

MONITORING REPORT

Ver. 02, 12th January 2009

(Monitoring period chosen from 24th March 2007 to 24th March, 2008 both days included)

**11.3 MW renewable energy project for a grid system by
K.M.Power (P) Limited
UNFCCC Reference No. 0750**

Net Emission Reductions: 27060 tCO₂e

Project Locations

4.0 MW Hydro Electric Project at Guntakandala Village,
District Kurnool, A.P, India.

3.3 MW Hydro Electric Project at Velpanuru Village,
District Kurnool, A.P, India.

4.0 MW Hydro Electric Project at Madhavaram Village
District Kurnool, A.P, India.

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1. Current Status of the Projects

K.M. Power (P) Ltd (KMPL) has established 11.3 MW Small Hydro Projects bundled of 4 MW at Guntakandala Village, 3.3 MW at Velpanur and 4 MW at Madhavaram villages of Velugonda Mandal, Kurnool District, Andhra Pradesh.

The Guntakandala small hydro project commissioned in February 2002, the Velpanuru small hydro project commissioned in November 2002 and Madhavaram small hydro project commissioned in December 2003 and all projects are in continuous operation.

The Project Activity was registered by the CDM Executive Board on 14th January 2007 and the crediting period of the project activity has been commenced from 6th February 2002. This is the third Periodic Monitoring Report for the project activity. The details of the earlier periodic verifications of CERs as mentioned below:

Description	Monitoring Period	Net Electricity Displaced GWh	Net Emission reductions (tCO ₂ e)	Status
1 st Periodic Verification	06.02.2002 to 24.03.2006	78.79	60602	Issued
2 nd Periodic Verification	25.03.2006 to 23.03.2007	33.87	24911	Issued
Total		112.66	85513	

2. Monitoring Period

The Monitoring period is chosen from 24th March 2007 to 24th March 2008. The net electricity exported to the State grid by the project activity is 37.483 GWh and the net emission reductions are of 27060 tCO₂e for the present reported period.

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

The details of major equipment of the project and suppliers are presented below:

Table 1 – Details of Plant Major Equipments and Suppliers

S.No	Location of plant	Equipment details
1	Guntakandala small hydro plant	2x2000 KW Vertical Kaplan Turbine, Adjustable runner & indicating and recording instruments guide vanes, etc

		Synchronous generator of 3 Phase, 6.6 kV, k 15%, 50 c/s, 750 RPM, 0.8 PF and rated output 2000 KW Supplier: M/s Boving Fouress Ltd, Bangalore
2	Velpanur small hydro plant	2x1650 KW Vertical Kaplan Turbine, Adjustable runner & indicating and recording instruments guide vanes, etc Synchronous generator of 3 Phase, 6.6 kV, k 15%, 50 c/s, 750 RPM, 0.8 PF and rated output 2000 KW Supplier: M/s Boving Fouress Ltd, Bangalore
3	Madhavaram small hydro plant	2x2000 KW Vertical Kaplan Turbine, Adjustable runner & indicating and recording instruments guide vanes, etc Synchronous generator of 3 Phase, 6.6 kV, k 15%, 50 c/s, 750 RPM, 0.8 PF and rated output 2000 KW Supplier: M/s Boving Fouress Ltd, Bangalore

The plant outages are detailed below.

Table 2: Guntakundala Power House - Details of Running & Non-Running Hours for the Monitored period – Unit wise

Monitored Period	Total Hours	Running Hours (HH:MM:SS)		Non-Running Hours (HH:MM:SS)	
	HH:MM:SS	UNIT - I	UNIT - II	UNIT - I	UNIT - II
24.03.07 to 23.04.07	744:00:00	99:55:00	0:00:00	644:05:00	744:00:00
23.04.07 to 24.05.07	720:00:00	0:00:00	0:00:00	720:00:00	720:00:00
23.05.07 to 23.06.07	768:00:00	36:05:00	0:00:00	731:55:00	768:00:00
24.06.07 to 24.07.07	720:00:00	41:20:00	233:10:00	678:40:00	486:50:00
24.07.07 to 23.08.07	720:00:00	395:35:00	585:55:00	324:25:00	134:05:00
23.08.07 to 23.09.07	744:00:00	723:35:00	717:35:00	20:25:00	26:25:00
23.09.07 to 23.10.07	720:00:00	563:30:00	557:40:00	156:30:00	162:20:00
23.10.07 to 23.11.07	744:00:00	607:05:00	666:25:00	136:55:00	77:35:00
23.11.07 to 23.12.07	720:00:00	672:35:00	609:45:00	47:25:00	110:15:00
23.12.07 to 23.01.08	744:00:00	627:35:00	349:40:00	116:25:00	394:20:00
23.01.08 to 23.02.08	744:00:00	582:05:00	35:20:00	161:55:00	708:40:00
23.02.08 to 24.03.08	720:00:00	618:20:00	66:45:00	101:40:00	653:15:00
Total	8808:00:00	4967:40:00	3822:15:00	3840:20:00	4985:45:00

Table 3: Velpanur Power House - Details of Running & Non-Running Hours for the Monitored period – Unit wise

