	No.	KM
Nov 04	0	0	0	0
Dec-04	0	0	0	0
Jan 05	26858.22	122	188	22989
Feb 05	68260.98	117	463	54024
Mar-05	98427.07	107	660	70369
April-05	150892.2	88	1077	94925
May-05	48482.25	85	378	32032
June-05	192.75	200	2	400
Oct-05	76589.63	100	462	46397
TOTAL	469703.05			321136
Nov-05	99611.03	95	599	57164
Dec-05	107185.2	88	701	61916
Jan 06	129829.1	82	879	72160
Feb-06	65279.36	79	431	33918
Mar-06	129058.9	76	854	64972
April-06	74965.55	158	537	84650
May-06	29398.4	112	215	24048
June-06	1502.65	103	10	1028
Oct-06	1725.85	73	11	803
TOTAL	638555.99			400659
Nov-06	35808.15	74	232	109354.1379
Dec-06	66946.23	75	422	48503.5545
Jan 07	227015.30	94	1480	62182.7027
Feb-07	89238.90	73	650	47742
Mar-07	91968.95	74	660	48532
TOTAL	510977.53			316314.3951

	Quantity	NCV	Heat input	Steam Enthalpy	Steam flow	Heat Output	Efficiency of heat generation
	(Tons)	Kcal/tonne	Kcal	Kcal/tonne	tonnes	Kcal	%
Nov 04	0	0	0	0	0	0	-
Dec-04	24371	1987000	48425177000	814230	54842	44654001660	92
Jan 05	22729	2095000	47617255000	819550	50842	41667561100	88
Feb 05	29654	2278000	67551812000	817650	67640	55305846000	82
Mar-05	34756	2100000	72987810000	819300	81105	66449326500	91
April-05	27815	2190000	60914850000	817700	70578	57711630600	95
May-05	9080	2295000	20838600000	817860	23577	19282685220	93
June-05	0	0	0	0	0	0	0
Jul-05	0	0	0	0	0	0	0
Aug-05	0	0	0	0	0	0	0
Sept-05	0	0	0	0	0	0	0
Oct-05	8596	2080000	17879680000	815930	21383	17447031190	98
TOTAL	157001.1						
Nov-05	29830	2110000	62941300000	814770	74825	60965165250	97
Dec-05	34344	2261000	77651784000	814320	86345	70312460400	91
Jan 06	31227	2330000	72758910000	805520	78487	63222848240	87
Feb-06	31815	2194000	69802110000	814940	78488	63963010720	92
Mar-06	35571	2185000	77722635000	814960	87252	71106889920	91
April-06	32042	2015000	64564630000	814740	78224	63732221760	99
May-06	25119	2072000	52046568000	815010	62503	50940570030	98
Jun -06	4954	2171000	10755134000	815850	12219	9968871150	93
Jul-06	0	0	0	0	0	0	0
Aug-06	0	0	0	0	0	0	0
Sept-06	0	0	0	0	0	0	0
Oct-06	3368	1999000	6732632000	810180	8175	6623221500	98
TOTAL	228270						

	Quantity	NCV	Heat input	Steam Enthalpy	Steam flow	Heat Output	Efficiency of heat generation
	(Tons)	Kcal/tonne	Kcal	Kcal/tonne	tonnes	Kcal	%
Dec-06	35399	2280000	80709720000	815520	87666	71493376320	89
Jan 07	36188	2065000	74728220000	815100	89398	72868309800	98
Feb-07	32265	2024000	65304360000	814090	79360	64606182400	99
Mar-07	35845	2201000	78894845000	813380	88150	71699447000	91
TOTAL	171814						

Emission reduction

Baseline and project emissions are calculated as per the formulas mentioned in Section E of the PDD. The same is given below:

Formulae used

The emission reduction is given by

$$ER_{\text{electricity},y} = EG_y \times EF_{\text{electricity},y}$$

where $ER_{\text{electricity},y}$ - are the baseline emissions due to displacement of electricity during the year y in tons of CO_2

$$EG_y = \text{Min} \{ (EG_{\text{project plant}, y}), (EG_{\text{total}, y} - (EG_{\text{historic}, 3 \text{ yr}})/3) \}$$

