Western Region Grid (2002-03)

Year	Source	Monitored Capacity (MW)	Gross Generation (GWh)	Auxiliary Consumption (%)	Net Generation (GWh)	Weighted AverageStation Heat (TJ/GWh)	Carbon Emission Factor (tC/TJ)	Conversion	Baseline Emissions tCO2	Emission Coefficient tCO2/GWh
2002-2003	Hydro	4477,14	8172,16	0,62%	8121,492608	0	0	0	0	**881,5153214**
	Steam	20691,5	137392	8,74%	125383,9392	11,0405916	25,8	3,666666667	130955997,1	
	Diesel	17,48	0	0,00%	0	11,0405916	20,2	3,666666667	0	
	Gas	4929,1	18713,3	1,91%	18355,87597	8,3736	15,3	3,666666667	8622837,206	
	Wind	588,8	878,51	0,00%	878,51	0	0	0	0	
	Nuclear	760	6200	9,68%	5599,84	0	0	0	0	
	Total	**31464,02**	**171355,97**		**158339,6578**				**139578834,3**	

Opeartion Station Heat Rate (Kcal/KWh) *	2637
Operation Station Heat Rate (TJ/GWh)	11,041
Operation Heat Rate of gas Based Stations (Kcal/KWh)	2000
Operation Heat Rate of gas Based Stations (TJ/GWh)	8,3736

Data Source:

Monitored Capacity:	Chapter - 2, Table no.: 2.4, All India Electricity Statistics, General Review 2002-03 (Contains Data for 2002-03)
Gross Generation	Chapter - 3, Table no.: 3.4, All India Electricity Statistics, General Review 2002-03 (Contains Data for 2002-03)
Auxiliary Consumption	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2002-03 (Contains Data for 2002-03)
Actual Generation:	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2002-03 (Contains Data for 2002-03)
Operation Station Heat Rate (Kcal/KWh) * :	Section 13, Pg. 4/9; Performance Review of Thermal Power Stations (2004-05) containing regional data of 03-04 & 04-05
Operation Heat Rate of gas Based Stations (Kcal/KWh)	Petition No.: 22/99, filed NTPC for approval of tariff for Kayamkulam Combined Cycle Power Project before CEA
Carbon Emission Factor (tC/TJ):	Pg. 1.6; Revised 1996 IPCC Guidelines for National Green house Gas Inventories : Workbook

***** **Based on the assumption that SHR doesn't change darastically over a period of one year.**

Western Region Grid (2003-04)

Year	Source	Monitored Capacity (MW)	Gross Generation (GWh)	Auxiliary Consumption (%)	Net Generation (GWh)	Weighted AverageStation Heat (TJ/GWh)	Carbon Emission Factor (tC/TJ)	Conversion	Baseline Emissions tCO2	Emission Coefficient tCO2/GWh
2003-2004	Hydro	4986,58	9282,38	0,60%	9226,68572	0	0	0	0	**867,0735229**
	Steam	20691,5	136063,45	8,40%	124634,1202	11,0405916	25,8	3,666666667	130172856,2	
	Diesel	17,48	0	0,00%	0	11,0405916	20,2	3,666666667	0	
	Gas	5035,72	21508,12	2,12%	21052,14786	8,3736	15,3	3,666666667	9889435,083	
	Wind	632,46	1521,76	0,00%	1521,76	0	0	0	0	
	Nuclear	760	5700	10,53%	5099,79	0	0	0	0	
	Total	**32123,74**	**174075,71**		**161534,5038**				**140062291,3**	

Opeartion Station Heat Rate (Kcal/KWh)	2637
Operation Station Heat Rate (TJ/GWh)	11,041
Operation Heat Rate of gas Based Stations (Kcal/KWh)	2000
Operation Heat Rate of gas Based Stations (TJ/GWh)	8,3736

Data Source:

