ABAN POWER COMPANY LIMITED

(An ISO: 14001 & ISO: 18001 Certified Company)

119.8 MW Natural Gas Based Combined Cycle Power Plant, at
Tanjavur, Tamilnadu by M/S Aban Power Company Limited
UNFCCC Registration No. 0999

MONITORING REPORT

VERSION 3 DATED 24TH August 2008

FOR THE PERIOD
MAY 16TH 2007 TO JUNE 15TH 2008

Project Location
Karuppur Village, Tanjavur Dist
Tamilnadu, India

ABAN POWER COMPANY LIMITED
25, G.N. Chetty Road
T.Nagar, Chennai – 600 017
Email: nagaprasad@lancogroup.com

Details of Project Activity:

The Project Activity is a large scale Registered CDM Project, under the Category 1: Energy Industries (renewable / non renewable sources) as per list of Sectoral Scopes. Version 01 of the approved baseline methodology AM0029, "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas", has been applied for the Project activity.

The Project activity, Aban Power Company Limited (APCL) 119.8 MW Natural Gas based Power Combined Cycle Power Plant, has been setup at Karuppur Village, Thiruvidaimarudur Taluk, Tanjavur Dist, Tamilnadu, India. APCL is an ISO 14001 and ISO 18001 certified Company. The project is situated around 260 kilo meters from Chennai (capital of Tamilnadu state).

The Natural Gas for the Power Plant is being supplied at the Plant boundary, through dedicated pipeline, by Gas Authority of India Ltd (GAIL), from a Gas Station of Oil and Natural Gas Commission (ONGC) located at Kuttalam, which is about 8 km from the Plant site.

The Project Activity is designed exclusively for firing of Natural Gas and usage of no other fuel other than Natural Gas is envisaged in the Project Activity.

The Power generated from the Project Activity is being stepped up to 110 KV by generator transformers and being supplied to TNEB Grid through Kadalangudi, Manalmedu, Cuddalore, Kattumanarkovil feeders.

The project activity, by feeding clean power to grid is reducing CO_2 emissions, which would have been otherwise generated by coal dominated power plants. This project activity therefore has excellent environmental benefits in terms of reduction in carbon emissions and coal resource conservation.

After obtaining all necessary statutory approvals, the Plant has commenced its commercial operations since August 2005 and started exporting clean power to grid. However the credit period of the Project Activity starts from January 2006 as per the Registered Project Design Document (PDD) considering the four months of stabilization period.

APCL, a Natural Gas Based Combined Cycle Power Plant (CCPP), with installed capacity of 119.8 MW has one Gas Turbine Generator (GTG) unit of 68.6 MW rated capacity, one Heat Recovery Steam Generator (HRSG) and one Steam Turbine Generator (STG) unit of 51.2 MW rated capacity, apart from other required electrical systems, Control & Instrumentation, Civil, Structural & Architectural facilities.

The list of vendors who supplied major equipments in the Plant are given below.

S.No	Equipment	Supplier
1	Gas Turbine Generator (GTG) unit, 6FA	General Electric (GE)
2	Heat Recovery Steam Generator (HRSG) unit	Thermax Babcock Wilcox Ltd, India.
3	Steam Turbine Generator (STG) unit	Siemens DDIT Industrial Turbines GmbH
4	Air Cooled Condenser	GEA Energy Systems, India
5	Gas Boosting Compressors	Dresser Rand, India
6	Boiler Feed Water Pumps	Sulzer Pumps, India
7	DCS System	Siemens

Plant obtained term loan from financial consortium lead by Power Finance Corporation (PFC), the lead banker, other bankers being Andhra Bank, Dena Bank, Indian Overseas Bank, Punjab National Bank, State Bank of Hyderabad, Syndicate bank, Lakshmi Vilas bank and UCO bank, in addition to equity from APCL itself.

During the present monitoring period i.e., from 12:00 PM on 15th May 2007 to 12:00 PM on 15th June 2008, plant exported 893934.928 MWh of Power to TNEB grid and consumed 185697552 SCM of Natural Gas.

Statement to what extent the project has been implemented as planned

The project has been completed as planned and described in the Registered Project Design Document (PDD), Version 2 and dated 16th December 2006.

The plant is in operation continuously since commissioning (with outages – forced & planned) during the present monitoring period.

The plant outages (both planned & forced) during the present monitoring period are as below;

(All figures are in hours)

Major Equipment	**Steam Turbine Generator**	**Gas Turbine Generator**
Planned Outages	822.81	470
Forced Outages	185.2	101.43

PROJECT'S CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

Project's contribution to sustainable development

A brief description of the contribution of the project activity towards 'Sustainable Development of India' is discussed under.