Monitored Period	Total Hours	Running Hours (HH:MM:SS)		Non-Running Hours (HH:MM:SS)	
	HH:MM:SS	UNIT - I	UNIT - II	UNIT - I	UNIT - II
24.03.07 to 23.04.07	744:00:00	116:55:00	0:00:00	627:05:00	744:00:00
23.04.07 to 23.05.07	720:00:00	0:00:00	0:00:00	720:00:00	720:00:00
23.05.07 to 24.06.07	768:00:00	7:05:00	0:00:00	760:55:00	768:00:00
24.06.07 to 24.07.07	720:00:00	160:40:00	62:50:00	559:20:00	657:10:00
24.07.07 to 23.08.07	720:00:00	481:00:00	344:20:00	239:00:00	375:40:00
23.08.07 to 23.09.07	744:00:00	726:00:00	726:40:00	18:00:00	17:20:00
23.09.07 to 23.10.07	720:00:00	517:45:00	698:40:00	202:15:00	21:20:00
23.10.07 to 23.11.07	744:00:00	645:00:00	653:55:00	99:00:00	90:05:00
23.11.07 to 23.12.07	720:00:00	581:45:00	665:55:00	138:15:00	54:05:00
23.12.07 to 23.01.08	744:00:00	549:05:00	433:55:00	194:55:00	310:05:00
23.01.08 to 23.02.08	744:00:00	571:15:00	37:05:00	172:45:00	706:55:00
23.02.08 to 24.03.08	720:00:00	650:50:00	5:10:00	69:10:00	714:50:00
Sub-Total	8808:00:00	5007:20:00	3628:30:00	3800:40:00	5179:30:00

Table 4: Madhavaram Power House - Details of Running & Non-Running Hours for the Monitored period – Unit wise

Monitored Period	Total Hours	Running Hours (HH:MM:SS)		Non-Running Hours (HH:MM:SS)	
	HH:MM:SS	UNIT - I	UNIT - II	UNIT - I	UNIT - II
24.03.07 to 28.04.07	888:00:00	110:15:00	0:00:00	777:45:00	888:00:00
28.04.07 to 23.05.07	576:00:00	0:00:00	0:00:00	576:00:00	576:00:00
23.05.07 to 24.06.07	768:00:00	0:00:00	14:30:00	768:00:00	753:30:00
24.06.07 to 24.07.07	720:00:00	5:00:00	216:05:00	715:00:00	503:55:00
24.07.07 to 23.08.07	720:00:00	232:45:00	599:50:00	487:15:00	144:10:00
23.08.07 to 23.09.07	744:00:00	725:15:00	729:20:00	18:45:00	14:40:00
23.09.07 to 23.10.07	720:00:00	525:05:00	705:40:00	194:55:00	14:20:00
23.10.07 to 23.11.07	744:00:00	611:50:00	726:50:00	132:10:00	17:10:00
23.11.07 to 23.12.07	720:00:00	576:50:00	710:35:00	143:10:00	9:25:00
23.12.07 to 23.01.08	744:00:00	278:55:00	700:55:00	465:05:00	43:05:00
23.01.08 to 23.02.08	744:00:00	28:35:00	570:50:00	715:25:00	173:10:00

23.02.08 to 24.03.08	720:00:00	2:50:00	663:20:00	717:10:00	32:40:00
Sub-Total	8808:00:00	3097:20:00	5637:55:00	5710:40:00	3170:05:00

4. Parameters being monitored according to Monitoring Plan

The following parameters were monitored on continuous basis.

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

Gross electricity generation from the plant and auxiliary consumption in the plant are measured continuously using the energy meters installed in the control room of the respective plant. The daily readings were aggregated to monthly readings.

b) Electricity Export and Import (in kWh):

Electronic energy meters were installed for the energy exported to the State grid and the energy imported from the State grid. Monthly energy meter readings have recorded and jointly certified by the representatives of APTRANSCO & KMPL. These energy meters have been calibrated regularly and the test reports & relevant records have been furnished to DOE for verification.

c) Weighted average Emission factor for Southern region grid (tCO₂/GWh)

As mentioned under sec. B.2 of registered PDD, the project has been considered the ex-post emission factor for the weighted average emissions of the current generation mix (incl. imports) of Southern regional grid. The project has reviewed the emission factors were mentioned in the registered PDD and the Carbon Dioxide Baseline Data base, Version 3, 15th December 2007 published by Government of India, Ministry of Power Central Electricity Authority¹, Government of India.

Though the registered PDD contains calculated emission factor for 2007-08 as 739.14 tCO₂/GWh as a conservative approach, authentic data from Table B of CO₂ data base of CEA is 721.94 tCO₂/GWh for the year 2007-08 has been used. Since electricity generation data for Southern grid for the year 2008-09 is not available on the CO₂ data base of official website of Central Electricity Authority of India, which is the only authentic and reliable source, the emission factor taken as the weighted average of the current generation mix for the most recent year (2006-07) available has been considered based on the clarification given on approved methodologies (AM_CLA_0038).

The PP also reviewed the latest Baseline Data base, Version 04 published by CEA during verification i.e. after initial monitoring report web host.