The following table gives the details about the historic generation

	Turbo Generator	T3	T4	T5	T1	T2	Total
	Oct.2001	0	0	0	0	0	
	Nov.2001			0			
	Dec.2001			0			
	Jan.2002			0			
	Feb.2002			0			
	Mar.2002			0			
	Apr.2002			0			
TOTAL	2001- 2002	4170480	4277190	0	10783292	10958904	30189866
	Oct.2002	0	0	0	0	0	0
	Nov.2002	51360	132240	0	246870	220896	651366
	Dec.2002	866040	891120	0	2144168	2205008	6106336
	Jan.2003	843180	932100	0	2122302	2136420	6034002
	Feb.2003	728040	814980	0	1875692	1864980	5283692
	Mar.2003	925140	910980	0	2169778	2111772	6117670
	Apr.2003	865440	888660	0	2063178	2005276	5822554
TOTAL	2002- 2003	4279200	4570080	0	10621988	10544352	30015620
	Oct.2003	17400	7800	0	8814	6760	40774
	Nov.2003	603420	632640	0	1449110	1483404	4168574
	Dec.2003	930780	963300	0	2205294	2196220	6295594
	Jan.2004	923040	932460	0	2189252	2199496	6244248
	Feb.2004	864600	880860	0	2037334	2019940	5802734
	Mar.2004	894660	966240	0	2184260	2211924	6257084
	Apr.2004	308160	497340	0	1101776	1016496	2923772
TOTAL	2003- 2004	4542060	4880640	0	11175840	11134240	31732780

The historic generation details had been verified by DOE during validation

Emission reductions

Carbon Emission Factor as per the baseline adopted (t CO₂/million KWh) = 923.54

Reference : <http://cdm.unfccc.int>

Baseline emissions (t CO₂) for Nov '04 – Oct '05 = **53424**

Project emission for (t CO₂) for Nov '04 – Oct '05 = **206**

Emission reductions = **53424 - 206**

= **53218**

Baseline emissions (t CO₂) for Nov '05 – Oct'06 = **70235**

Project emission for (t CO₂) for Nov '05 – Oct'06 = **257**

Emission reductions = **70235 -257**

= **69977**

Baseline emissions (t CO₂) for Nov '06 – Mar '07 = **63418**

Project emission for (t CO₂) for Nov '06 – Mar '07 = **203**

Emission reductions = **63418 - 203**

= **63214**

Period	Baseline Emission factor (tCO ₂ /MWh)	Net Power produced (MWh)	Baseline emissions (t CO ₂)	Project emissions (t CO ₂)	Emission reductions (ton of CO ₂)
Nov 04-Oct 05	0.92	57847.23	53424	206	53218
Nov 05-Oct 06	0.92	76049.33	70235	257	69977
Nov 06-Mar 07	0.92	68932.12	63418	203	63214

Measures to ensure the Results / uncertainty analysis

As per the Power Purchase Agreement (PPA), the energy exported to the UPPCL Grid is recorded from two independent meters viz., Main Meter and Check Meter and reading of main meter is used for billing. In the event of main meter not in operation / fails, the reading of the check meter shall be used for billing. The Calibration of monitoring equipment has been carried out according to the specifications of the equipment (Ist calibration in 2 years of installation and thereafter subsequent calibrations at an interval of 1 year). Power Generation, Export & Auxiliary Consumption, fuel consumption are being recorded daily and the same is being verified and approved by Manager (O&M).

Roles and responsibilities

Shift Engineer (Co-Gen) is responsible for monitoring of daily data of the steam generated from bagasse based boiler, steam fed to turbine, parameters of steam and flow meter readings of the captive power plant. The report is then sent to the GM (Power Plant) for the review.

Shift Electrician (Electrical) is Responsible for taking meter readings for electricity generation daily.

Shift Incharge is Responsible for compilation of data which is then sent to GM (Power) for preliminary review.

The electricity generation details report is sent to the GM (Power Plant) through Shift incharge with due verification for his review on a daily basis. In the absence of GM (Power Plant) this role is performed by the Dy. Chief Engineer.

GM (Power Plant) is responsible for reviewing the monitored parameters report on a daily basis and presenting a daily executive summary report, duly signed by himself, to the Vice President (CP) Corporate office which is finally reported to Managing Director (MD), TEIL.

Organization structure responsible for monitoring and reporting of parameters involved in CDM project activity has been presented in the following flow chart.