Environment Wellbeing: The project activity is a clean fuel power project, which uses Natural Gas as a fuel for power generation and export the clean power to TNEB grid. This power generation substitutes the power generation by TNEB which is predominantly operated with coal as fuel. Since the Carbon Dioxide (CO_2) emission due to combustion of Natural Gas is substantially less as compared to combustion of coal, lignite or Naptha, the project helps in reducing GHG emissions.

Since this project activity is based on natural gas, it will positively contribute towards the reduction in (demand) use of coal and increasing its availability to other places where natural gas is not available.

As the Plant is using sweet gas (Natural Gas without Sulphur content), practically there will not be any SO_2 emissions and suspended particulate matter (SPM).

The project activity therefore has excellent environmental benefits in terms of reduction in carbon emissions and coal resource conservation. Also, gas based power plants would not lead to production of huge quantities of solid waste (like ash in thermal power plants) and hence reduces the burden of solid waste disposal.

Technical Wellbeing: The project activity is equipped with Air Cooled Condenser instead of conventional Water Cooled Condenser, resulting in consumption of lesser quantity of water and hence conserves scarce water resources. The cycle efficiency of natural gas based combined cycle power plant is in the range of 50-55% as compared to average cycle efficiency of 36-42% of coal fired Rankine cycle based thermal power plants. Plant uses High temperature F class gas turbine with the higher fuel efficiency than the standard E class turbines.

Also the Plant is designed in such a manner that the effluent discharge from the Plant is Zero (Zero Discharge). The Project is the first of its kind with zero discharge in the Region. The Plant is equipped with latest technology in controlling the NOx in the field of gas turbines by installation of Dry Low NOx (DLN) burners, which specifically tunes the burners of the turbine, controls the formation of NOx at very low level, enhances the efficiency of the engine and does not use DM water or steam as in the conventional engines, thus eliminating water requirement. The Plant has also established rain water harvesting pond with percolation features.

The Plant is also equipped with a Continuous online Emission Monitoring System (CEMS) attached to the main stack to monitor the consistency of the performance of the machine. Accordingly, regular calibrations are in place as a part of the standard and safe operating procedures. This CEMS measurement is connected to the Distribution Control System (DCS) for recording and retrieval facility of the data and for operational control.

Social Wellbeing: The Plant is providing direct employment to about 60 persons and indirectly creating business opportunities to stakeholders like bankers, consultants, suppliers & contractors, traders, caterers etc.,

The Promoter of the Project Activity is LANCO Group. Lanco Group has formed a public charitable trust by the name of Lanco Institute of General Humanitarian Trust (LIGHT) in 2000. In a short time, the trust has succeeded in making its presence felt in the social service sector through its various programs. APCL actively supports LIGHT to run its various charity activities. So far APCL has donated 3.75 Million INR to LIGHT social activities.

LIGHT undertakes philanthropic activities such as providing medical assistance to the needy, setting up educational scholarships, providing basic amenities for the rural poor, setting up old age homes, environment protection and development, encouraging fresh talent in the area of sports, Taking up other humanitarian activities like relief at the time of natural calamities, felicitation of freedom fighters etc.

Lanco Infratech Ltd, the holding Company of LANCO Group, has been adjudicated as one of the winners for the prestigious TERI (The Energy and Resources Institute) Corporate Awards for 2006-07 for the CSR activities of LIGHT.

Apart from this donation to LIGHT, APCL has also paid INR 22817 to local panchayat towards annual tax, which is being used for development of local region.

Economic Wellbeing: Implementation of the Project Activity resulted in the economic development in the region and also improved the economic wellbeing of neighboring villages by providing direct and indirect employment opportunities. The Project Activity also improved the power supply situation in the state which in turn helps industry to improve the productivity due to reduction in power cuts.

Overall, this project activity is contributing to the Environmental & Social issues locally and globally by:

- Exporting of about 113.2 MW of Power to TNEB and thereby eliminating the generation of same quantity of power by a fossil fuel based power plants, which would have been installed to meet the increasing electricity supply and demand gap in the state;

- Conserving Coal, a fuel used by masses in India for daily living needs;

- Making coal available for other important applications;

- Reducing GHG emissions;

- Providing direct employment to about 60 persons and indirectly creating business opportunity for stakeholders like bankers, consultants, suppliers, manufacturers, contractors, traders, caterers etc.

- Space requirements per MW for a gas based stations are less than coal based stations.

Monitoring period

The billing period for the plant is from 12:00 PM on the 15th of every month to the 12:00 PM on the 15th of the next month. The joint meter reading procedures are followed for recording the energy meter readings and this is performed in the presence of the representatives of company officials and the state electricity board. These readings form the basis for raising the invoice on the state electricity board. The electricity exported to the grid by the power plant, the quantity of natural gas consumed during the period is indicated in the invoice. Hence these monitoring periods has been chosen to follow the billing cycle.