¹ <http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm>

The details of Baseline emission factor (in tCO₂/GWh) are furnished below:

Year	Regd. PDD	CEA Data Ver.03	CEA Data Ver.04
2007 - 08	739.14	721.94 (2006-07)	722.28

The baseline emission figures mentioned in registered PDD & Recent CEA published data i.e. Version 04 are higher than the baseline emission factor considered from Version.03. As a conservative approach, authentic data from Table B of CO₂ data base of CEA is 721.94 tCO₂/GWh for the year 2006-07 has been used for emission reduction calculations.

Data being collected in order to monitor the GHG reduction is mentioned in the Table under sec D.3 of registered PDD:

ID number	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	Gross Generation	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Readings are being recorded from energy meter which was installed in the plant control room
D.3.2	Power	Auxiliary Consumption	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Readings are being recorded from energy meter which was installed in the plant control room
D.3.3	Power	Power Import	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Readings are being recorded from Trivector meters which were installed in the Sub-Station
D.3.4	Power	Power Export	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Readings are being recorded from energy meter which was installed at project site.
D.3.5	Emission factor	Grid Emission Factor (EF)	tCO ₂ /GWh	c	Yearly	100%	Electronic and Paper	Crediting period plus 2 years	Taken latest information of CEA this data item is required for estimating the baseline emission and emission reduction

As per the billing data, the Month wise data on electricity generation, auxiliary consumption, net electricity export for three projects is presented in the tables given below:

Table -5: Guntakandala Power House – Details of power generation, Aux. Power Consumption and Electricity exported to grid, Electricity imported from grid and Net electricity exported to Grid as per billing period.

Monitored Period	Gross Electricity Generated, kWh			Aux. Power Consumption, KWh		Electricity Exported to Grid	Electricity Imported from Grid	Net Electricity Exported to Grid
	UNIT.1	UNIT.2	TOTAL	Monitored at Proj. Site [See Note-1]	As per Calc. [See Note-2]	KWh	KWh	KWh
			G		G+I-E	E	I	
24.03.07 to 23.04.07	65060	0	65060	1619	5160	61400	1500	59900
23.04.07 to 23.05.07	0	0	0	0	0	0	0	0
23.05.07 to 24.06.07	38130	0	38130	1142	1430	37400	700	36700
24.06.07 to 24.07.07	30030	264790	294820	4561	7620	288500	1300	287200
24.07.07 to 23.08.07	590460	861160	1451620	20545	35520	1417500	1400	1416100
23.08.07 to 23.09.07	1465580	1510700	2976280	36017	68780	2907700	200	2907500
23.09.07 to 23.10.07	880010	1174820	2054830	24182	46730	2008400	300	2008100
23.10.07 to 23.11.07	903660	1422210	2325870	23311	46870	2279200	200	2279000
23.11.07 to 23.12.07	1169910	1325910	2495820	27162	52720	2443200	100	2443100
23.12.07 to 23.01.08	769860	747080	1516940	15971	32140	1485000	500	1484800
23.01.08 to 23.02.08	639460	68140	707600	8124	15400	693500	1300	692200
23.02.08 to 24.03.08	1113060	35450	1148510	9125	21310	1128200	1000	1127200
Sub-Total	7665220	7410260	15075480	171759	333980	14750000	8500	14741500

Unit-II of Guntakandala Power House has operated with excess electricity generation on rated capacity in the month of September 2007 to utilize the available water for electricity generation. The details are furnished below:

Monitored Period	TG Installed Rated Capacity Generation, KWh	Gross Electricity Generated	Excess electricity generation on rated capacity
	Calculation	Recorded at Project site	Calculation
23.08.07 to 23.09.07	1488000	1510700	1.5 %

The technical specification sheet provided by M/s Boving Fouress Limited, the supplier of the TG that the turbine capable to generate max. output 2363.9 KW i.e. 18.2% excess generation on rated capacity (2000 KW) and the same is furnished to DOE for verification. As there is no restriction on the monthly plant load factor from the state electricity board authorities, the excess generation is deemed acceptable.

Table -6: Velpanur Power House – Details of power generation, Aux. Power Consumption and Electricity exported to grid, Electricity imported from grid and Net electricity exported to Grid as per billing period

Monitored Period	Gross Electricity Generated, kWh			Aux. Power Consumption, KWh		Electricity Exported to Grid	Electricity Imported from Grid	Net Electricity Exported to Grid
	UNIT.1	UNIT.2	TOTAL	Monitored at Proj. Site [See Note-1]	As per Calc. [See Note-2]	KWh	KWh	KWh
24.03.07 to 23.04.07	67610	0	67610	1040	4510	64400	1300	63100
23.04.07 to 23.05.07	0	0	0	1085	1200	0	1200	-1200
23.05.07 to 24.06.07	3490	0	3490	1118	1390	3400	1300	2100
24.06.07 to 24.07.07	140880	74780	215660	3340	5860	211100	1300	209800
24.07.07 to 23.08.07	453020	493110	946130	13963	24230	923300	1400	921900
23.08.07 to 23.09.07	904560	978940	1883500	16117	42600	1841100	200	1840900
23.09.07 to 23.10.07	577910	980010	1557920	12141	28020	1530200	300	1529900
23.10.07 to 23.11.07	723380	924680	1648060	10679	27460	1621000	400	1620600
23.11.07 to 23.12.07	701150	934550	1635700	12543	29100	1607000	400	1606600
23.12.07 to 23.01.08	486010	631300	1117310	7280	19610	1098000	300	1097700
23.01.08 to 23.02.08	524590	51060	575650	9894	15850	560400	600	559800
23.02.08 to 24.03.08	871340	7650	878990	5392	14390	865100	500	864600
Sub-Total	5453940	5076080	10530020	94592	214220	10325000	9200	10315800

