



Shalivahana Non-Conventional Renewable Sources Biomass Power Project

UNFCCC Project Activity Ref. No: **0591**

FOURTH MONITORING REPORT

Ver. 01, 15th March 2010

[The Monitoring period: 25th Jan 2009 to 24th Jan 2010]

Net Emission Reductions: 27376 tCO₂

Registered Office	Project Site
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1. Current Status of the Project

The name of the authorized participant of the project “ Shalivahana Non – conventional Renewable Sources Biomass Power Project”, Shalivahana Projects Limited (SPL) has been changed to Shalivahana Green Energy Limited (SGEL) with effective from 28th September 2007 as per the certificate issued by Government of India, Ministry of Corporate Affairs, Registrar Of Companies, Andhra Pradesh. The same has been informed to host country, and has been approved by host country, Ministry Of Environment & Forestry (MOEF), Government of India on 27th August 2008. This change of the name is acknowledged and reflected in the project activity 0591 on 9th June 2009.

Shalivahana Green Energy Limited (SGEL, formerly, Shalivahana Projects Limited) established Non-Conventional Renewable Biomass Power Project of 6.0 MW at Mancheri Village, Adilabad Dist., Andhra Pradesh, India, has been commissioned and is in operation since 7th December 2002. The project activity is generation of electricity for the APTRANSCO grid system by utilizing the surplus biomass residues such as rice husk, saw dust, maize cobs, red gram stalks, cotton stalks, & coconut waste, etc.,

The purpose of this Monitoring Report is to calculate the Greenhouse Gas emission reductions achieved by the 6.0 MW grid connected project.

The project was registered as CDM activity with the Executive Board on 13th February 2007 and the crediting period commenced from 8th December 2002.(web link: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1157919687.29/view>)

For the 1st Monitoring Period i.e. from 8th Dec 2002 to 24th Jan 2007, the project has exported 17.422 GWh of electricity to APTRANSCO grid and issued 113984 CERs for this vintage:

(web Link <http://cdm.unfccc.int/UserManagement/FileStorage/YD8MQ0C0HYCS4LFW87LYL8L0EUPEI6>)

For the 2nd monitoring period i.e., from 25th Jan 2007 to 24th Jan 2008, the project has exported 38.492 GWh of electricity to APTRANSCO grid and issued 19394 CERs.

(web Link :<http://cdm.unfccc.int/UserManagement/FileStorage/PEMRLXEWCRK8ZOCWP5M0CQWAUWHXP>)

For the 3rd monitoring period i.e., from 25th Jan 2008 to 24th Jan 2009, the project has exported 37.73 GWh of electricity to APTRANSCO grid and issued 22507 CERs

(web link: <http://cdm.unfccc.int/UserManagement/FileStorage/VDH2E9W15Q7FICSAY8OPJX4RUTMG6Z>)

2. Monitoring Period

The present monitoring period covers the project activity from 25th Jan 2009 to 24th Jan 2010. The project exported 41.191 GWh of net electricity to APTRANSCO grid and consumed 59752 MT of biomass fuels and 5841 MT of coal for the reported period.

3. Details of Major Equipment of the Project & Plant shut downs for the Monitored Period

The details of major equipments of the plant and suppliers are presented in Table-1.



Table – 1: Details of Plant Major Equipments and Suppliers

S.No	Equipment Details	Suppliers
1	Boiler Type: Multifuel fired Traveling Grate. Capacity: 35 TPH, Pressure 66 Kg/cm ² (g), 485 ± 5 Deg. C ESP outlet dust concentration <115 mg/Ncu.m	Thermax Babcock & Wilcox Ltd (TBW), Pune.
2	Turbine Capacity: 6000 KW, Steam Inlet Pressure 64 Kg/cm ² Temp. 480 Deg. C, Exhaust Pressure: 0.1 ata,	Alstom Power (I) Limited
3	Alternator Make: TDPS, Capacity: 9.375 MVA, Speed 1500 rpm, Generation Level: 11 kV / 3 Phase / 0.8 pf / 50 Hz Excitations: Brush less	Alstom Power (I) Limited
4	Cooling Tower Type: RCC Induced draft type, Capacity: 2400 cu.m /hr, Hot water temp. 41Deg.C, Cold water temp. 33 Deg. C, Wet bulb temp. 30 Deg.C	Shriram Tower Tech Limited, Chennai.
5	D.M. Plant Capacity: 10cu.m/hr	Doshi Ion Exchange & Chemical Industries Ltd.