The earlier monitoring period chosen was from 12:00 Hrs IST on 01.01.2006 till 12:00 IST Hrs on 15.05.2007.

The present monitoring period is chosen from 16.05.2007 to 15.06.2008[1].

[1] A day in this case is referred to 24 hour period between, 12:00 hrs IST on the previous date to 1200 hours IST on the said date. Thus 16.05.2007 refers to the 24 hour period between 12:00 hours IST on 15.05.2007 to 12:00 hours IST on 16.05.2007. Similarly, 15.06.2008 refers to the 24 hour period between 12:00 hours IST on 14.06.2008 to 12:00 IST hours on 15.06.2008

Parameters being monitored according to Monitoring Plan

For the project activity, the following parameters are being monitored on continuous basis;

Data / Parameter:	$FC_{f,y}$
Data unit:	m^3
Description:	Annual quantity of fuel "f" consumed in project activity
Source of data used	Fuel flow meter reading at project boundary
Description of measurement methods and procedures applied:	Natural gas for the Power generation is being supplied by Gas Authority of India Ltd (GAIL) to the Power Plant by a dedicated pipe line. GAIL has gas metering station at the gas supply terminal in the Power Plant to ensure proper monitoring and quantification of gas intake to the Plant. Quantity of gas intake to the Power Plant is being measured with the help of Gas Flow meter continuously and daily readings are being recorded and fortnightly invoices are raised by GAIL giving the daily Gas Consumption details and NCV of the gas. The gas flow meter is calibrated at regular intervals as per GAIL standards.
QA/QC procedures applied:	Natural gas supply metering to the project will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the gas company.

Data / Parameter:	NCV_y
Data unit:	GJ/m^3 (or kcal/SCM)
Description:	Net calorific value of fuel type f
Source of data used:	Fuel supplier
Description of measurement methods and procedures applied:	The calorific value of the gas would be provided by the supplier (GAIL) and recorded and verified by the project participant
QA/QC procedures applied:	No additional QA/QC procedures may need to be planned

Data / Parameter:	$EFCO_{2,f,y}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor for natural gas
Source of data used:	IPCC default value (2006 IPCC Guidelines for National Greenhouse Gas Inventories) as per Host Country National recommendation

Description of measurement methods and procedures applied:	Supplier provided data or local data is not available for the said project activity. India's Initial National Communication to the UNFCCC refers to and justifies the use of IPCC values and hence the same have been used as emission factor. http://unfccc.int/resource/docs/natc/indnc1.pdf

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Electricity exported to grid by the project activity
Source of data used:	Data measured and recorded from Energy meters installed in the plant and in substation
Description of measurement methods and procedures applied:	Power exported to the grid and imported from the grid is monitored from energy meters installed and the meter reading is taken on 15th day of every month. A joint meter reading for the energy exported to the Grid is recorded by representatives of TNEB and Company and the readings are jointly signed by both the parties as a proof of export of Power to the grid from the Power Plant and import of Power from grid by the Power Plant. These meter readings are the basis for the invoices raised by the Company. Net Power Export to the grid is derived by deducting Power import from the grid to the Plant from Power Export to Grid from the Plant.
QA/QC procedures applied:	Meters will be calibrated as per the standard procedures and documents for the same will be maintained throughout.

Data / Parameter:	$Oxid_f$
Data unit:	–
Description:	Oxidation factor of the gas used
Source of data used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	1.0 Oxidation factor of the gas is taken as per the latest guidelines available from IPCC on National Green House gas inventory on year to year basis

Description of measurement methods and procedures applied:	IPCC guidelines
QA/QC procedures applied:	As per IPCC guidelines

Data / Parameter:	$COEF_y$
Data unit:	tCO_2/m^3
Description:	CO_2 emission coefficient
Source of data used:	Calculated as per equation 2a mentioned in Version 01 of the methodology AM0029.
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	0.00219
Description of measurement methods and procedures applied:	-
QA/QC procedures applied:	-

Monitoring Data

Billing Month-wise data on Power Generation, Net Power Export to grid (Export to grid from the Project activity deducting import from grid by the Project activity), Auxiliary Power Consumption, natural gas consumption, gas analysis and Emission Reductions is given below for the present monitoring period:

Power Generation, Net Export, Natural Gas Consumption & Analysis details

Period[$]	Power Generation MWh	Net Power Export to grid, MWh (Export to Grid –Import from Grid)	Natural Gas consumed, SCM	Avg.Net calorific Value of gas*, kcal/SCM
12.00Hrs. on 15-05-07 to 12.00Hrs. on 15-06-07	67353.271	63925.394	13261883	9332.19
12.00Hrs. on 15-06-07 to 12.00Hrs. on 15-07-07	78784.455	74866.383	15388266	9369.00
12.00Hrs. on 15-07-07 to 24.00Hrs. on 31-07-07	37175.350	35511.495	7452655	9372.70
00.00Hrs. on 01-08-07 to 12.00Hrs. on 15-08-07	37960.000	35863.545	7310888	9294.67
12.00Hrs. on 15-08-07 to 12.00Hrs. on 15-09-07	73609.005	69975.700	15129720	9348.79
12.00Hrs. on 15-09-07 to 12.00Hrs. on 15-10-07	76770.469	72858.295	14939666	9230.35
12.00Hrs. on 15-10-07 to 12.00Hrs. on 15-11-07	75883.461	72046.138	14812330	9411.08
12.00Hrs. on 15-11-07 to 12.00Hrs. on 15-12-07	75960.051	72231.246	14864902	9382.16
12.00Hrs. on 15-12-07 to 24.00Hrs. on 31-12-07	42072.451	39979.200	8206970	9274.54
Total for the Year 2007	**565568.513**	**537257.396**	**111367280**	**9339.03**
00.00Hrs. on 01-01-08 to 12.00Hrs. on 15-01-08	37248.317	35405.059	7270811	9344.05
12.00Hrs. on 15-01-08 to 12.00Hrs. on 15-02-08	74228.810	70400.274	14644580	9359.48
12.00Hrs. on 15-02-08 to	74085.787	70391.186	14395075	9358.87

12.00Hrs. on 15-03-08				
12.00Hrs. on 15-03-08 to 24.00Hrs. on 31-03-08	40451.182	38633.501	7919142	9351.71
00.00Hrs. on 01-04-08 to 12.00Hrs. on 15-04-08	36695.024	34547.219	7131654	9379.28
12.00Hrs. on 15-04-08 to 12.00Hrs. on 15-05-08	61147.373	58211.389	12058242	9360.57
12.00Hrs. on 15-05-08 to 12.00Hrs. on 15-06-08	51937.119	49088.904	10910768	9295.31
Total for the year 2008	**375793.612**	**356677.532**	**74330272**	**9349.68**
Total for the monitoring period	**941362.125**	**893934.928**	**185697552**	**9343.29**

* Weighted average calorific value of the gas for the respective periods

$ For one billing month joint meter readings are taken by TNEB, GAIL officials and Plant Representatives on 15th day of that month at 12.00 PM. The export from the Plant to Grid and Gas consumption for that billing month i.e. export and Gas consumption from 15th day of previous month at 12.00 PM to 15th day of that month till 12.00PM will be recorded in the certified meter readings as the export and Gas consumption for that billing month. Export and Gas consumption from 12.00 PM onwards of same 15th day till 15th day of next month will be certified as export and Gas consumption for the next month.

Emission Reductions

Presented below are the emission reduction calculations for the chosen monitoring period from 12:00 PM on 15.05.2007 to 12:00 PM on 15.06.2008.

Period[$]	Power Generation, MWh	Net Power Export to grid, MWh (Export to Grid –Import from Grid)	Natural Gas consumed, SCM	Avg.Net calorific Value of gas*, kcal/SCM	COEF of Gas $tCO_2/m3$	Baseline emissions[¥], tCO_2	Project emissions, tCO_2	Net leakage attributable to the project activity[$], tCO_2	Net emission reductions, tCO_2
12.00Hrs. on 15-05-07 to 12.00Hrs. on 15-06-07	67353.271	63925.394	13261883	9332.19	0.00219	45067	29064	515	15488
12.00Hrs. on 15-06-07 to 12.00Hrs. on 15-07-07	78784.455	74866.383	15388266	9369.00	0.00220	52781	33857	592	18332
12.00Hrs. on 15-07-07 to 24.00Hrs. on 31-07-07	37175.350	35511.495	7452655	9372.70	0.00220	25036	16404	302	8330
00.00Hrs. on 01-08-07 to 12.00Hrs. on 15-08-07	37960.000	35863.545	7310888	9294.67	0.00218	25284	15958	268	9058
12.00Hrs. on 15-08-07 to 12.00Hrs. on 15-09-07	73609.005	69975.700	15129720	9348.79	0.00220	49333	33216	648	15469
12.00Hrs. on 15-09-07 to	76770.469	72858.295	14939666	9230.35	0.00217	51365	32383	543	18439