Table -7: Madhavaram Power House – Details of power generation, Aux. Power Consumption and Electricity exported to grid, Electricity imported from grid and Net electricity exported to Grid as per billing period

Monitored Period	Gross Electricity Generated, kWh			Aux. Power Consumption, KWh		Electricity Exported to Grid	Electricity Imported from Grid	Net Electricity Exported to Grid
	UNIT.1	UNIT.2	TOTAL	Monitored at Proj. Site [See Note-1]	As per Calc. [See Note-2]	KWh	KWh	KWh
24.03.07 to 28.04.07	80600	0	80600	2694	4000	78500	1900	82900

28.04.07 to 23.05.07	0	0	0	1312	1600	0	1600	-1600
23.05.07 to 24.06.07	0	10418	10418	1287	1918	10100	1600	8500
24.06.07 to 24.07.07	4320	281990	286310	5147	8210	279900	1800	278100
24.07.07 to 23.08.07	314430	903820	1218250	15168	27550	1191300	600	1190700
23.08.07 to 23.09.07	1033850	1159680	2193530	13276	69330	2124300	100	2124200
23.09.07 to 23.10.07	751140	1082890	1834030	11650	40130	1794000	100	1793900
23.10.07 to 23.11.07	967920	1057090	2025010	22107	43410	1981700	100	1981600
23.11.07 to 23.12.07	869790	1121990	1991780	20962	41480	1950300	0	1950300
23.12.07 to 23.01.08	483730	874240	1357970	14620	41570	1316700	300	1316400
23.01.08 to 23.02.08	48880	665540	714420	11516	18420	696800	800	696000
23.02.08 to 24.03.08	5330	1028120	1033450	5375	22150	1011600	300	1011300
Sub-Total	4559990	8185778	12745768	125114	319768	12435200	9200	12426000

Note-1: Measured aux. consumption includes part of electricity generated by the project activity and electricity imported from grid taken through energy meter located on LT panel at project site. The losses on account of power transformer & transmission line are not included in the measured aux. consumption.

Note-2: Computed based on the gross electricity generation recorded in the plant and electricity exported to the grid & electricity imported from grid readings certified by APTRANSCO & Plant personnel.

5. Formulae Used

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

$$ER_y = BE_y - PE_y - L_y$$

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

The baseline emissions are calculated as follows:

$$BE_y = EG_y \cdot EF_y$$

Where EG_y is the net electricity export to grid in a given year (GWh)
 EF_y is the emission factor for a given year (tCO₂/GWh)

Leakage

The energy generating equipment is not transferred from another activity. Hence, the leakage emissions are considered zero.

Since the project emissions (PE_y) as well as the leakage (L_y) are zero, the emission reductions are equal to baseline emissions.

Using the above formulas, the Emission reductions from the project activity are shown below.

6. Net Emission Reductions – Project wise

The emission reductions for the chosen monitored period i.e. from 25th March 2006 to 23rd March 2007 are as given below:

Table - 8: Guntakandala Power House – Net Emission Reductions

Monitored Period	Net Electricity Exported to Grid		Baseline Emission Factor	Baseline Emissions	Project Emissions	Net Emission Reductions
	KWh	GWh	tCO ₂ /GWh	tCO ₂ e	tCO ₂ e	tCO ₂ e
24.03.07 to 23. 04.07	59900	0.060	721.94	43	0	43
23.04.07 to 23. 05.07	0	0	721.94	0	0	0
23.05.07 to 24.06.07	36700	0.037	721.94	26	0	26

24.06.07 to 24.07.07	287200	0.287	721.94	207	0	207
24.07.07 to 23.08.07	1416100	1.416	721.94	1022	0	1022
23.08.07 to 23.09.07	2907500	2.908	721.94	2099	0	2099
23.09.07 to 23.10.07	2008100	2.008	721.94	1450	0	1450
23.10.07 to 23.11.07	2279000	2.279	721.94	1645	0	1645
23.11.07 to 23.12.07	2443100	2.443	721.94	1764	0	1764
23.12.07 to 23.01.08	1484800	1.485	721.94	1072	0	1072
23.01.08 to 23.02.08	692200	0.692	721.94	500	0	500
23.02.08 to 24.03.08	1127200	1.127	721.94	814	0	814
Sub-Total	14741800	14.742		10642	0	10642

Table – 9: Velpanur Power House – Net Emission Reductions

Monitored Period	Net Electricity Exported to Grid		Baseline Emission Factor	Baseline Emissions	Project Emissions	Net Emission Reductions
	KWh	GWh	tCO ₂ /GWh	tCO _{2e}	tCO _{2e}	tCO _{2e}
24.03.07 to 23.04.07	63100	0.063	721.94	46	0	46
23.04.07 to 23.05.07	-1200	-0.001	721.94	-1	0	-1
23.05.07 to 24.06.07	2100	0.002	721.94	2	0	2
24.06.07 to 24.07.07	209800	0.210	721.94	151	0	151
24.07.07 to 23.08.07	921900	0.922	721.94	666	0	666
23.08.07 to 23.09.07	1840900	1.841	721.94	1329	0	1329
23.09.07 to 23.10.07	1529900	1.530	721.94	1104	0	1104
23.10.07 to 23.11.07	1620600	1.621	721.94	1170	0	1170
23.11.07 to 23.12.07	1606600	1.607	721.94	1160	0	1160
23.12.07 to 23.01.08	1097700	1.098	721.94	792	0	792
23.01.08 to 23.02.08	559800	0.560	721.94	404	0	404
23.02.08 to 24.03.08	864600	0.865	721.94	624	0	624
Total	10315800	10.316		7447	0	7447

Table - 10: Madhavaram Power House – Net Emission Reductions

Monitored Period	Net Electricity Exported to Grid		Baseline Emission Factor	Baseline Emissions	Project Emissions	Net Emission Reductions
	KWh	GWh	tCO ₂ /GWh	tCO ₂ e	tCO ₂ e	tCO ₂ e
24.03.07 to 28.04.07	76600	0.077	721.94	55	0	55
28.04.07 to 23.05.07	-1600	-0.002	721.94	-1	0	-1
23.05.07 to 24.06.07	8500	0.009	721.94	6	0	6
24.06.07 to 24.07.07	278100	0.278	721.94	201	0	201
24.07.07 to 23.08.07	1190700	1.191	721.94	860	0	860
23.08.07 to 23.09.07	2124200	2.124	721.94	1534	0	1534
23.09.07 to 23.10.07	1793900	1.794	721.94	1295	0	1295
23.10.07 to 23.11.07	1981600	1.982	721.94	1431	0	1431
23.11.07 to 23.12.07	1950300	1.950	721.94	1408	0	1408
23.12.07 to 23.01.08	1316400	1.316	721.94	950	0	950
23.01.08 to 23.02.08	696000	0.696	721.94	502	0	502
23.02.08 to 24.03.08	1011300	1.011	721.94	730	0	730
Total	12426000	12.426		8971	0	8971

Table - 11: Summary of Net Emission Reductions for the Monitored Period

Parameter	Unit	Guntakandala	Velpanuru	Madhavaram	Total
Electricity Exported to Grid	kWh	14750000	10325000	12435200	37510200
Electricity Imported from Grid	KWh	8500	9200	9200	26900
Net Electricity Exported to Grid	kWh	14741500	10315800	12426000	37483300
Net Electricity Exported to Grid	GWh	14.742	10.316	12.426	37.483
Emission Factor	t CO ₂ /GWh	721.94	721.94	721.94	
Baseline Emissions	t CO ₂ e	10642	7447	8971	27060
Project Emissions	t CO ₂ e	0	0	0	0
Net Emission Reductions	t CO₂e	10642	7447	8971	27060

The details of calculation of emission reductions month wise is presented as Annexure (Excel Sheet)

7. Measures to ensure the results / uncertainty analysis

The energy exported by each projects of K.M. Power (P) Ltd. is recorded from independent main meter installed at the interconnecting point i.e. Sub-station of the respective project. In the event, the main meter is not in operation, and the reading from check meter is used for billing.

Since all Main meters & Check meters are under the control of Transmission Corporation of Andhra Pradesh Limited (APTRANSCO) who is the buyer of electricity from the project activity, the periodic calibration is carried out by the ETDC, Ministry of Communication & Information Technology, Govt. of India as per the Power Purchase Agreement (PPA).

8. Details of Monitoring team and Responsibilities

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

Table 12 - Monitoring Team

Project	Shift Incharge	Plant Incharge	Executive Director	Managing Director
Guntakandala	Raghavendra	A.Venkateswara Reddy	Mr.Y Thimmaiah	Mr.G. Ramanarayan Reddy
Velpanur	J.Sivaiah	K.Madan Mohan Reddy	Mr.Y Thimmaiah	Mr.G. Ramanarayan Reddy
Madhavaram	Ravindra Babu	K.Madan Mohan Reddy	Mr.Y Thimmaiah	Mr.G. Ramanarayan Reddy

Enclosure - I

BASELINE INFORMATION

From Carbon Dioxide Baseline Data base, Version 3, 15th December 2007 published by Government of India, Ministry of Power Central Electricity Authority, Government of India.

www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Fuel Emission Factors (EF) (Source: Coal/Lignite - Initial National Communication, Gas/Oil/Diesel/Naphta - IPCC 2006, Corex - own assumption)

	Unit	Coal	Lignite	Gas	Oil	Diesel	Naphta	Corex
EF based on NCV	gCO ₂ /MJ	95.8	106.2	56.1	77.4	74.1	73.3	0.0
Delta GCV NCV	%	3.6%	3.6%	10%	5%	5%	5%	n/a
EF based on GCV	gCO ₂ /MJ	92.5	102.5	51.0	73.7	70.6	69.8	0.0
Oxidation Factor	-	0.98	0.98	1.00	1.00	1.00	1.00	n/a
Fuel Emission Factor	gCO ₂ /MJ	90.6	100.5	51.0	73.7	70.6	69.8	0.0

n/a = not applicable (i.e. no assumptions were needed)

Assumptions at Station Level (only where data was not provided by station)

	Unit	Coal	Lignite	Gas-CC	Gas-OC	Oil Diesel-Eng	Diesel-OC	Naphta	Hydro	Nuclear
Auxiliary Power Consumption	%	8.0	10.0	3.0	1.0	3.5	3.5	1.0	3.5	0.5
Gross Heat Rate	kcal/MWh (gross)	2,500	2,713	0	3,150	0	1,975	3,213	0	n/a
Net Heat Rate	kcal/MWh (net)	2,717	3,014	0	3,182	0	2,047	3,330	0	n/a
Specific Oil Consumption	ml/MWh (gross)	2.0	3.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
GCV	kcal/kg (or m3)	3,755	n/a	8,800	n/a	10,100	10,500	10,500	11,300	n/a
Density	t/1,000 lt	n/a	n/a	n/a	n/a	0.95	0.83	0.83	0.70	n/a
Specific CO ₂ emissions	tCO ₂ /MWh	1.04	1.28	0.00	0.68	0.00	0.60	0.98	0.64	n/a

n/a = not applicable (i.e. no assumptions were needed)

Assumptions at Unit Level (by capacity; only for units in the BM, where data was not provided by station)

Coal	Unit	67.5 MW	120 MW	10-250 MW	500 MW
Gross Heat Rate	kcal/MWh	2,750	2,500	2,500	2,425
Auxiliary Power Consumption	%	12.0	9.0	9.0	7.5
Net Heat Rate	kcal/MWh	3,125	2,747	2,747	2,622
Net Efficiency	%	28%	31%	31%	33%
Specific Oil Consumption	ml/MWh	2.0	2.0	2.0	2.0
Specific CO ₂ Emissions	tCO ₂ /MWh	1.19	1.05	1.05	1.00
Lignite	Unit	75 MW	125 MW	10/250 MW	
Gross Heat Rate	kcal/MWh	2,750	2,560	2,713	
Auxiliary Power Consumption	%	12.0	12.0	10.0	
Net Heat Rate	kcal/MWh	3,125	2,909	3,014	
Net Efficiency	%	28%	30%	29%	
Specific Oil Consumption	ml/MWh	3.0	3.0	3.0	
Specific CO ₂ Emissions	tCO ₂ /MWh	1.32	1.23	1.28	
Gas	Unit	0-49.9 MW	0-99.9 MW	>100 MW	
Gross Heat Rate	kcal/MWh	1,950	1,910	1,970	
Auxiliary Power Consumption	%	3.0	3.0	3.0	
Net Heat Rate	kcal/MWh	2,010	1,969	2,031	
Net Efficiency	%	43%	44%	42%	
Specific CO ₂ Emissions	tCO ₂ /MWh	0.43	0.42	0.43	
Diesel	Unit	0.1-1 MW	1-3 MW	3-10 MW	>10 MW
Gross Heat Rate	kcal/MWh	2,350	2,250	2,100	1,975
Auxiliary Power Consumption	%	3.5	3.5	3.5	3.5
Net Heat Rate	kcal/MWh	2,435	2,332	2,176	2,047
Specific CO ₂ Emissions	tCO ₂ /MWh	0.72	0.69	0.64	0.60
Naphta	Unit	All sizes			
Increment to Gas Heat Rate	%	2%			
Gross Heat Rate	kcal/MWh	0			
Auxiliary Power Consumption	%	3.5			
Net Heat Rate	kcal/MWh	0			
Specific CO ₂ Emissions	tCO ₂ /MWh	0.00			
Combined Margin	Unit				
Weight OM	%	50%			
Weight BM	%	50%			
Conversion Factors	Unit				
Energy	kJ/kcal	4.1868			
	MJ/MWh	3.6			
Oil					
Specific Emission	gCO ₂ /ml	2.96			

Appendix B Grid Emission Factors

Table A: Values for all regional grids for FY 2000-01 until FY 2006-07,

excluding Inter regional and cross-border electricity transfers.

Note: Values are rounded off to two decimals See the web link given

Above for additional decimal places(Database –Excel worksheet)

Weighted Average Emission Rate (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.72	0.73	0.74	0.71	0.71	0.71	0.72
East	1.09	1.06	1.11	1.10	1.08	1.08	1.03
South	0.73	0.75	0.82	0.84	0.78	0.74	0.72
West	0.90	0.92	0.90	0.90	0.92	0.87	0.85
North-East	0.42	0.41	0.40	0.43	0.32	0.33	0.39
India	0.82	0.83	0.85	0.85	0.84	0.82	0.80

Simple Operating Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.97	0.99	0.99
East	1.22	1.22	1.20	1.23	1.20	1.16	1.13
South	1.02	1.00	1.01	1.00	1.00	1.01	1.00
West	0.98	1.01	0.98	0.99	1.01	0.99	0.99
North-East	0.74	0.71	0.74	0.74	0.71	0.70	0.69
India	1.02	1.02	1.02	1.03	1.03	1.02	1.01

Build Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	0.71
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

Combined Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.76	0.76	0.77	0.76	0.75	0.80	0.81
East	1.06	1.06	1.05	1.07	1.05	1.06	1.03
South	0.86	0.85	0.86	0.85	0.85	0.86	0.85
West	0.87	0.89	0.88	0.88	0.89	0.81	0.79
North-East	0.44	0.43	0.44	0.44	0.43	0.42	0.46
India	0.86	0.86	0.86	0.86	0.86	0.85	0.85

Table B: Values for all regional grids for FY 2000-01 until FY 2006-07, including inter-regional and cross-border electricity transfers.

Weighted Average Emission Rate (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.72	0.73	0.74	0.71	0.72	0.73	0.74
East	1.06	1.03	1.09	1.08	1.05	1.05	1.00
South	0.74	0.75	0.82	0.84	0.78502	0.73595	0.72194
West	0.90	0.92	0.90	0.90	0.92	0.89	0.86
North-East	0.42	0.41	0.40	0.43	0.52	0.33	0.40
India	0.82	0.83	0.85	0.85	0.84	0.81	0.80

Simple Operating Margin (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.98	1.00	1.00
East	1.22	1.19	1.17	1.20	1.17	1.13	1.09
South	1.02	1.00	1.01	1.00	1.00088	1.00790	1.00303
West	0.98	1.01	0.99	0.99	1.01	1.00	0.99
North-East	0.74	0.71	0.74	0.74	0.90	0.70	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02	1.01

Build Margin (tCO2/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70469	0.71013	0.70546
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

Combined Margin in tCO2/MWh (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.76	0.76	0.77	0.76	0.76	0.80	0.81
East	1.06	1.05	1.04	1.05	1.04	1.05	1.01
South	0.86	0.85	0.86	0.85	0.85278	0.85902	0.85424
West	0.87	0.89	0.88	0.88	0.89	0.82	0.79
North-East	0.44	0.43	0.44	0.44	0.52	0.42	0.46
India	0.85	0.86	0.86	0.86	0.86	0.85	0.84

Enclosure : II

Details of Plant Outages and Reasons

Table 13.1 : Guntakundala Powerhouse

S.No.	Date	Type of Shut Down			Reasons
		Planned	Forced	Non-availability of water	
Guntakundala Unit-1					
1	27.03.07		6:20:00		Plant Stopped Due AVR Problem
2	30.03.07		13:10:00		Plant Stopped Due to the trip Problem
3	2.04.07 to 23.04.07			514:50:00	Plant Stopped Due Low Availability of water
4	23.04.07 to 24.06.07			1427:55:00	
5	26.06.07 to 13.07.07			432:00:00	
6	14.07.07 to 24.07.07			245:00:00	
7	1.08.07 to 2.08.07		35:00:00		Plant Stopped Due Flood Water enter in to Plant
8	5.08.07 to 18.08.07			272:20:00	Plant Stopped Due Low Availability of water
9	12.10.07 to 18.10.07			107:45:00	
10	23.10.07 to 31.10.07			92:15:00	
11	1.11.07 to 2.11.07		28:40:00		Runner blade & Hub checking
12	23.12.07 to 30.12.07			48:35:00	Plant Stopped Due Low Availability of water
13	2.01.08 to 12.01.08			61:20:00	
14	16.02.08 to 23.02.08			107:10:00	
15	21.03.08 to 24.03.08			90:45:00	
16	Short Interruptions*		142:25:00	214:50:00	
	Total	0	225:35:00	3614:45:00	
Guntakundala Unit-2					
1	24.03.07 to 23.04.07			744:00:00	Plant stopped due Low Availability of Water
2	23.04.07 to 23.06.07			1464:00:00	
3	24.06.07 to 29.06.07			119:00:00	
4	04.07.07 to 16.07.07			309:00:00	
5	1.08.07 to 2.08.07		34:30:00		Plant Stopped Due Flood Water enter in to Plant
6	8.08.07 to 10.08.07			27:00:00	Plant stopped due Low Availability of Water
7	26.09.07			24:00:00	
8	28.09.07 to 2.10.07		82:35:00		Plant Stopped Due to the Gear Box Problem
9	30.10.07 to 1.11.07			40:05:00	Plant stopped due Low Availability of Water
10	18.12.07 to 23.12.07			50:55:00	
11	5.01.08 to 23.01.08			338:35:00	
12	23.01.08 to 23.02.08			708:40:00	

13	23.02.08 to 24.02.08			653:15:00	
14	Short Interruptions*		123:45:00	266:25:00	
	Total	0	240:50:00	4744:55:00	

* Short interruption includes the both grid failures, transmission line problems and Non- availability of water.

Table 13.2 : Velpanur Powerhouse

S.No	Date	Type of shut down			Reasons
Velpanur Unit-1					
		Planned	Forced	Non-availability of water	
1	24.03.07 to 26.03.07			46:30:00	Plant Stopped due to low Availability of water
2	27.03.07		12:20:00		Plant Stopped due AVR Problem
3	1.04.07		15:15:00		Main Supply Failure and Intake Cleaning
4	2.04.07 to 23.04.07			515:05:00	Plant Stopped due to low Availability of water
5	23.04.07 to 23.05.07			720:00:00	
6	23.05.07 to 21.06.07			700:30:00	
7	22.06.07 to 23.06.07			36:25:00	
8	24.06.07 to 24.07.07			558:30:00	
9	1.08.07 to 2.08.07		35:25:00		plant stopped due to flood water enter in to plant
10	7.08.07 to 10.08 .07		41:15:00		Plant stopped due to the canal banking works
11	19.08.07		12:45:00		Supply failed
12	20.08.07 to 21.08.07			33:50:00	Plant Stopped due to low Availability of water
13	24.09.07		3:15:00		Plant stopped due to the trash cleaning
14	25.09.07 to 27.09.07			39:45:00	Plant Stopped due to low Availability of water
15	12.10.07 to 18.10.07			138:00:00	
16	25.10.07 to 29.10.07			57:05:00	
17	16.11.07 to 23.11.07		8:10:00		Plant Stopped due to main supply failed.
18	28.11.07		5:20:00		Plant Stopped due to the Runner blade problem
19	11.12.07 to 17.12.07		9:45:00		Plant Stopped due to main supply failed.
20	18.12.07 to 23.12.07			62:40:00	Plant Stopped due to low Availability of water
21	23.12.07 to 25.12.07			24:55:00	
22	27.12.07 to 14.01.08			154:45:00	
23	5.02.08 to 9.02.08			48:05:00	
24	10.02.08 to 11.02.08		6:30:00		Plant Stopped due to the Grid Failure and Trash Cleaning
25	17.02.08 to 23.02.08			111:05:00	Plant Stopped due to low Availability of water
26	21.03.08 to 24.03.08			47:20:00	

27	Short Interruptions*		253:05:00	103:05:00	
	Total	0	403:05:00	3397:35:00	
Velpanur Unit-2					
1	24.03.07 to 23.04.07			744:00:00	Plant Stopped due to low Availability of water
2	24.04.07 to 23.05.07			720:00:00	
3	23.05.07 to 24.06.07			744:00:00	
4	24.06.07 to 20.07.07			651:30:00	
5	1.08.07		11:20:00		Plant stopped due to the flood water enter in to the plant
6	2.08.07 to 18.08.07			353:40:00	Plant Stopped due to low Availability of water
7	31.10.07 to 1.11.07		40:55:00		Plant stopped due SF6 Breaker Failure & Runner Blade Problem
8	15.11.07 to 23.11.07		8:50:00		Plant Stopped due to Main Supply Problem
9	5.01.08 to 23.01.08			303:50:00	Plant Stopped due to low Availability of water
10	12.02.08 to 23.02.08			283:00:00	
11	23.02.08 to 26.02.08			77:10:00	
12	28.02.08 to 07.03.08			216:00:00	
13	09.03.08 to 24.03.08			378:30:00	
14	Short Interruptions*		144:00:00	502:45:00	
	Total	0	205:05:00	4974:25:00	

* Short interruption includes the both grid failures, transmission line problems and Non- availability of water.

Table 13.3 : Madhavaram Powerhouse

S.NO	Date	Type of Shut Down			Remarks
Madhavaram Unit-1 Details					
		Planned	Forced	Non-Availability of water	
1	24.03.07 to 2.04.07			137:20:00	Plant Stopped due to the Low Discharge
2	3.04.07 to 28.04.07			648:00:00	
3	28.04.07 to 23.05.07			624:00:00	
4	24.05.07 to 24.06.07			768:00:00	
5	25.06.07 to 24.07.07			720:00:00	
6	1.08.07 to 8.08.07		175:35:00		Manually stopped due to repair work
7	9.08.07 to 21.08.07			294:10:00	Plant Stopped due to the Low Discharge
8	26.09.07			24:00:00	
9	12.10.07 to 18.10.07			140:55:00	
10	23.10.07 to 31.10.07			122:55:00	
11	27.11.07		24:00:00		Manually stopped due to CT failed at CT&LAVT panel-2 & Trash Cleaning

12	20.12.07			21:40:00	Plant Stopped due to the Low Discharge
13	21.12.07		22:25:00		Manually tripped due to low discharge of water
14	25.12.07 to 8.01.08			174:25:00	Plant Stopped due to the Low Discharge
15	09.01.07 to 23.01.08			284:55:00	
16	24.01.07 to 09.02.08			408:00:00	
17	12.02.08 to 23.02.08			285:00:00	
18	23.02.08 to 23.03.08			693:10:00	
19	Short Interruptions*		71:35:00	70:35:00	
Total		0	293:35:00	5417:05:00	
Madhavaram Unit-2					
1	23.03.07 to 24.08.07			888:00:00	Plant Stopped due to the Low Discharge of Water
2	28.04.07 to 23.05.07			624:00:00	
3	23.05.07 to 22.06.07			724:00:00	
4	26.06.07 to 16.07.07			445:00:00	
5	2.08.07 to 3.08.07		48:00:00		Plant stopped due to the heavy rain
6	11.08.07 to 14.08.07			36:50:00	Plant Stopped due to the Low Discharge
7	17.02.08 to 20.02.08			91:10:00	
8	23.03.08			17:00:00	
9	Short Interruptions*		147:25:00	148:40:00	
Total		0	195:25:00	2974:40:00	

* Short interruption includes the both grid failures, transmission line problems and Non- availability of water.