The details of forced shut down periods, planned shut down periods and reasons for shut downs are detailed below.

Table – 2.a: Details of Plant Shut downs for the Monitored period

Monitoring Period Hrs	Total available, Hrs	Type of shut down		Operating Hours Hrs
		Planned	Forced	
25.01.2009 to 24.01.2010	8760	751	638	7371

Table – 2.b: Details of Major Shut down days and reasons – Forced & Planned for the monitored period

SR NO	PERIOD	Type of Shutdown HRS		REASON
		PLANNED	FORCED	
1	21/02/09 to 26/02/09	127		Preventive Maintenance of Air Compressors & Coal crushers
2	10/03/09 to 16/03/09		156	Travelling grate bars broken
3	25/03/09 to 30/03/09		132	Due to rice husk screw feeders pipes badly damaged
4	20/04/09		15	Economizer coil weld joint Leakage
5	29/04/09 to 6/05/09	154		Preventive Maintenance of auxiliary cooling water pumps and raw water pumps



6	14/05/09 to 17/05/09		71	Travelling grate bars broken
7	24/05/09 to 30/05/09	120		Preventive Maintenance of drag chain feeders and mechanical spreaders
8	10/08/09 to 12/08/09		48	Travelling grate bars broken
9	2/9/2009		5	Grid Problem RSS Breaker Maintenance
10	28/09/09 to 5/10/09		168	Travelling grate bars broken
11	21/11/09 to 6/12/09	350		Annual maintenance, travelling rate, turbine, id fan, boiler inspection etc., energy meter calibration etc.,
12	13/01/10		13	Auxiliary Breaker Flash in PCC Panel
13	19/01/10 to 20/01/10		30	I D fan Motor Bearing problem
	TOTAL	751	638	

4. Parameters being monitored according to monitoring plan

The following parameters were monitored on continuous basis

Electricity Generation (in kWh) and Aux. Electricity Consumption (in kWh):

Electricity generation from the plant is measured continuously using the energy meter installed in the control room of the plant. Aggregated daily auxiliary electricity consumption computed based on the gross power generation recorded in the plant and electricity exported to the grid values. The daily readings were aggregated to monthly readings. The meter installed is of 0.2 class. The meter has been calibrated yearly once.

Electricity Export and import (in kWh):

Electronic energy meters were installed at 132/33 kV Sub-station, Mancherial for the measurement of electricity exported to the State grid and the electricity imported from the State grid. Monthly energy meter readings have been recorded and jointly certified by the representatives of APTRANSCO & SGEL on 24th day of every month during day time. The meter installed is of 0.2 class. The meter has been calibrated yearly once.

Biomass Fuels (of all types in MT):

The rice husk is being used as a main fuel. Other biomass fuels such as cotton stalks, ground nut shells, and other biomass were also used during the reported period. The fuel on receipt in the plant premises is weighed at the Electronic weighbridge installed at the plant



main gate, unloaded in the fuel yard and stacked properly. The type of fuel, quantities, vehicle No., etc are recorded by weighbridge staff and the same was certified by the fuel yard staff and security personnel. The weigh bridge is of Class- III with a capacity of 40 MT, and has been verified and certified for accuracy by Department of Legal Metrology of Govt. of Andhra Pradesh. It has been calibrated annually by calibrating agency.

The biomass fuels after necessary preparation is fed to the Boiler as per the requirement and consumption is being recorded on daily basis.

Calorific value of the Biomass fuels (in kcal/kg):

The calorific value of the Biomass fuel of all types used is being carried out periodically by independent third party laboratory. These values are used for cross verification of energy balances and calculations for internal monitoring purpose from the view of energy efficiency.