12.00Hrs. on 15-10-07									
12.00Hrs. on 15-10-07 to 12.00Hrs. on 15-11-07	75883.461	72046.138	14812330	9411.08	0.00221	50793	32736	579	17478
12.00Hrs. on 15-11-07 to 12.00Hrs. on 15-12-07	75960.051	72231.246	14864902	9382.16	0.00220	50923	32751	577	17595
12.00Hrs. on 15-12-07 to 24.00Hrs. on 31-12-07	42072.451	39979.200	8206970	9274.54	0.00218	28185	17875	304	10006
Total for the Year 2007	**565568.513**	**537257.396**	**111367280**	**9339.03**	**0.00219**	**378767**	**244244**	**4328.00**	**130195**
00.00Hrs. on 01-01-08 to 12.00Hrs. on 15-01-08	37248.317	35405.059	7270811	9344.05	0.00219	24961	15954	277	8730
12.00Hrs. on 15-01-08 to 12.00Hrs. on 15-02-08	74228.810	70400.274	14644580	9359.48	0.00220	49632	32188	578	16866
12.00Hrs. on 15-02-08 to 12.00Hrs. on 15-03-08	74085.787	70391.186	14395075	9358.87	0.00220	49626	31637	545	17444
12.00Hrs. on 15-03-08 to 24.00Hrs. on 31-03-08	40451.182	38633.501	7919142	9351.71	0.00220	27237	17391	301	9545

00.00Hrs. on 01-04-08 to 12.00Hrs. on 15-04-08	36695.024	34547.219	7131654	9379.28	0.00220	24356	15708	278	8370
12.00Hrs. on 15-04-08 to 12.00Hrs. on 15-05-08	61147.373	58211.389	12058242	9360.57	0.00220	41039	26506	471	14062
12.00Hrs. on 15-05-08 to 12.00Hrs. on 15-06-08	51937.119	49088.904	10910768	9295.31	0.00218	34608	23817	485	10306
Total for the Year 2008	**375793.612**	**356677.532**	**74330272**	**9349.68**	**0.00220**	**251459**	**163201**	**2935**	**85323**
Grand Total	**941362.125**	**893934.928**	**185697552**	**9343.29**	**0.00219**	**630226**	**407445**	**7263**	**215518**

* Weighted average calorific value of the gas for the respective periods

$: For one billing month joint meter readings are taken by TNEB, GAIL officials and Plant Representatives on 15th day of that month at 12.00 PM. The export from the Plant to Grid and Gas consumption for that billing month i.e. export and Gas consumption from 15th day of previous month at 12.00 PM to 15th day of that month till 12.00PM will be recorded in the certified meter readings as the export and Gas consumption for that billing month. Export and Gas consumption from 12.00 PM onwards of same 15th day till 15th day of next month will be certified as export and Gas consumption for the next month.

¥: Baseline emissions calculated considering baseline CO_2 emission factor 0.705 tCO_2/MWh, determined *ex-post* (please refer page number 17 for details.).

§: Leakage Emissions calculated considering Emission factor for upstream fugitive CH4 emissions occurring in the absence of the project activity 0.019174 tCO_2/MWh and Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution 160 tCH_4/PJ.(this parameter has been fixed *ex-ante*)

Calculation of Emission Reductions

Project activity adopted the procedures mentioned in the approved methodology (AM0029) to calculate project emissions, baseline emissions, leakage emissions and emission reductions. The procedures used for calculating these emissions are described below:

Project emissions:

The project activity is on-site combustion of natural gas to generate electricity. The CO_2 emissions from electricity generation (PEy) are calculated as follows:

$$PE_y = \sum FC_{f,y} * COEF_{f,} \quad (1)$$

Where:

$FC_{f,y}$: is the total volume of natural gas or other fuel 'f' combusted in the project plant or other start-up fuel (m3 or similar) in year(s) 'y'

$COEF_{f,y}$: is the CO_2 emission coefficient (tCO_2/m^3 or similar) in year(s) for each fuel and is obtained as:

$$COEF_{f,y} = \sum NCV_y * EFco_{2,f,y} * OXID_f \quad (2)$$

Where:

NCV_y : is the net calorific value (energy content) per volume unit of natural gas in year 'y' (GJ/m^3) as determined from the fuel supplier, wherever possible, otherwise from local or national data

$EFco_{2,f,y}$: is the CO_2 emission factor per unit of energy of natural gas in year 'y' (tCO_2/GJ) as determined from local or national data as the same has been referred to an justified by the Host Country.

$OXID_f$: is the oxidation factor of natural gas

For startup fuels, IPCC default calorific values and CO_2 emission factors are acceptable, if local or national estimates are unavailable.