Monitored Capacity:	Chapter - 2, Table no.: 2.3, All India Electricity Statistics, General Review 2005 (Contains Data for 2003-04)
Gross Generation	Chapter - 3, Table no.: 3.4, All India Electricity Statistics, General Review 2005 (Contains Data for 2003-04)
Auxiliary Consumption	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2005 (Contains Data for 2003-04)
Actual Generation:	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2005 (Contains Data for 2003-04)
Operation Station Heat Rate (Kcal/KWh):	Section 13, Pg. 4/9; Performance Review of Thermal Power Stations (2004-05) containing regional data of 03-04 & 04-05
Operation Heat Rate of gas Based Stations (Kcal/KWh)	Petition No.: 22/99, filed NTPC for approval of tariff for Kayamkulam Combined Cycle Power Project before CEA
Carbon Emission Factor (tC/TJ):	Pg. 1.6; Revised 1996 IPCC Guidelines for National Green house Gas Inventories : Workbook

Western Region Grid (2004-05)

Year	Source	Monitored Capacity (MW)	Gross Generation (GWh)	Auxiliary Consumption (%)	Net Generation (GWh)	Weighted AverageStation Heat (TJ/GWh)	Carbon Emission Factor (tC/TJ)	Conversion	Baseline Emissions tCO2	Emission Coefficient tCO2/GWh
2004-05	Hydro	5876,33	10609,57	0,59%	10546,97354	0	0	0	0	**885,4562455**
	Steam	20816,5	141964,37	8,40%	130039,3629	11,3546016	25,8	3,666666667	139681172	
	Diesel	17,48	0	0,00%	0	11,3546016	20,2	3,666666667	0	
	Gas	5035,72	25526,35	1,95%	25028,58618	8,3736	15,3	3,666666667	11757402,61	
	Wind	658,7	884,12	0,00%	884,12	0	0	0	0	
	Nuclear	760	5100	11,18%	4529,82	0	0	0	0	
	Biomass Power	48,5	0	0,00%	0	0	0	0	0	
	Biomass Gasifier	22,4	0	0,00%	0	0	0	0	0	
	U & I	7,13	0	0,00%	0					
	Total	**33242,76**	**184084,41**		**171028,8626**				**151438574,6**	

Opeartion Station Heat Rate (Kcal/KWh)	2712
Operation Station Heat Rate (TJ/GWh)	11,355
Operation Heat Rate of gas Based Stations (Kcal/KWh)	2000
Operation Heat Rate of gas Based Stations (TJ/GWh)	8,3736

Data Source:

Monitored Capacity:	Chapter - 2, Table no.: 2.3, All India Electricity Statistics, General Review 2006(Contains Data for 2004-05)
Gross Generation	Chapter - 3, Table no.: 3.4, All India Electricity Statistics, General Review 2006(Contains Data for 2004-05)
Auxiliary Consumption	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2006(Contains Data for 2004-05)
Actual Generation:	Chapter - 5, Table no.: 5.5, All India Electricity Statistics, General Review 2006(Contains Data for 2004-05)
Operation Station Heat Rate (Kcal/KWh):	Section 13, Pg. 4/9; Performance Review of Thermal Power Stations (2004-05) containing regional data of 03-04 & 04-05
Operation Heat Rate of gas Based Stations (Kcal/KWh)	Petition No.: 22/99, filed NTPC for approval of tariff for Kayamkulam Combined Cycle Power Project before CEA
Carbon Emission Factor (tC/TJ):	Pg. 1.6; Revised 1996 IPCC Guidelines for National Green house Gas Inventories : Workbook

Average Emission of Western Regional Grid over the last three years

Year	Weighted Average Emission of Western Regional Grid (tCO2/GWh)
2002-03	881,5153214
2003-04	867,0735229
2004-05	885,4562455
Average	878,01503

EMISSION REDUCTION CALCULATION - AACL

Project Activity Emissions

Steam output from the Boiler (TPH)	18	
Enthalpy Of the steam (Kcal/kg)	807	
Thermal Efficiency of the coal fired boiler	70%	
Anthracite Coal flow rate (tonnes/hr)	4,527913718	
Operating Hours	24	
Operationg Days on Coal	60	
Total Coal Consumption for 60 days	6520,195754	
Average Calorific Value (Kcal/kg)	4583	
Average Calorific Value (TJ/t)	0,019188104	
Carbon Emission Factor (tC/TJ)	26,8	
Fraction of C oxidized	0,98	
Mass conversion Factor (tCO2/tC)	3,666666667	
Fuel Consumption in Energy Equivalent (TJ/60 days)	125,1101968	
CO2 Emission Factor (tCO2/TJ)	96,30133333	
Total Project Activity Emissions (tCO2 eqiv./60 days)	**12048,27877**	**tCO_2e/yr**

Baseline Emissions due to DG Set(CEEd):

Plant Operational Days	330	Days
Plant Operational Time (approx.)	11	months
Total Connected load of the AACL Plant (P_l)	1,5	MW
Auxiliary Consumption of Co-gen plant (P_A)	0,3	MW
Average time for which AACL plant ran on DG set per month	89,2	hrs.
Total time for which AACL plant will run on DG set (H_d)	981,2	hrs.
Energy Generated from DG Set (E_d)	1,17744	GWh
Emission Factor for DG set	800	tCO_2/GWh
Baseline Emissions due to DG Set(CEEd):	**941,952**	**tCO_2e/yr**

Baseline Emissions due to Power generation (CEE_m):

Plant Operational Days	330	
Total Connected load of the AACL Plant (P_l)	1,5	
Auxiliary Consumption of Co-gen plant (P_A)	0,3	
Total time for which Co-gen plant will run on bagasse (H_m)	6938,8	
Net Electricity Supplied to AACL Plant	8,32656	GWh
Western Region Grid Emission Factor (CEFm)	878,01503	tCO2/GWh
Baseline Emissions due to Power generation (CEEm):	**7310,844828**	**tCO_2**

Total Baseline Emissions due to Power Generation(CE_{BLP}): **8252,796828** **tCO_2e/yr**

Baseline Emissions due to Thermal Energy Generation (CE_{BLT}):

	Total Steam Produced	14.78 MWh (19 TPH)	
(i)	Furnace Oil consumed to produce 6.75 MWh (8.5 TPH) of thermal energy to be supplied to the process		
	Steam Suplied to the Process (TPH)	8,5	
	Enthalpy Of the steam (Kcal/kg)	684,01	
	Thermal Efficiency of the Oil fired boiler	80%	
	Furnace Oil flow rate (tonnes/hr)	0,757357883	
	Average Calorific value of Furnace Oil (Kcal/kg)	9596	
	Operating Days	330	
	Operating Hours	24	
	Total Furnace Oil Consumption (tonnes)	**5998,274437**	

(ii)	Furnace Oil consumed to produce 8.1 MWh (10.5 TPH) of thermal energy to be supplied to the process		
	Steam Suplied to the Process (TPH)	10,5	
	Enthalpy Of the steam (Kcal/kg)	667,02	
	Thermal Efficiency of the Oil fired boiler	80%	
	Furnace Oil flow rate (tonnes/hr)	0,91232154	
	Average Calorific value of Furnace Oil (Kcal/kg)	9596	
	Operating Days	330	
	Operating Hours	24	
	Total Furnace Oil Consumption (tonnes)	**7225,586599**	
	Furnace Oil consumed to produce 14.78 MWh (19 TPH) of thermal energy to be supplied to the process	**13223,86104**	T
	Net Calorific value of Furnace Oil	40,176	$TJ/10^3t$
	Fuel Consumption in Energy Equivalent	**531,281841**	TJ/yr
	Carbon Emission Factor	21,1	tC/TJ
	Fraction of C Oxidised	0,99	
	Mass Conversion Factor	3,666666667	tCO_2/tC
	CO2 Emission Factor	**76,593**	**tCO_2/TJ**
	Baseline Emissions due to Thermal Energy Generation (CE_{BLT}):	**40692,47005**	**tCO_2e/yr**
TOTAL BASELINE EMISSIONS (CE_{BL}):		**48945,26687**	**tCO_2e/yr**
NET EMISSION REDUCTIONS		**36896,9881**	**tCO_2e/yr**