Coal/Diesel (in MT/Ltrs.):

The project is also consumed coal as supporting fuel during the reported period. Coal on receipt is weighed at the Electronic weighbridge installed at the plant main gate, unloaded in the fuel yard and stacked properly. The quantities, vehicle No., etc are recorded by weighbridge staff and the same was certified by the fuel yard staff and security personnel. Coal is fed to the boiler as and when required and consumption will be recorded accordingly. The project is also used diesel in DG set for plant lighting and handling of biomass residues within the premises of the power plant and the same is being monitored on regular basis using level gauge/measurement on store issues.

Calorific value (in kcal/kg) and % of Carbon content in Coal:

The analysis of coal for % of carbon content and calorific value is being carried out periodically by independent third party laboratory and also reviewed the information provided by the coal suppliers. The project has taken the % of Carbon values from test reports for estimation of project emissions due to usage of coal.



Data being collected in order to monitor the GHG reduction is given in the Table 3 as mentioned in section D.3 in the registered PDD:

Table – 3: Data being monitored as per section D.3 in PDD

ID No.	Data Type	Data Variable	Data Unit	Measured (m), Calculated (C) or Estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	For how long is archived data to be kept?	Comments
D.3.1	Power	Electricity Generated	KWh	Measured	Daily	100%	Electronic and Paper	Crediting period plus 2 years	From the energy meter in the plant control room
D.3.2	Power	Auxiliary Consumption	KWh	Calculated	Daily	100%	Electronic and Paper	Crediting period plus 2 years	Based on difference Between units Generated and units exported
D.3.3	Power	Export	KWh	Measured	Daily	100%	Electronic and Paper	Crediting period plus 2 years	Measured from the trivector meter in the sub-station
D.3.4	Fuel	Biomass used	MT	Measured	Daily Measurement & Monthly Recording	100%	Electronic and Paper	Crediting period plus 2 years	
D.3.5	Fuel	Avg. calorific value of Biomass used	Kcal/Kg	Measured	Quarterly/ Half Yearly	100%	Electronic and Paper	Crediting period plus 2 years	Tested quarterly/half yearly only if the source of fuel is different.
D.3.6	Fuel	Coal Used	MT	Measured	Every batch	100%	Electronic and Paper	Crediting period plus 2 years	Tested every batch only if the source of fuel is different.
D.3.7	Fuel	Calorific value of coal used	Kcal/Kg	Measured	Every batch	100%	Electronic and Paper	Crediting period plus 2 years	Tested every batch only if the source of fuel is different.
D.3.8	Fuel	%carbon	%	Measured	Every batch	100%	Electronic and Paper	Crediting period plus 2 years	Tested every batch only if the source of fuel is different.



As per the billing period, the data on electricity generation, auxiliary electricity consumption, electricity exported to grid and electricity imported from grid and fuels consumption for the plant is presented in the tables given below:

Table – 4.a: Details of Gross electricity generation, auxiliary consumption, electricity exported to grid, electricity imported from grid and net electricity displaced for Billing period

Month Period	Generated	Aux-Consumption	Exported	Imported	Net Electricity Displaced
	kWh	kWh	kWh	kWh	kWh
25.01.2009 to 24.02.2009	4577600	557100	4020500	9900	4010600
24.02.2009 to 24.03.2009	3331500	405100	2926400	17600	2908800
24.03.2009 to 24.04.2009	3699500	492500	3207000	18200	3188800
24.04.2009 to 24.05.2009	2895700	410800	2484900	25900	2459000
24.05.2009 to 24.06.2009	3799700	493000	3306700	17800	3288900
24.06.2009 to 24.07.2009	4498600	586300	3912300	2000	3910300
24.07.2009 to 24.08.2009	4461000	564200	3896800	9700	3887100
24.08.2009 to 24.09.2009	4612000	597200	4014800	3500	4011300
24.09.2009 to 24.10.2009	3539380	447880	3091500	16400	3075100
24.10.2009 to 24.11.2009	4575500	556500	4019000	10800	4008200
24.11.2009 to 24.12.2009	2847300	342200	2505100	21200	2483900
24.12.2009 to 24.01.2010	4533000	564500	3968500	9300	3959200
Total	47370780	6017280	41353500	162300	41191200



Table – 4.b: Details of Biomass & other fossil fuels consumption in line with Billing Period

Month Period	Biomass Consumption, MTs						Coal Consumption		Diesel Consumption Ltrs.
	Rice Husk	Saw dust	Coconut Waste s	Discarded seeds	Others	Total	MTs	% of Carbon	
25.01.2009 to 24.02.2009	3634	247	145	1494	0	5520	495.14	33.57	0
24.02.2009 to 24.03.2009	3622	235	230	15	113	4215	320	30.86	0
24.03.2009 to 24.04.2009	3573	252	173	208	163	4369	786.03	33.57	295
24.04.2009 to 24.05.2009	2479	340	143	430	133	3525	427.97	31.30	20
24.05.2009 to 24.06.2009	4658	314	143	20	4	5139	155	33.57	30
24.06.2009 to 24.07.2009	4707	238	102	66	59	5172	1000	35.53	0
24.07.2009 to 24.08.2009	4876	416	54	89	5	5440	730.66	31.30	50
24.08.2009 to 24.09.2009	4915	783	80	238	0	6016	663.18	33.57	160
24.09.2009 to 24.10.2009	3731	618	110	83	16	4558	460	33.57	100
24.10.2009 to 24.11.2009	5131	223	490	335	8	6187	245	33.57	100
24.11.2009 to 24.12.2009	3176	278	13	357	0	3824	175	33.57	300
24.12.2009 to 24.01.2010	5037	750	0	0	0	5787	383	33.57	0
Total	49539	4694	1683	3335	501	59752	5840.98		1055

5. GHG Calculations-Formulae Used

Project type: **Type I - Renewable Energy Projects**

Approved Baseline methodology: **AMS I.D / Version 8**

The following formula is adopted for calculating emission reductions generated by the project activity:



$$ER_y = BE_y - PE_y - Ly$$

Where ER_y is emission reductions in a given year
BE_y is baseline emissions in a given year
PE_y is project emissions in a given year
L_y is leakage in a given year

Baseline Emissions (BE_y)

The baseline emissions are calculated as follows:

$$\text{Baseline Emissions} = \text{Electricity Exported to Grid (kWh)} \times \text{Baseline emission factor (kg CO}_2\text{/kWh)}$$

The baseline emission factor of the Southern grid, which is fixed ex-ante for the crediting period, the project has been taken the baseline emission factor 0.8345 kg CO₂/kWh as mentioned in the registered PDD.

Project Emissions (PE_y)

The emissions occurred due to use of coal and diesel is considered as project emissions in estimations.

Project emission due to usage of Coal:

$$CE_c = C * Q * (44 / 12)$$

Where

CE_c = Stoichiometric Carbon-dioxide emission due to coal burning at project, t CO₂
C = Carbon percentage in coal, %
Q = Quantity of coal burned, MT

Project emission due to usage of diesel in DG Set and other purpose:

$$PE_{\text{diesel},y} = F_{d,y} * D * NCV_{\text{Diesel}} * EF_{\text{CO}_2} * \text{OXID} / 10^6$$

Where

PE_{diesel,y} = The emissions due to usage of diesel by the project activity during year y(tCO₂)
F_{d,y} = The quantity of diesel used during the year (Ltrs)
D = Density of diesel (0.82 kg/Ltr.)
NCV_{Diesel} = The calorific value of diesel (43 TJ/Gg as per IPCC 2006 default value)



- EF_{CO2} = The CO₂ emission factor of Diesel (74.1 t CO₂/TJ as per IPCC 2006 default value)
- OXID = The oxidation factor of the Diesel (1 as per IPCC 2006 default value)

Leakage

leakages, Ly = 0.

Using the above formulas, the Emission reductions from the project activity are shown in table-6.

6. Measures to ensure the results/uncertainty analysis

As per the Power Purchase Agreement (PPA), the energy exported by SGEL is being recorded from independent energy meters i.e. Main meter & Check meter were installed at 132/33 KV Sub-Station, Mancherial of APTRANSCO. In the event, the Main meter is not in operation, and the reading from Check meter is used for billing.

The calibration of monitoring meters is being maintained as per the requirement of APTRANSCO and the same is being done regularly. Electricity export to grid and electricity import is being recorded daily and the same is being verified by the respective officials. The details about the calibration of meters are tabulated below.

Table – 5: Calibration details for Energy meters for the Monitored Period

SI No	Meter Name	Calibration Date	Accuracy class	Calibrating Agency	Calibration Due
01988430	Main Meter	11-11-08, 24-05-09 , 17-11-09 &	0.2 for both (active & Reactive)	MRT-TL&SS Division of Transmission corporation of AP Ltd	16-05-2010
01988433	Check Meter	11-11-08, 24-05-09 , 17-11-09 &	0.2 for both (active & Reactive)	MRT-TL&SS Division of Transmission corporation of AP Ltd	16-05-2010
020301035	Generation Meter	25-12-08 & 29-11-09	0.2 for both (active & Reactive)	TVL Electricals, Vijayawada	28-11-10



7. Net Emission Reductions for the Monitored Period

Emission reductions are calculated based on grid electricity displaced by the project activity for the chosen monitoring period

Table – 6: Emission Reductions for the Monitored Period

S.No.	Monitoring Period	Net Electricity Displaced	Coal Consumption		Diesel Consumption	Baseline Emission Factor	Baseline Emissions	Project Emissions tCO ₂		Leakage Emissions	Net Emission Reductions
		kWh	MTs	% of Carbon	Ltrs.	kgCO ₂ / kWh	tCO ₂	Coal	Diesel	tCO ₂	tCO ₂
1	25.01.2009 to 24.02.2009	4010600	495.14	33.57	0	0.8345	3347	717	0	0	2630
2	24.02.2009 to 24.03.2009	2908800	320.00	30.86	0	0.8345	2427	463	0	0	1964
3	24.03.2009 to 24.04.2009	3188800	786.03	33.57	295	0.8345	2661	1096	1	0	1564
4	24.04.2009 to 24.05.2009	2459000	427.97	31.30	20	0.8345	2052	527	0	0	1525
5	24.05.2009 to 24.06.2009	3288900	155.00	33.57	30	0.8345	2745	216	0	0	2529
6	24.06.2009 to 24.07.2009	3910300	1000.00	35.53	0	0.8345	3263	1394	0	0	1869
7	24.07.2009 to 24.08.2009	3887100	730.66	31.30	50	0.8345	3244	629	0	0	2615
8	24.08.2009 to 24.09.2009	4011300	663.18	33.57	160	0.8345	3347	570	0	0	2777
9	24.09.2009 to 24.10.2009	3075100	460.00	33.57	100	0.8345	2566	396	0	0	2170
10	24.10.2009 to 24.11.2009	4008200	245.00	33.57	100	0.8345	3345	302	0	0	3043
11	24.11.2009 to 24.12.2009	2483900	175.00	33.57	300	0.8345	2073	215	1	0	1857
12	24.12.2009 to 24.01.2010	3959200	383.00	33.57	0	0.8345	3304	471	0	0	2833
Total		41191200	5840.98		1055		34374	6996	2	0	27376



8. Details of Monitoring team

A CDM team has been formed in SGEL, for monitoring and verification of all the monitoring parameters as per the guidelines formulated by the management of SGEL. Qualified and trained people monitor the parameters and emission reduction calculations. In the complete implementation and monitoring Plan, SGEL is the sole agency responsible for implementation and monitoring. The details of monitoring team are detailed below:

Table – 7: Monitoring Team

S. No.	Name of the Person	Designation
1	Mr. M. Komaraiah	Chairman & Managing Director
2	Mr. I. Raja Babu	Director
3	Mr. K. Joga Rao	General Manager - Finance
4	Mr. N. Janardhan	Manager
5	Mr. Ch.Shankaraiah	G.M. - Biomass
6	Mr. S. Krishna	Plant Manager
7	Mr.P Venkata Srinivas	Dy.Manger- CDM & Energy
8	Mr. Thirmala Rao	In-charge, CDM data management
9	Mr. A. Mallesham	Shift In charge