Baseline emissions:

Baseline emissions are calculated by multiplying the electricity generated in the project plant ($EG_{PJ,y}$) with a baseline CO_2 emission factor ($EF_{BL,CO2,y}$), as follows:

$$BE_y = EG_{PJ,y} * EF_{BL,CO2,y} \quad (3)$$

As per the applied methodology ACM0002, the Baseline emission factor is chosen as the minimum of the following three options

Option 1. The build margin, calculated according to ACM0002; and

Option 2. The combined margin, calculated according to ACM0002, using a 50/50 OM/BM weight.

Option 3. The emission factor of the technology (and fuel) identified as the most likely baseline scenario under "Identification of the baseline scenario" above, and calculated as follows:

$$EF_{BL,CO2,y}\,(tCO2/MWh) = \frac{COEF_{BL}}{\eta_{BL}} * 3.6GJ/MWh \qquad (4)$$

Where

$COEF_{BL}$ = The fuel efficiency coefficient tCO_2e / GJ, based on national average fuel data, if available, otherwise IPCC defaults can be used.

η_{BL} = The energy efficiency of the technology, as estimated in the baseline scenario above.

Further, the methodology states that this determination will be made once at the validation stage based on an *ex ante* assessment and if either option 1 (BM) or option 2 (CM) are selected, they will be estimated *ex post*, as described in ACM0002.

The determination of the build margin, the combined margin and the technology margin was made at the time of validation. The build margin had worked out as the lowest of the three options and had been used for the ex ante calculation of the baseline emissions. As required by the methodology, for the calculation of the baseline emissions during the monitoring period, the build margin has been determined ex post as described in the latest version of the methodology ACM0002. Additionally, the combined margin has also been determined ex post. The technology margin, as required by the applied methodology, had been determined at the time of validation and fixed ex ante.

The calculation procedures followed, the formulae used, the assumptions made and the source of data used for the calculation of the Build Margin and Combined Margin have been detailed in Annex 02. The value of the build margin, combined margin and the technology margin, thus calculated is provided below:

Sl.No	Option	Value (tCO_2/MWh)	Comment
1	Option 1: The build margin, calculated according to ACM002	0.705	Determined Ex Post
2	Option 2: The combined margin, calculated according to ACM002, using a 50/50 OM/BM weight	0.853	Determined Ex Post
3	Option 3: The emission factor of the technology (and fuel) identified as the most likely baseline scenario under "Identification of the baseline scenario"	1.048[2]	Determined Ex Ante

[2] Source: Registered PDD of the project activity, Version 02 dated 16/12/2006

Estimation of Baseline Emission Factor:

As is evident from the above table, the build margin, calculated ex post, is the lowest of the three options and has been selected as Baseline Emission Factor (BEF) on conservative basis.

$$BEF = \text{lowest of } (BM, CM, EF_{BL, CO2,y} (tCO_2/MWh)) \quad (5)$$
$$= 0.705\ tCO_2/MWh$$

Leakage:

Leakage may result from fuel extraction, processing, liquefaction, transportation, regasification and distribution of fossil fuels outside of the project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. In this methodology, the following leakage emission sources shall be considered.

Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, regasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.

In the case LNG is used in the project plant: CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system

Thus, leakage emissions are calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y} \quad (6)$$

There will be no LNG consumption in the project activity, so $LE_{LNG,CO2,y}$ will be zero.

Where

$LE_{CH4,y}$ Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e

Fugitive methane emissions

For the purpose of estimating fugitive CH_4 emissions, project participants should multiply the quantity of natural gas consumed by the project in year y with an emission factor for fugitive CH_4 emissions ($EF_{NG,upstream,CH4}$) from natural gas consumption and subtract the emissions occurring from fossil fuels used in the absence of the project activity, as follows:

$$LE_{CH4,y} = [FC_y * NCV_y * EF_{NG,upstream, CH4} - EG_{PJ,y} * EF_{BL,upstream,CH4}] * GWP_{CH4} \quad (7)$$

Where

LE_{CH4}	Leakage emissions due to fugitive upstream CH_4 emissions in the year y in tCO_2e
FC_y	Quantity of natural gas combusted in the project plant during the year y in Sm^3
NCV_y	Average net calorific value of the natural gas combusted during the year y in GJ/m^3
$EF_{NG,upstream, CH4}$	Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution and in the case of LNG, liquefaction, transportation, degasification and compression in to a transmission or distribution system, in tCH4 per GJ fuel supplied to final consumers
$EG_{PJ,y}$	Electricity generation in the project plant during the year in MWh
$EF_{BL,upstream,CH4}$	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH4 per MWh electricity generation in the project plant, as defined below
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period

The emission factor for upstream fugitive CH4 emissions occurring in the absence of the project activity ($EF_{BL,\ upstream,\ CH4}$) has been calculated consistently with the baseline emission factor ($EF_{BL,CO2}$) used in equation (4) above. The lowest baseline emission factor has been found to be the one calculated as per build margin method, so the same calculation procedure has been adopted to calculate $EF_{BL,\ upstream,\ CH4}$. The same has been described below.

$$EF_{BL,upstream,CH4} = \frac{\sum_j FF_{j,k} * EF_{k,upstream,CH4}}{\sum_j EGj} \quad (8)$$

Where:

$EF_{BL,upstream,CH4}$	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH4 per MWh electricity generation in the project plant
j	Plants included in the build margin
FFj	Quantity of fuel type k (a coal or oil type) combusted in power plant j included in the build margin

$EF_{k,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type l (coal or oil type) in tCH4 per MJ fuel produced
EGj	Electricity generation in the plant j included in the build margin in MWh/a plant included in the operating margin

The value has been calculated using the latest version of the CO_2 Baseline Database for the Indian Power Sector, Version 3[3], dated 15th Dec 2007 made available by the Central Electricity Authority, Ministry of Power, Govt. of India

$EF_{BL,upstream,CH4}$ = 0.000913 tCH_4/ MWh
= 0.019174 tCO_2/ MWh

The default values used in the project activity, which are fixed for throughout crediting period are as follows:

[3] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

S.No	Parameter	Default Value	Remarks
1	Emission factor for fugitive CH4 upstream emissions for Coal	0.8 tCH4 /kt coal	Most of the coal production in India comes from open pit mines contributing over 81% of the total production. A number of large open pit mines of over 10 million tones per annum capacity are in operation. Underground mining currently accounts for around 19% of national output. (http://www.mbendi.co.za/indy/ming/coal/as/in/p005.htm) Hence 0.8t/ CH4 /kt coal value is used for surface mining.
2	Emission factor for fugitive CH4 upstream emissions for Oil	4.1 tCH4 /PJ	As per the Table 2 of the methodology. This value includes for oil production, transport, refining and storage.
3	Emission factor for fugitive CH4 upstream emissions for Natural Gas	160 tCH4/PJ	As per the Table 2 of the methodology, 296 tCH4 /PJ is applicable for rest of the world and 160 tCH4 /PJ is for USA and Canada. However, the US/Canada value is used as the system element (gas production and / or processing/transmission / distribution) is predominantly of recent vintage and built and operated to international standards. GAIL is maintaining all its processing plants and gas transmission lines matching the international standards and are of recent vintage. GAIL also formulating a guidelines for the pipelines along with the BIS for development of uniform standards for high-pressure oil and gas transmission pipeline systems13. Also GAIL conducts the regular safety audits to maintain the international safety standards with some reputed international firms.
4	Oxidation factor of natural gas	1	IPCC values as per 2006 IPCC guidelines for National Green House Gas Inventories.

Emission Reductions:

To calculate the emission reductions the project participant had applied the following equation:

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

Where:
ERy emissions reductions in year y (t CO_2e)
BEy emissions in the baseline scenario in year y (t CO_2e)
PEy emissions in the project scenario in year y (t CO_2e)
LEy leakage in year y (tCO_2e)

Measures to ensure the Results / uncertainty analysis

As per the Power Purchase Agreement, the energy exported to the Grid is recorded from two independent meters viz., Main Meter and Check Meter. Both the meters are

of 0.2 class accuracy and readings of both the meters are compared monthly. However readings of main meter are used for billing purpose. Both the meters, Main and Check meters are being calibrated once in six months as per TNEB requirement. In the event of main meter not in operation / fails, the reading of the check meter shall be used for billing.

Gas measurement is done with the help of gas flow meter i.e. on site meter recording, which is installed by gas supplier. This is done continuously. Flow Meter is calibrated on a regular basis according to GAIL Standards. Measurement results are crosschecked with the natural gas purchase record.

The project employed latest state of art monitoring and control equipment that measure, record, report, monitor and control various key parameters. Parameters monitored are quantity and quality of gas consumed, total power generated, net power exported to the grid, from the project, etc. These monitoring and controls are part of the Distributed Control System (DCS) of the entire plant. All monitoring and control functions are done as per the internally accepted standards and norms.

The available instrumentation and control system comprises of microprocessor-based instruments of reputed make with desired level of accuracy. All instruments are calibrated at regular intervals so that the accuracy of measurement can be ensured all the time.

The Project is certified for ISO 14001 and ISO 18001. Hence all the parameters are being monitored and documented as per the requirement and as part of standard internal procedures.

Power Generation, Net Export & Auxiliary Consumption, gas consumption are being recorded daily and the same are being verified by General Manager (O&M), reviewed by Chief Operating Officer (COO) and approved by the Whole time Director .

Roles & Responsibilities

A CDM Committee has been formed for the Project Activity for monitoring and verification of all the monitoring parameters as per the guidelines formulated by the management of the Company and as per PDD. Qualified and trained people are monitoring the parameters and emission reductions.

In the complete implementation and monitoring Plan, the company is the sole agency responsible for implementation and monitoring.

Annex 01

Abbreviations

APCL	Aban Power Co Ltd
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
DCS	Distributed Control System
DLN	Dry Low NOx
GAIL	Gas Authority of India Ltd
GHG	Green House Gases
GTG	Gas Turbine Generator
HRSG	Heat Recovery Steam Generator
INR	Indian Rupees
ISO	International Organization for Standardization
kW	Kilo Watt
LIGHT	LANCO Institute of General Humanitarian Trust
MW	Mega Watts
NG	Natural Gas
NCV	Net Calorific value
ONGC	Oil and Natural Gas Commission
O&M	Operation & Maintenance
PDD	Project Design Document
PFC	Power Finance Corporation
SCM	Standard Cubic Meter
SPM	Suspended Particulate Matter
STG	Steam Turbine Generator
So2	Sulphur Dioxide
TNEB	Tamilnadu Electricity Board
TERI	The Energy and Research Institute
UNFCCC	United Nations Framework Convention on Climate Change

Annex 02

Calculation of the Combined Margin and the Build Margin

The baseline methodology AM0029 Version 01 requires the estimation of the ex post determination of the build margin as the same had worked out as the lowest of the three options provided in the methodology and was used for the ex ante calculation of the baseline emissions. Additionally, in order to demonstrate conservativeness, the combined margin has also been determined ex post. As required in the methodology, the "*Tool to calculate the emission factor for an electricity system*" has been used for determination of the build margin and the combined margin. The latest version of the said tool, Version 01, has been used for the calculation.

Step 1: Identifying the relevant electric power system

A "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.
A "connected electricity system" is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint. The tool requires the following considerations while determining whether significant transmission constraints exist or not:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

In the Indian context, as no well established spot markets exist, the first criterion is not applicable. Similarly, a transmission line fulfilling the second criteria is an exception in Indian Context. Hence the use of these criteria does not result in a clear grid boundary. In such a scenario, the use of a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial, regional/national) is recommended. Further, it states that a provincial grid definition may in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity.

The Indian power system is divided into five independent regional grids, namely Northern, Eastern, Western, Southern and North-Eastern. Each grid covers several states. The southern grid covers four states and two Union Territories including the state of Tamil Nadu, where the project activity is located.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is

relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional gird in which it is located. Hence for the purpose of estimation of the baseline emission factor, the Southern Regional grid has been chosen as the relevant electricity system.

Step 2: Selection of an Operating Margin method

The project proponents wish to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation. A three year generation weighted average based on the most recent data available at the time of submission of the PDD to the DOE for validation has been used for the estimation of the operating margin.

Step 3: Calculation of the OM according to the Simple OM method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The power sector data provided by the Central Electricity Authority (CEA), Ministry of Power, Government of India, an official data source has been relied upon for the calculation of the OM. The latest version of the CO2 Baseline Database for the Indian Power Sector, Version 3[4], dated 15th Dec 2007 has been used. The OM calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Assumptions

The following assumptions have been in case of unavailability of data at station level:

Net generation: In case of stations where only gross generation data is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:
   - All units of a station fall into the build margin; or
   - All units of a station have the same installed capacity; or

[4] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

- The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO_2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)

m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units

i = All fossil fuel types combusted in power plant / unit m in year y

y = The three most recent years for which data is available.

The average simple operating margin of the past three years (2004-05 to 2006-07) thus calculated is 1.00.

OM = 1.00 tCO_2/MWh

Step 4: Identification of the cohort of power units to be included in the Build Margin

The sample group of power units m selected for calculation of the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The

data pertaining to the units thus identified are detailed in the Version 3 of the Baseline Carbon Dioxide Emissions database of the CEA[5].

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The Build Margin calculated based on the most recent data available has been used and the build margin thus calculated is 0.705 tCO_2/MWh.

Therefore,

$$BM = 0.705\ tCO_2/MWH$$

Step 6: Calculation of the combined Build Margin

The combined margin will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

The default values to be used for the weightage for OM and BM are 0.5. Hence, the Baseline Emission Factor is calculated as below:

$$EF_{Grid,CM} = w_{OM} * OM + w_{BM} * BM$$
$$= 0.5 * 1.00 + 0.5 * 0.705$$
$$= 0.853\ tCO_2/MWh$$

[5] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm