CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

SECTION A. General description of project activity

A.1 Title of the project activity:

Title: 18 MW Kemphole Mini Hydel Scheme (KMHS), by International Power Corporation Limited, India
Version: 1.0
Date: 20st October 2005

A.2. Description of the project activity:

Kemphole Mini Hydel Scheme (KMHS) is an 18 MW (3 X 6 MW) Run-of-the-River hydro power project located at Kemphole stream in Hassan district of Karnataka in India. The main activity of the project is generation of electricity using hydro potential available in Kemphole stream and exporting the generated power to Karnataka Power Transmission Corporation Ltd. (KPTCL) as per power purchase agreement between two of them.

KMHS project was completed in two stages; in first stage 2X6 MW units were installed (20th Oct 2003, 20th Nov 2003), in second stage 6 MW was installed (10th Jan 2005). The project activity utilises the water flow and fall available in the Kemphole stream. The project location is situated in dense forests of the Kemphole reserve forest and there is no habitation in the near by area. The project does not involve any displacement of local population and associated rehabilitations. The project uses horizontal Francis turbines for power generation.

The project is based in Netravathi river basin. As this is the first project in the river basin (it is tough terrain), there was no data available for gauging of the power potential. Many technological/structural innovations have been introduced in the project activity like to utilise automatic thrash-rack-cleaning system etc. Further the project activity is in a hilly area and is surrounded by dense forest with no power evacuation facility, for a distance of 29 KMs, a transmission system (with 124 towers) had to be created by the project proponent to evacuate power in the nearby substation.

The project generates electrical energy through sustainable means without causing any negative impact on environment. Use of renewable sources for power generation contributes to mitigation of greenhouse gases emissions. Apart from the power generation project activity shall also contribute to the following:

- Sustainable development through utilization of renewable hydro resources available in the project region.
- Contribution to power requirements of Karnataka state grid.
- Conserving environment and its natural resources (like coal, petroleum oils etc.) through use of renewable source of energy.

The project is in line with India's national policy to promote clean power. Contribution of project activity to sustainable development of the host party is as follows:-

Environmental Well Being

In India coal is the primary source of energy for power generation and production processes. The demand for electrical energy has been steadily increasing. Expansion of the electrical supply to new areas and rapid industrialization are the main reasons for the growth in demand for power. The project activity

contributes to the welfare of environment at large considering the carbon emissions that would have been generated by a thermal plant of equal capacity. The project hence decreases the future needs for coal based power generation by the grid and thereby reducing the CO_2 emissions from the electricity sector. Associated SPM, SO_x, NO_x emissions and emissions related to transportation and excavation of fossil fuel are also avoided.

Since the project is a Run-of-the-River project and there are no major irrigation works across the stream and has no pondage of water, there are no negative environmental impacts.

Social Well Being
Karnataka is witnessing major shortage of power. On an average there was a shortage of supply over demand by 15 per cent during 1994-2000. The project activity is augmenting grid supply that is necessary for the sustenance and development of the society.

Economic Well Being
The project activity provides a fillip to economic activity in the region. Direct & Indirect Employment has been generated in the plant for the project implementation & management.

Technological Well Being
The project uses well established horizontal Francis turbines for power generation. The project activity is the first hydel power project in the Netravathi river basin. The success of the project activity has catalysed more hydel power projects to come in the basin/region.

Therefore the project is contributing to the sustainable development in following manner.

- Generating 51.08 million units of electricity on an annual basis
- Reducing electricity consumption required for auxiliary consumption to generate equivalent amount of electricity in thermal power plants
- Conservation of natural resources like coal/gas/oil, this makes natural resources available for other important applications
- Reducing GHG emissions
- Reducing pollution of other kind (like SOx, NOx) which happen in thermal power plants

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (yes/no)
Government of India	International Power Corporation Limited (IPCL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The KMHS is located in Heggadde village of Hassan district, Karnataka. The project site is located at about 26 KM from Sakaleshpura along Hassan-Mangalore highway.

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

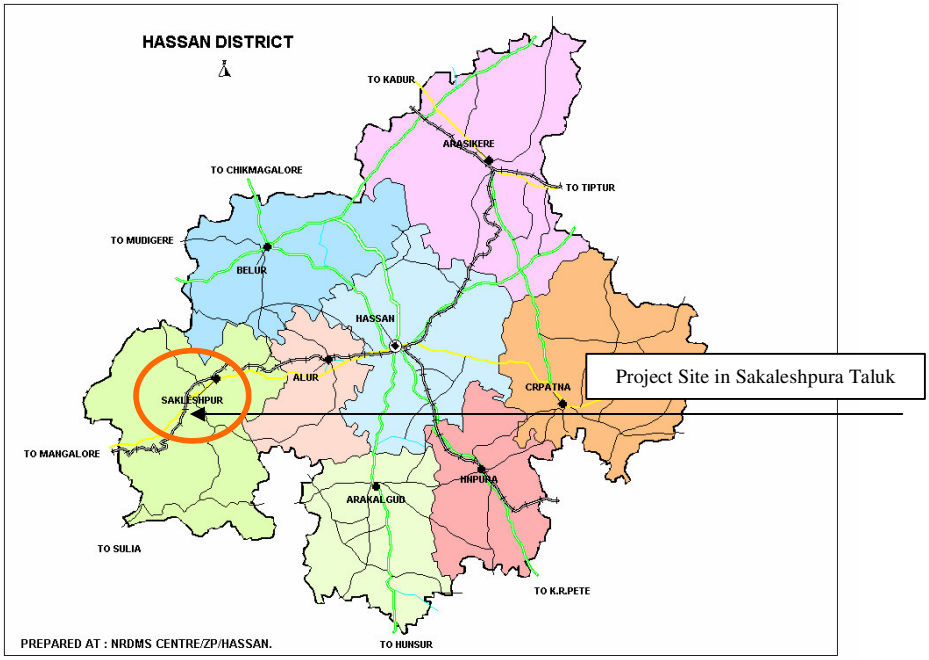
Karnataka State

A.4.1.3. City/Town/Community etc:

Village: Heggadde
Taluk: Sakaleshpura
District: Hassan
State: Karnataka

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Gundia River is one of the important tributaries of river Kumarashara, which in turn is a tributary of Netravathi River. Gundia River is formed by streams namely Yettinahole & Kemphole to which streams Kadumane hole and Hongadahalle join in the course. The project is located in the Kemphole stream.



A.4.2. Category(ies) of project activity:

The project is a run-of-the-river hydro power project and categorised in Scope Number 1; Sectoral Scope-Energy industries (renewable/non-renewable sources) as per Sectoral scopes related approved methodologies and DOEs (version 07 Oct 05|12:34)

A.4.3. Technology to be employed by the project activity:

The Project uses well established hydro power generation technology in electricity generation and transmission. A gated weir across Kemphole, downstream of confluence of Kadumanehole with Kemphole is constructed. The river bed level at the gated weir site is 319 m and the full reservoir level of the weir is 340 m. Three horizontal Francis turbines of 6 MW capacity each coupled with horizontal 3 phase, 50 Hz, 500 rpm synchronous generators are used. The gross head available for the project is 68 meters.

A 66 KV double circuit transmission line (total 124 towers over 29 KMs) from the switchyard to the 11/66 KV sub-station at Sakaleshpura is used for power evacuation from the project activity.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project activity is a run-of-river with no project emissions associated with its operations. In the absence of the project activity same amount of power would have been generated using fossil fuels as in the case of current grid generation mix. The project activity thus avoids power generation using fossil fuels and reduces associated GHG emissions.

The project activity is not financially attractive and faces other barriers. Without CDM benefits it would have not been possible to implement the project. However taking into account economic value of CERs and the group's policy to invest in renewable energy projects, project proponent have decided to use hydro energy for power generation.

The estimated total reduction in tonnes of CO2 equivalent over the crediting period of 7 years = 256053 tCO2e for the first crediting period

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tones of CO2 e
Oct 03- Mar 04	5535
April 04-Mar05	34123
April 05-Mar06	43279
April 06-Mar 07	43279
April 07-Mar08	43279
April 08-Mar09	43279
April 09-Mar10	43279
April 10-Mar11	43279

Total estimated reductions (tonnes of CO2 e)	256053
Total number of crediting years	7 years (first crediting period, twice renewable)
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	36579

A.4.5. Public funding of the project activity:

IPCL is promoted by Public Power International Inc, USA. Equity investment is done by USA based promoters. However this financing is not part of an International Official Development Assistance (ODA) effort. Details of investments are available to DOE for validation.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

Methodology: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002/Version 03, Sectoral Scope: 1, 30 September 2005

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The position of the CDM project activity vis-à-vis applicability conditions in the ACM 0002/Verson03 is described in the following table.

Applicability Conditions in the AM0002/Version03	Position of the project activity vis-à-vis applicability conditions
Applies to electricity capacity additions from: Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.	The project activity is a grid connected run-of-the-river hydro power project
This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	It's a renewable energy project with no fuel-switch
The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available; and	The project activity supplies power to KPTCL – Karnataka Power Transmission Corporation Limited. KPTCL supplies power to various consumers in Karnataka state. KPTCL encompasses all power plants supplying power to Karnataka state that can be dispatched without significant transmission constraints.

	KPTCL is therefore the geographical and system boundary (project electricity system). Adequate data is available to estimate grid emission factor.

B.2. Description of how the methodology is applied in the context of the project activity:

The project activity uses the approach described in the ACM0002/Version03**- "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"**

Step 1: Establish additionality of the project activity

The Project Activity is demonstrated as additional using latest version of the "*Tool for the demonstration and assessment of additionality*" agreed by the Executive Board. The details are provided in section B.3 of the PDD.

Step 2: Estimation of baseline emissions

Baseline scenario is that the Electricity delivered to the grid by the project would otherwise have been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

Step 2.1: Calculate the Operating Margin emission factor ($EF_{OM,y}$)

ACM0002 suggested following methods to calculate the Operating Margin emission factor(s) ($EF_{OM,y}$):

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As per the approved methodology ACM0002 Dispatch data analysis should be the first methodological choice. However due to lack of data availability 'Dispatch Data Analysis' is not selected for the project activity.

The Simple adjusted OM and Average OM methods are applicable to project activities connected to the project electricity system (grid) where the low-cost/must run resources constitute more than 50% of the total grid generation.

'Simple OM' method is applicable to project activity connected to the project electricity system (grid) where the low-cost/must run resources constitute less than 50% of the total grid generation in 1) average of the five most recent years, or 2) based on long-term normal for hydroelectricity production.

The project activity supplies power to KPTCL; the low-cost/must run resources contribute to less than 50% of total power in the grid hence 'Simple OM' option has been chosen.

Table 1.1: Power generation Mix of Karnataka

Source	1999-00	2000-01	2001-02	2002-03	2003-04
Total Power Generation (MU)	26117.5	26520.5	28063.9	28754.0	30722.4
Total Thermal Power Generation (MU)	13116.2	14625.7	17131.2	19760.7	21368.8
Total Low Cost Power Generation[1] (MU)	13001.2	11894.8	10932.7	8993.2	9353.5
Thermal % of Total power generation	50.22	55.15	61.04	68.72	69.55
Low Cost % of Total power generation	**49.78**	**44.85**	**38.96**	**31.28**	**30.45**
% of Low Cost generation out of Total generation - Average of the five most recent years –39.06%					
Data Source for the years 1999-00, 2000-01, 2001-02, 2002-03 & 2003-04: KPTCL					

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MU) of all generating sources serving the project electricity system, not including low-operating cost and must-run power plants.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

- A 3-year average, based on the most recent statistics available at the time of PDD submission, or
- The year in which project generation occurs, if EFOM,y is updated based on ex post monitoring.

The project activity uses the OM emission factor as per the 3-year average of Simple OM calculated based on the most recent statistics available at the time of PDD submission. The following Table 1.2 presents the key information and data used to determine the Simple OM emission factor.

Table 1.2: Data used for Simple OM emission factor[2]

Parameters	2002-2003			2003-2004			2004-2005			Source
	Coal	Gas	Diesel	Coal	Gas	Diesel	Coal	Gas	Diesel	
NCV_i (kcal/kg)	3877	10750	9760	4171	10750	9760	4171	10750	9760	Coal: General Review 2000-2001 & 2002-2003 (CEA) Gas: IPCC-Good Practice Guidance Diesel: General Review 2002-03 (CEA)
$EF_{CO2,i}$ (tonne CO_2/TJ)	96.1	73.3	74.1	96.1	73.3	74.1	96.1	73.3	74.1	IPCC 1996 Revised Guidelines and the IPCC Good Practice Guidance

[1] Low-cost/must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation

[2] $COEF_{i,j\ y-}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the Net Calorific Value (energy content) per mass or volume unit of a fuel i (NCV_i), the CO2 emission factor per unit of energy of the fuel i($EF_{CO2,i}$), and the oxidation factor of the fuel i ($OXID_i$).

$OXID_i$	0.98	0.995	0.99	0.98	0.995	0.99	0.98	0.995	0.99	Page 1.29 in the 1996 Revised IPCC Guidelines
$COEF_{i,j,y}$ (tonne of CO_2/ton of fuel)	**1.526**	**3.277**	**2.992**	**1.642**	**3.277**	**2.992**	**1.642**	**3.277**	**2.992**	**Calculated as per Equation (2) of ACM0002**
Parameters [3]	**2001-2002**			**2002-2003**			**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	
$\Sigma_j GEN_{j,y}$ (MU)	14281.8	943.57	1466.1	16962.31	1178.18	1103.73	17364.31	866.37	800.91	Refer to Tables 2-1, 2-2, 2-3, and 2-4: Power Generation Data of Annex 3-Baseline Information
Station Heat Rate (Design Values)	2434.38	1911	2062	2425.92	1911	2062	2425.92	1911	2062	Coal -Performance Review of Thermal Power Stations 2001-02, 2002-03 & 2003-04 -Section 13 Gas- Petition No. 22/99; IA No.27/1999 AND IA No.18/2000 Diesel – http://mnes.nic.in/baselinepdfs/annexure2c.pdf
Ei,j (%)	35.327	45	41.707	35.45	45	41.707	35.45	45	41.707	Calculated using Station Heat Rate Values
NCV_i (kcal/kg)	**3877**	**10750**	**9760**	**4171**	**10750**	**9760**	**4171**	**10750**	**9760**	Coal – General Review 2000-2001 & 2002-2003 (CEA) Gas-IPCC-Good Practice Guidance Diesel-General Review 2002-03 (CEA)
$F_{i,j,y}$ (tons/yr)	**8967585**	**167739**	**309744**	**9865550**	**209445**	**233185**	**10099359**	**154015**	**169209**	Calculated

3 GENj,y is the electricity (MU) delivered to the grid by source j, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports from the grid. The j power sources would also include electricity imports from the Central Generating Stations since the net imports from CGS exceed 20% of the total generation in the project electricity system - KPTCL.

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit, here tons/yr) consumed by relevant power sources j in year(s) y

$\Sigma_j GEN_{j,y}$ (MU)	16691.47	19244.22	19031.59	Refer to Tables 2-1, 2-2, 2-3, and 2-4: Power Generation Data of Annex 3-Baseline Information
Parameters	**2001-2002**	**2002-2003**	**2003-2004**	**Source**
EF (excluding electricity imports from other grids) (ton ofCO_2/MU)	908.23	913.47	924.24	Calculated
There are some electricity transfers from the connected electricity systems (PTCIL, PGCIL, NTPC-NVVN,WREB and SREB) to the KPTCL project electricity system.				
Import % from National Grid out of total generation	**1.35**	**1.70**	**7.61**	Refer to the CER Calculation Sheet
Import % from WREB out of total generation	**0.20**	**0.06**	**0.00**	Refer to the CER Calculation Sheet
Import % from SREB out of total generation	**0.01**	**0.04**	**0.00**	Refer to the CER Calculation Sheet
As per ACM0002 the CO_2 emission factor for the net electricity imports from the connected electricity system may be determined as the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system. The Emission Factor of the National Grid has been used as the emission factor for imports from PTCIL (Power Trading Corporation of India Limited), PGCIL (Power Grid Corporation of India Limited) and NTPC-NVVN. The Emission Factor of the Western Grid has been used as the emission factor for imports from WREB (Western Regional Electricity Board). The Emission Factor of the Southern Grid has been used as the emission factor for imports from SREB (Southern Regional Electricity Board).				
EF (National Grid) (ton ofCO_2/MU)	**872**	**865**	**845**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of National Grid has been considered)
EF (WREB) (ton ofCO_2/MU)	**932**	**910**	**910**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of Western Grid has been considered)

EF (SREB) (ton ofCO_2/MU)	**752**	**769**	**757**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of Southern Grid has been considered)
Net $EF_{OM,simple,y}$ is the calculated as the weighted average of the EF (excluding electricity imports from other grids), EF (National Grid), EF (WREB) and EF (SREB).				

Parameters	2001-2002	2002-2003	2003-2004	Source
Imports from NTPC-NVVN, PTCIL and PGCIL (MU)	**379.92**	**487.81**	**2337.28**	Refer to Tables 2-4: Power Generation Data of Annex 3-Baseline Information
Imports from WREB (MU)	**57.32**	**16.16**	**0.00**	Refer to Tables 2-4: Power Generation Data of Annex 3-Baseline Information
Imports from SREB (MU)	**2.52**	**12.56**	**0.00**	Refer to Tables 2-4: Power Generation Data of Annex 3-Baseline Information
Net $EF_{OM,simple,y}$ (ton of CO_2/MU)	**907.49**	**912.18**	**915.58**	Calculated
$EF_{OM,simple}$ (ton of CO_2/MU)	**911.75**			Average of the most recent three years' Simple OM

Step 2.2: Calculate the Build Margin emission factor ($EF_{BM,y}$)

As per the methodology the Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2/MU) of a sample of power plants. The project activity calculates the Build Margin emission factor $EF_{BM,y}$ ex ante based on the most recent information available on plants already built for sample group m at the time of PDD submission.

The sample group *m* consists of either:

(a) The five power plants that have been built most recently, or
(b) The power plants' capacity additions in the electricity system, that comprise 20% of the system generation (in MU) and that have been built most recently.

As per the baseline information data the option (b) comprises the larger annual generation. Therefore for the project activity the sample group m consists of power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently. Power plant capacity additions registered as CDM project activities are excluded from the sample group.

The following Table B-3 presents the key information and data used to determine the Simple BM emission factor.

Table 1.3: Data used for Simple BM emission factor				
Parameters	**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	
$COEF_{i,m,}$- is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the Net Calorific Value (energy content) per mass or volume unit of a fuel i (NCV_i), the CO_2 emission factor per unit of energy of the fuel i ($EFCO_{2,i}$), and the oxidation factor of the fuel i ($OXID_i$).				
NCV_i (kcal/kg)	4171	10750	9760	Coal & Diesel – General Review 2002-2003 (CEA) Gas-IPCC-Good Practice Guidance
$EF_{CO2,i}$ *(tonne CO_2/TJ)*	96.1	73.3	74.1	IPCC 1996 Revised Guidelines and the IPCC Good Practice Guidance
$OXID_i$	0.98	0.995	0.99	Page 1.29 in the 1996 Revised IPCC Guidelines
$COEF_{i,m}$ (tonne of CO_2/ton of fuel)	**1.642**	**3.277**	**2.992**	**Calculated as per Equation (2) of ACM0002**
Where NCV_i ,$EFCO_{2,i}$ $OXID_i$, $COEF_{i,m}$ are analogous to the variables described for the simple OM method above for plants in the sample group m.				
Parameters	**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	
$F_{i,m,y}$ - Fuel Consumption – is the amount of fuel consumed by relevant power sources m (where m – power sources which are a part of the sample group m delivering electricity to the grid). The Fuel Consumption is calculated based on total generation of the relevant power sources (m) ($\Sigma_m GEN_{m,y}$) , efficiency of power generation with fuel source i (Ei,m)and the Net Calorific Value (energy content) per mass or volume unit of a fuel i (NCVi).				
$\Sigma GEN_{m,y}$ *(MU)*	3363.82	866.37	0.00	Refer to Table 3-5 Power Generation Data for Calculation of Built Margin of Annex 3-Baseline Information
Station Heat Rate (Design Values)	2425.92	1911	2062	Coal -Performance Review of Thermal Power Stations 2003-04 Section 13 Page no. 13.3 Gas- Petition No. 22/99; IA No.27/1999 AND IA No.18/2000 Diesel – http://mnes.nic.in/baselinepdfs/annexure2c.pdf
Avg. efficiency of power generation with fuel source as (in %)	35.45	45	41.707	Calculated using Station Heat Rate Values
NCVi (kcal/kg)	4171	10750	9760	Coal & Diesel – General Review 2002-2003 (CEA) Gas-IPCC-Good Practice Guidance
$F_{i,m,y}$ (tons/yr)	**1956451**	**154015**	**0**	**Calculated**
Where $GEN_{m,y}$ *(MU)* , NCVi ,*Fi,m,y*, are analogous to the variables described for the simple OM method above for plants in the sample group m.				
Parameters	**2003-2004**			**Source**

ΣGENm,y (excluding imports of electricity from other grids) (MU)	**5122.41**	Refer to Table 3-5 Power Generation Data for Calculation of Built Margin of Annex 3-Baseline Information.
Where *GENm,y* is analogous to the variables described for the simple OM method above for plants in the sample group m.		
EF (BM,excluding imports of electricity from other grids) (ton of CO_2/MU)	**725.50**	Calculated
There are some electricity transfers from the connected electricity systems (PTCIL, PGCIL, NTPC-NVVN,WREB and SREB) to the KPTCL project electricity system.		
Import % from National Grid out of total generation of the 'm' plants considered for BM Calculation	**22.86**	Refer to the CER Calculation Sheet
Import % from WREB out of total generation of the 'm' plants considered for BM Calculation	**0.00**	Refer to the CER Calculation Sheet
Import % from SREB out of total generation of the 'm' plants considered for BM Calculation	**0.00**	Refer to the CER Calculation Sheet

Parameters	**2003-2004**	**Source**
The imports from various grids have been dealt with in a manner similar to that of the OM calculation. The Emission Factor of the National Grid has been used as the emission factor for imports from PTCIL (Power Trading Corporation of India Limited), PGCIL (Power Grid Corporation of India Limited) and NTPC-NVVN. The Emission Factor of the Western Grid has been used as the emission factor for imports from WREB (Western Regional Electricity Board).The Emission Factor of the Southern Grid has been used as the emission factor for imports from SREB (Southern Regional Electricity Board).		
EF (National Grid) (ton ofCO_2/MU)	**845**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of National Grid has been considered)
EF (WREB) (ton ofCO_2/MU)	**910**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of Western Grid has been considered)
EF (SREB) (ton ofCO_2/MU)	**757**	http://mnes.nic.in/baselinepdfs/chapter2.pdf (EF of Southern Grid has been considered)
$EF_{BM,y}$ is then calculated as the weighted average of the EF (excluding electricity imports from other grids), EF (National Grid), EF (WREB) and EF (SREB).		
Imports from	**1517.62**	Refer to Table 3-5 Power Generation Data for Calculation of Built

NTPC-NVVN, PTCIL and PGCIL (MU)		Margin of Annex 3-Baseline Information.
Imports from WREB (MU)	**0.00**	Refer to Table 3-5 Power Generation Data for Calculation of Built Margin of Annex 3-Baseline Information.
Imports from SREB (MU)	**0.00**	Refer to Table 3-5 Power Generation Data for Calculation of Built Margin of Annex 3-Baseline Information.
BM, $EF_{BM,y}$ (ton of CO_2/MU)	**752.81**	Calculated

Step 2.3: Calculate the Electricity Baseline Emission Factor ($EF_{electricity, y}$)

Electricity baseline emission factor is calculated as the weighted average of the Operating Margin emission factor (*EFOM,y*) and the Build Margin emission factor (*EFBM,y*) where the weights *wOM* and *wBM*, by default, are 50% (i.e., *wOM* = *wBM* = 0.5). The most recent 3-years average of the Simple OM and the BM of the base year i.e. 2003-2004 are considered. This is presented in the table below.

Table 1.4: Baseline Emission Factor

Parameters	Values (ton of CO_2/MU)
Simple OM, $EF_{OM,simple}$	911.75
BM, $EF_{BM,y}$ (ton of CO_2/MU)	752.81
Baseline Emission Factor, EF_y	**832.28**

Step 3: Project Emissions:
As per the ACM0002 there are no project related emissions.

Step 4: Leakage:
As per ACM0002 the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above). Project participants do not need to consider these emission sources as leakage in applying this methodology.

Step 5: Emission Reductions:
The project activity reduces carbon dioxide through displacement of grid electricity generation with fossil fuel based power plants by renewable-hydro electricity. The emission reduction ERy due to the project activity during a given year y is calculated as the difference between baseline emissions (BEy), project emissions (PEy) and emissions due to leakage (Ly), as per the formulae given below:

$$ER_y = BE_y – PE_y - L_y$$

Where

BEy Baseline emissions Tons CO2
PEy Project emissions; PEy = 0 for the project activity.
Ly Emissions due to Leakage Ly = 0 for the project activity.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The KMHS is a Run-of-the-River hydel project which is exporting power to KPTCL. The power generated by the project activity displaces the power that would have otherwise been generated by Karnataka grid. Karnataka grid is operating with a mix of hydro, nuclear and fossil fuel power plants.

As per the decision 17/cp.7 Para 43, a project activity is considered additional if anthropogenic emissions of green house gases by sources are reduced below those that would have occurred in the absence of the registered project activity.

In the absence of project activity, there shall be extra burden on the state grid that shall be equal to the amount of electricity being generated by the project. The state grid comprises of a mix of power plants using hydro, nuclear and fossil fuels for power generation. The CO_2 emission factor calculated for the grid in accordance with the provisions of ***ACM0002/ Version 03*** is ***832.28 tonnes per MU***.

In the following steps project activity is demonstrated as additional following the approach described in ***"Tool for demonstration and assessment of additionality"***.

Step 0: Preliminary screening based on the starting date of the project activity

The project activity was started on 20th October 2003 (Start of first stage). The Project Proponent has decided to invest in the Project activity, after accounting for the benefits available under Clean Development Mechanism. The project promoter plans to get the project activity get registered before 31st December 2005.

IPCL was aware that the KMHS project is a GHG abatement project, which could avail financial benefits under CDM if the project activity was found additional wherein the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project.

In year 2003, IPCL came to know about KPTCL's proposition to reduce the power tariff rate below the rate proposed in the PPA signed between IPCL and KPTCL from the sale of power from KMHS. IPCL has done a revised project feasibility assessment based on the revised tariff which was discussed by IPCL management in March 2003. Based on the new scenario project was found to be non attractive for investment. A possibility of availing CDM benefits was explored and a detailed feasibility analysis including CDM benefits was done. With the CDM revenue as one of the annual cash inflows, the KMHS project activity was found attractive for investment. The project feasibility based on CDM revenue was recommended to the Board of Directors for approval in the meeting held on 12th March 2003.

The same has been recorded in various official documents, where the proposed project was approved. These documents will be made available to DOE for validating the project activity.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

In sub steps 1a & 1b realistic and credible alternatives available to project developers are identified which provide output comparable to the project activity. Then it has been verified that whether these alternatives are in compliance with all applicable legal & regulatory requirements or not.

Sub-step 1a- Define alternatives to the project activity:
Project activity is a Run-of-the-River hydel project. Two alternatives can be identified to the project activity for this purpose. Either project developers can implement the project without considering it as a CDM project or situation could continue as it is i.e. no implementation of KMHS.

Alternative 1: Implementation of KMHS not undertaken as a CDM project activity

KMHS is using renewable sources of energy for generation of electric power and exporting it to the Karnataka grid. Thus project activity is displacing certain amount of electricity being generated by the state grid using a mix of power plants and there are no CO_2 emissions by the project activity.

The option is not feasible without CDM benefits as in that case Internal Rate of Return (IRR) of the project is not attractive compared to the cost of funding (Weighted Average Cost of Capital-WACC). Also there were many barriers for implementation of the project. This point is well proven with the help of facts & figures in the subsequent section.

Alternative 2: Continuation of Current Situation

If current situation is continued i.e. KMHS is not implemented there would be no displacement of grid power and an equivalent amount of Carbon-dioxide would continue to be emitted to the environment. This alternative thus truly represents the scenario in the absence of project activity and has been considered as baseline.

Sub Step 1b- Enforcement of applicable laws and regulations
Both of the alternatives identified here are in compliance with applicable laws and regulations.

Conclusion:
As per *Step 1 of Tool for demonstration and assessment of additionality* two alternatives have been identified to the project activity, there alternatives are in compliance with all applicable laws and regulatory requirements. Thus project activity can be termed as "Additional" up to this stage and can be preceded towards Step 2.

Step 2: Investment Analysis
At this step it has been determined whether the project activity is economically or financially viable and attractive without the sale of Certified Emissions Reduction (CER).

Sub Step 2a- Determining appropriate analysis method
As the project activity generates financial benefits by selling electricity generated by the plant to the KPTCL therefore Option I i.e. Simple Cost Analysis couldn't be applied for investment analysis.

Out of the other two alternatives available i.e. Investment Comparison Analysis and Benchmark Analysis project developer has chosen to apply Benchmark Analysis and has taken Weighted Average Cost of Capital (WACC) as benchmark.

Sub Step 2b- Applying the selected analysis method
The project activity entails high capital cost investments. An investment analysis of the project activity was done based on the Internal Rate of Return as the financial indicator. 'Internal Rate of Return' is one

of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. The project activity IRR was then compared with WACC[4] for the project activity.

Sub Step 2c- Calculation and comparison of financial indicators

The financial internal rate of return of the KMHS project activity without CDM revenues is 12.4 % which much lower than the 16% weighted average cost of capital for the project activity as required by the investors.

The Project IRR without CDM revenues was calculated based on the following parameters:

1. Annual export to KPTCL – 51.80 mu
2. Power tariff rate of KPTCL – INR 3/- per unit with an annual escalation rate of 2%.
3. IRR is computed from the year 2005-2014.
4. Annual CER generated – 43,500
5. Exchange rate - 1EURO equivalent to INR 55/-

All financial data would be available to the DOE in the process of Validation.

Sub Step 2d- Sensitivity Analysis

A detailed sensitivity analysis of the project activity was done to test the project feasibility with varying project parameters. The project activity feasibility is dependent on the following parameters.

- Annual export to KPTCL – 51.80 mu
- OM Expenses
- Tariff paid by KPTCL

Sensitivity Table showing impact of variations in key factors on IRR without CDM revenue:

(a) Variation in Annual Export of power-

SN	Parameters	Variation	IRR	% Change	Comments
1	Annual Export to KPTCL	+10%	13.7%	+ 10.48%	The IRR of the project activity is still lower than the WACC benchmark; *The probability of a 10% increase in annual export to KPTCL is not very high. It is unlikely that the hydrological conditions that are available in the project activity are able to sustain a 10% increase*

[4] The WACC (16%) was calculated as a weighted average of the different cost of capital used in the project activity.

					in the annual power generation.
		-10%	10.6%	- 14.52%	The IRR of the project activity is very low in comparison of WACC benchmark.

(b) Variation in Power Tariff-

SN	Parameters	Variation	IRR	% Change	Comments
2	Power Tariff paid by KPTCL	+10%	12.7%	+ 2.41%	The IRR of the project activity is still lower than the WACC benchmark i.e. 16%;
		-10%	10.6%	- 14.51%	The IRR of the project activity is lower than the WACC benchmark;

(c) Variation in OM Expenses-

SN	Parameters	Variation	IRR	% Change	Comments
3	OM Expenses	+10%	12.1%	- 2.42%	The IRR of the project activity is lower than the WACC benchmark.
		-10%	12.7%	+ 2.42%	The IRR of the project activity is still lower than the WACC benchmark. However OM expenses are unlikely to be reduced by 10%.

Conclusion:
Following various sub steps in Step 2 it has been well established and demonstrated that project activity is not a financially attractive option even if all key assumptions on the basis of which IRR has been calculated are changed in both directions and is thus additional.

As in Step 2 it has been concluded that proposed project activity is unlikely to be the most financially attractive now various barriers faced by the project have been summarized under step 3.

Step 3: Barrier analysis

Technology Barrier –
Although technology used for power generation through hydrological sources is well established and available in India there were many other technological barriers faced by the project. Due to these barriers it was difficult for the project proponent to go ahead with the project.

- **Hydrological Risk:** The project is based in Netravathi river basin. As this is the first project in the river basin, and also due to tough terrain there was no data available for gauging of the power

potential. The project proponent had made substantial efforts to assess the site potential. Due to lack of old authentic data, project faces performance risk.

- **Inflow of waste with Water:** Because the site is based in dense forest, thrash material (forest waste like wood, etc) flow into water stream severely risking the power generation equipment. The project proponents have installed an automatic thrash cleaning system to avoid damages to equipments. Many technological/structural innovations have been introduced in the project activity to utilise automatic cleaning system.

Infrastructural Barrier –
Plant is located in hilly forest area in Karnataka. Lack of infrastructural facilities was a major barrier for project implementation.

- **Evacuation facility:** The project activity is in hilly area and is surrounded by dense forest with no power evacuation facility in the nearby area up to 29 Km. Project proponents had to install 124 tower transmission systems to evacuate power to the nearby sub-station. Due to extremely difficult terrain (Hilly and forest area) installation of towers was not an easy task and many difficulties were faced in executing the project.

- **Lack of support infrastructure:** There is no support infrastructure like housing, communication, approach roads etc available for the project implementation. Also there is shortage of skilled manpower in the region. Lack of infrastructure was a major challenge for the project promoters to implement the project activity.

To overcome technological challenges and lack of infrastructure facilities, additional investments and efforts were required however there were no additional returns/ benefits available from these investments/efforts.

Step 4: Common Practice Analysis

Sub Step 4a- Analyze other activities similar to the proposed project activity
The project activity is supplying power to KPTCL. An analysis of total power generated in the state of Karnataka shows that power generated by hydel projects being implemented by Independent Private Parties (IPP) have a very low percentage of share. In April'2003 only 0.7 per cent of total power generation was done by plants in this category.

The project activity is also the first project in the Netravathi river basin. Lack of hydrological data for the river stream has made it difficult for implementation of hydro power projects.

Sub Step 4b- Discuss any similar option that are occurring
No project activities are found being implemented previously those are similar to the project activity. Thus it can be concluded that implementation of hydel projects by IPP is not at all a common practice in the state of Karnataka in India.

Step 5: Impact of CDM Registration

As discussed in the step 2 & step 3 of the additionality analysis done above, the project is financially not attractive to be undertaken and also faced significant barriers for implementation. IPCL could have decided to invest in the project activity considering the impacts of CDM registration only. Primary incentives and benefits which were considered for this purpose are following

- Possible CDM revenue which make the project financially attractive for investment.
- Reduction of GHG emissions in the overall system by use of renewable sources of energy for power generation.
- Attracting private sector participation in power generation in the region. Successful implementation of project activity will encourage other project developers to accept a low IRR considering CDM benefits.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The project site:

KMHS project activity boundary covers the entire power generation plant, including penstock, surge tank, switch yard, turbines and other equipments used for power generation. The project activity supplies power to KPTCL grid, hence transmission network used to evacuate power is also included in the project boundary.

Electricity Grid:

KPTCL transmits power in the entire State of Karnataka. KPTCL purchases power from Karnataka Power Corporation Limited, which generates and operates major power generating projects in the state consisting of Hydel, Thermal and other sources.

KPTCL also purchases power from private owned power generation plants exporting power to KPTCL and Central Government owned generating stations like National Thermal Power Corporation, Neyvelli Lignite Corporation and the Atomic Power Stations at Kalpakkam and Kaiga. The approximate share of power from these generating stations is around 16%.

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid Electricity Generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification- this is conservative
		N_2O	No	Excluded for simplification- this is conservative

Project Activity	Electricity Generation	CO_2, CH_4, N_2O	No	The project activity is a renewable energy project and hence no emissions.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The baseline was completed in October 2005 by Emergent Ventures India Pvt. Ltd. And Srividhya Consultancy Services who are Project Advisor. Contact details are as under:

Ashutosh Pandey
Emergent Venturs India Pvt. Ltd.
II C-141. Ridgewood Estate, DLF Phase-IV
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E-mail : srividhyaconser@gmail.com

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The management of IPCL approved the KMHS project activity in March 2003. However site civil construction started in June 2002. 20st October 2003; the project activity (first unit of 6 MW) has started generating power. KMHS project was completed in two stages; in first stage 2X6 MW units were installed (20th Oct 2003, 20th Nov 2003), in second stage 6 MW was installed (10th Jan 2005).

C.1.2. Expected operational lifetime of the project activity:

30 Years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

1st October 2003

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

Methodology: "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources"

Reference: Approved consolidated monitoring methodology ACM0002/Version 03, Sectoral Scope: 1, 14 September 2005

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity meets the applicability criteria of the 'Approved baseline methodology ACM0002'. (Please refer to Section B.2. for details). The applicability criteria of the 'Approved monitoring methodology ACM0002' are identical to those of the 'Approved baseline methodology ACM0002'. Therefore the project activity has used the 'Approved monitoring methodology ACM0002' in conjugation with the 'Approved baseline methodology ACM0002' for the project activity.

The project activity would monitor following as per the guidance provided in the approved methodology (ACM0002):

- Electricity generation from the proposed project activity;
- Data needed to recalculate the operating margin emission factor, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

- Data needed to recalculate the build margin emission factor, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

Project emission associated to the project activity is zero. Therefore this section is Not Applicable

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	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)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

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D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

1	EGy : Electricity supplied to the grid by the project activity	KMHS records/ KPTCL records	MWh	Directly Measured	Hourly measurement and monthly recording	100%	Electronic	
2	EFy : CO2 emission factor of the grid	KPTCL/CEA	tCO2/ MWh	Calculated	Yearly	100%	Electronic	Calculated as weighted sum of OM and BM emission factors as per step 3 in ACM0002
3	EFOM,,y :CO2 operating margin emission factor of the grid	KPTCL/CEA	t CO2/ MWh	Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated as Step 1 of ACM0002
4	EFBM,y : CO2 build margin emission factor of the grid	KPTCL/CEA	t CO2/ MWh	Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated as Step 2 of ACM0002
5	Fi,j,y :Amount of fossil fuel i, consumed by each power source/ plant in year y	KPTCL/CEA	tons	Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated based on the Total power generation, Average Net Calorific Value of the Fuel used and the Designed Station Heat Rate data of power plants of KPTCL grid
6	COEFi,j,y : CO2 emission factor of each fuel type i,	IPCC	t CO2 / ton of fuel	Standard /Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated based on the IPCC default value of the Emission Factor, Net Calorific Value and Oxidation Factor of the Fuel used by the power plants of KPTCL grid
7	GENj,y : Electricity delivered to the grid by power source j in year y	KPTCL/CEA	MWh/ annum	Measured	Once at the beginning of a crediting period	100%	Electronic	Obtained from authentic and latest local statistics.

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Calculation of baseline emission factor

The baseline emission factor ($EF_{,y}$) is calculated as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the following three steps. Calculations for this combined margin are based on data from an official source.

STEP 1: Calculate the Operating Margin emission factor

Simple OM approach is the most appropriate calculations method because in the KPTCL grid mix, the low-cost/must run resources constitutes less than 50% of total grid generation. Simple OM factor is calculated as under.

$EF_{OM,simple,y}$ is calculated as the average of the most recent three years (2001-02, 2002-03 & 2003-04) .

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \, x \, COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Where

$GEN_{j,y}$: The electricity (MWh) delivered to the grid by source j

$COEF_{i,j\,y}$: The CO_2 emission coefficient of fuel i (t CO_2 / mass or volume unit of the fuel), calculated as described below and

$F_{i,j,y}$: The amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y , calculated as described below

J, Refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports from the grid

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_{\ i} = NCV_{\ i} \otimes EF_{CO\,2,i} \otimes OXID_{\ i}$$

Where

NCV_i : The net calorific value (energy content) per mass or volume unit of a fuel i

$EF_{CO2,I}$: The CO_2 emission factor per unit of energy of the fuel i (IPCC default value)
$OXID_i$: The oxidation factor of the fuel (IPCC default value)

The Fuel Consumption $F_{i,j,y}$ is obtained as

$$\sum_i F_{i,j,y} = \left(\sum_j GEN_{j,y} \otimes 860 \Big/ NCV_i \otimes E_{i,j} \right)$$

Where

$GEN_{j,y}$: The electricity (MWh) delivered to the grid by source j
NCV_i : The net calorific value (energy content) per mass or volume unit of a fuel i
$E_{i,j}$: The efficiency (%) of the power plants by source j

STEP 2: Calculate the Build Margin emission factor ($EF_{BM,y}$) as the generation-weighted average emission factor (t CO_2/MWh) of a sample of power plants m of KPTCL grid, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \, x \, COEF_{i,m}}{\sum_m GEN_{m,y}}$$

Where

$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ - Are analogous to the variables described for the simple OM method above for plants m.

Considered calculations for the Build Margin emission factor $EF_{BM,y}$ which is updated annually ex post for the year in which actual project generation and associated emissions reductions occur. The sample group m for the most recent year consists of the 20 (twenty) power plants that have been built most recently, since it comprises of larger annual power generation. (Refer to Annex 3)

Further, power plant capacity additions registered as CDM project activities have been excluded from the sample group m of KPTCL grid mix.

STEP 3: Calculate the baseline emission factor $EF_{,y}$ as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = W_{OM} \otimes EF_{OM,y} \oplus W_{BM} \otimes EF_{BM,y}$$

where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,Simple,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in t CO_2/MWh.

Calculation of Baseline Emissions

$$BE_y = EF_y \; x \; EG_y$$

Where
BE_y : Baseline emissions due to displacement of electricity during the year y in tons of CO_2
EG_y : Electricity supplied to the grid by the project activity during the year y in MWh, and
EF_y : CO_2 baseline emission factor for the electricity displaced due to the project activity in during the year y in tons CO_2/MWh.

For this methodology, it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity. They are therefore neglected.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

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D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	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)	Comment

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

There are no emission sources as leakage in the project activity. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction. However according to ACM0002 Project participants do not need to consider these emission sources as leakage in applying this methodology.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Formula used for estimation of the total net emission reductions due to the project activity during a given year *y* is as under.

$$ER_y = BE_y - PE_y - L_y$$

Where

ER_y : Emissions reductions of the project activity during the year y in tons of CO_2
BE_y : Baseline emissions due to displacement of electricity during the year y in tons of CO_2
PE_y : The project emissions associated with the project activity (none for the project activity)
L_y : The emissions sources as leakage (none for the project activity)

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. EG_y - Electricity supplied to the grid by the project activity	*Low*	Electricity meters are properly maintained with regular testing and calibration schedules developed as per the technical specification requirements to ensure accuracy.
2,3,4	*Low*	This is calculated based on the formula described in ACM0002
5,7	*Low*	Authentic grid data is used
6	*Low*	IPCC default values used

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

A CDM project team is constituted with participation from relevant departments. People are trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity check data collected, emissions reduced etc. On a weekly basis, the monitoring reports are checked and discussed by the seniors CDM team members/managers. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On monthly basis, these reports are forwarded at the management level. Detailed monitoring plan attached in annex-4.

D.5 Name of person/entity determining the monitoring methodology:

Ashutosh Pandey
Emergent Ventures India Pvt Ltd (not a project participant)
II C-141 Ridgewood Estate, DLF Phase IV
Gurgaon, Haryana – 122 002, India
Phone: 91-124 5102980
Mobile: 91-9312547154
Email: ashutosh@emergent-ventures.com

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

There are no project emissions in the project activity. PEy = 0

E.2. Estimated leakage:

There are no emission sources as leakage in the project activity. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction. However according to ACM0002 Project participants do not need to consider these emission sources as leakage in applying this methodology.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Total project activity emissions are zero over entire crediting period.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

SN	Operating Years	Baseline Emission Factor (tCO_2 / MU)	Baseline Emissions (tCO_2)
1.	Oct, 03 – Mar, 04	832.28	5535
2.	April,04 – Mar, 05	832.28	34123
3.	April, 05 – Mar, 06	832.28	43279
4.	April, 06 – Mar, 07	832.28	43279
5.	April, 07 – Mar, 08	832.28	43279
6.	April, 08 – Mar, 09	832.28	43279
7.	April, 09 – Mar, 10	832.28	43279

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

SN	Operating Years	CO2 Emission Reductions (tCO2)
1.	Oct, 03 – Mar, 04	5535
2.	April,04 – Mar, 05	34123
3.	April, 05 – Mar, 06	43279
4.	April, 06 – Mar, 07	43279
5.	April, 07 – Mar, 08	43279
6.	April, 08 – Mar, 09	43279

SN	Operating Years	CO2 Emission Reductions (tCO2)
7.	April, 09 – Mar, 10	43279

E.6. Table providing values obtained when applying formulae above:

SN	Operating Years	Baseline Emissions (tCO2)	Project Emissions (tCO2)	Leakages (tCO2)	CO2 Emission Reductions (tCO2)
1.	Oct, 03 – Mar, 04	5535	0	0	5535
2.	April,04 – Mar, 05	34123	0	0	34123
3.	April, 05 – Mar, 06	43279	0	0	43279
4.	April, 06 – Mar, 07	43279	0	0	43279
5.	April, 07 – Mar, 08	43279	0	0	43279
6.	April, 08 – Mar, 09	43279	0	0	43279
7.	April, 09 – Mar, 10	43279	0	0	43279

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including trans boundary impacts:

The environmental assessment studies (two) have been carried out in a corridor of 10 Km. on the either side of Kemphole. The reports fully follow the guidelines of the Ministry of Environment and Forest, Government of India issued time to time. Accordingly the environment impact of the project area is evaluated bringing out the beneficial and ill-effect of the project.

The following are the salient conclusions of Environment Impact Study:

a) Project is a run-of-the-river scheme and submersion is least.
b) No water was extracted from ground during construction phase.
c) No surface water is being sourced during the operational phase and no effluent is being released into the surface water.
d) The impoundment of water behind the weir is negligible and doesn't result in landslides or any effect on earthquakes or any other geotechnical adverse effect.
e) Construction activity had brought normal changes to site topsoil and some components of the land. But these impacts were kept minimized by adopting the best technology and appropriate measures.
f) There is no agricultural activity near surrounding the project site.

g) The proposed project comes within the uninhabited village therefore there was no displacement of population. The progressive development and operation of the project has in no way affected the sparsely distributed village life in the catchment area.
h) Within the radius of 25 Km from the project, there are no ecologically sensitive areas. Hence the implementation of project in no way affected the wild life. Birds, plants and animals common to cultivated and populated areas are found in the area. No rare or endangered species have been reported.
i) During construction excavation, temporary storage of materials caused unsightly conditions and dusty atmosphere. But developers had undergone a good housekeeping and proper handling of solid waste. This had definitely enhanced the visual compatibility of the project.

The project thus does not have any negative effect on the environment on the whole. There are many beneficial effects such as increase in aquatic fauna, improvement in ground water level and increase in the vegetation density etc. which has brought over all enhancement of the environment and improvement in the socio-economic condition and living standards of the people in the area.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

As discussed above environmental impacts of the project can not be categorized as significant as per guidelines issued by regulatory authorities in host party. The project activity is a run-of-the-river type and hence there was no submersion of nearby land. Land being used by the project is minimal considering the magnitude of the project and no adverse affects can be counted on the flora and fauna of the surroundings due to proposed activity.

In general, there are no major adverse effect on the environmental components and ecosystems of the region due construction and operation of the project. EIA studies conducted by the project developers before start of the project activity revealed that the project will generate the much needed electricity with least disturbance to the eco-systems of the surroundings. It has been observed that project has been able in accomplishing this assessment very well.

There were some normal temporary inconvenience during construction phase but developers have been successful in mitigating those through a proper Environment Management Plan as under:

SN	Impact	Mitigation Plan
1	***Disposal of excavated material from the power canal and related areas***	Surplus excavated material was disposed of so as to merge with the environment to provide areas for forestry. Monsoon season was avoided for the construction particularly for excavation work. Proper Soil erosion Check Dams and Dykes were provided for control of soil erosion.
2	***Acquisition of land likely to be submerged***	Preliminary designs were made and land likely to be submerged and used for power channel was identified. This land came in the category of marginal land with gravelly and lithic type of soils.
3	***Acquisition of land for the footings of transmission tower***	Land required and used for transmission towers footing is also minimal. Transmission lines were laid avoiding reserved forest areas. This route is devoid of vegetation and didn't involve

		cutting of trees and any disturbance to any wild life. The study of the transmission line system indicates that the route length is on exposed rock and little soil cover.

SECTION G. Stakeholders' comments

G.1. Brief description how comments by local stakeholders have been invited and compiled:

A meeting with all stakeholders for the project was organised by IPCL. Documentary proofs and minutes of these meetings are maintained and can be presented at the time of validation.

Following stakeholders were consulted:

- Village Panchayat
- Local population
- Various NGOs working in the area

Sarpanch of the Village Panchayat was present in the meeting along with sufficient number of participation from the local population.

Besides project proponents have also received all necessary approvals & clearances from Government bodies like Karnataka Renewable Energy Development Authority (KREDA), Karnataka Pollution Control Board (KPCB) and Environment Department, Government of Karnataka.

G.2. Summary of the comments received:

Project activity doesn't involve any significant negative impact over social structure and environment. Therefore all stakeholders had really shown their pleasure and support to the project activity. Comments received from stakeholders are well documented and can be presented for verification at the time of validation.

G.3. Report on how due account was taken of any comments received:

No negative comment was received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Participant

Organization:	International Power Corporation Limited, India
Street/P.O.Box:	Defense Colony, HAL, 2nd Stage,
Building:	"Radhakrishna", No 38, 2nd Main,
City:	Bangalore
State/Region:	Karnataka
Postfix/ZIP:	560038
Country:	India
Telephone:	080-26531685
FAX:	080-26531685
E-Mail:	raghavms@vsnl.com
URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Raghavendra
Middle Name:	S.
First Name:	M.
Department:	
Mobile:	91-9845039520
Direct FAX:	080-26531685
Direct tel:	080-26531685
Personal E-Mail:	raghavms@vsnl.com

Host Country Details

Organization:	The National CDM Authority (Designated National Authority (DNA)
Street/P.O.Box:	Lodhi Road
Building:	Paryavaran Bhawan, CGO Complex
City:	New Delhi
State/Region:	New Delhi
Postfix/ZIP:	110003
Country:	India
Telephone:	+91 11 24362252
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E-Mail:	rksethi@menf.delhi.nic.in
URL:	www.cdmindia.nic.in
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Sethi
Middle Name:	K.
First Name:	R.

Department:	The National CDM Authority
Mobile:	
Direct FAX:	+91 11 24363577
Direct tel:	+91 11 2436 2252
Personal E-Mail:	dir.cc@nic.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

IPCL is promoted by Public Power International Inc, USA. Equity investment is done by USA based promoters. However this financing is not part of an International Official Development Assistance (ODA) effort. Details of investments are available to DOE for validation.

Annex 3

BASELINE INFORMATION

The data of Table 2.1, 2.2, 2.3 and 2.4 given above are used for Simple OM emission factor ($EF_{OM,,y}$).

Table 2.1 : Power Generation Mix of Karnataka from State Generating Stations						
Sl.No.	**Name of Power Plant**	**Fuel**	**Installed Capacity**	**Net Generation in MU**		
			(MW)	**2001-02**	**2002-03**	**2003-04**
A.	**State- Thermal[5]**					
1	RTPS-I to IV	Coal	4x210	5922.03	6079.33	5911.48
2	RTPS-V & VI	Coal	210	2253.07	3036.22	2999.46
3	RTPS-VII	Coal	210	0	275.55	1504.33
4	Power Purchase-VVNL	Diesel		745.971	684.976	523.783
Total- Thermal				**8921.071**	**10076.076**	**10939.053**
B	**State-Hydro[6]**					
1	Sharavathy	Hydel	10x103.5	4155.68	2827.11	3261.49
2	Chakra	Hydel		0	412.46	455.38
3	Linganamakki	Hydel	2x27.5	175.77	111.23	126.93
4	Nagajhari	Hydel	3x135+3x150	2393.18	1782.86	1700.84
5	Supa	Hydel	2x50	387.9	250.31	234.5
6	Ghataprabha	Hydel	2x16	72.47	57.79	63.01
7	Varahi	Hydel	2x115	870.85	822.53	696.84
8	Mani	Hydel	2x4.5	19.41	17.46	10.62
9	Bhadra	Hydel	2x12+1x2	23.67	8.76	4.73
10	Kadra	Hydel	3x50	282.55	228.69	214.73
11	Kalmala	Hydel	1x0.4	0.13	0.05	0.12
12	Sirwar	Hydel	1x1	0.22	0.78	0.17
13	Ganekal	Hydel	1x0.35	0.49	0.14	0.07
14	Mallapur	Hydel	2x4.5	28.34	0.76	8.46
15	Kodasali	Hydel	3x40+4x60	274.82	213.63	212
16	Gerusoppa	Hydel		408.25	309.63	355.38
17	Bhadra Right Bank	Hydel	1x7.2+1x6	20.66	7.49	3.79
18	Kappadagudda	Hydel	9x0.225+11x0.23	5.31	10.86	14.98
19	Almatti Dam Power House	Hydel		0	0	0.45
20	Power Purchase-VVNL	Hydro		215.749	250.234	191.347
Total- Hydro				**9335.449**	**7312.774**	**7555.837**
State Sector Total				**18256.52**	**17388.85**	**18494.89**
Data Source: KPTCL						

Table 2.2 : Power Generation Mix of Karnataka from Independent Power Producers

[5] Installed capacity as on 31st August'2004

[6] Installed capacity as on 31st August'2004

Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
A	**IPP**[7]					
1	Rayalseema Alkalies	Diesel	27	189.08	61.8	41.63
2	TATA Electric Company	Diesel	81	531.05	356.95	235.5
3	Taneer Bhavi Power Company	Gas (Naptha)	220	943.57	1178.18	866.37
Total- IPP(Major)				**1663.7**	**1596.93**	**1143.5**
Data Source: KPTCL						

Table 2.3 : Power Generation Mix of Karnataka from Private Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
A	**IPP-Mini-Hydel**					
1	ITPL			2.37	1.38	0.66
2	EDCL			24.48	22.87	20.76
3	Murudeshwar Power Corporation Ltd.			48.54	37.91	37.17
4	Bhoruka Power Corporation Ltd.			27	27.3	23.59
5	Bhoruka Power (Shahapur)			0	0	2.86
6	S.M.I.O.R.E			28.46	11.98	4.45
7	Thungabhadra Steel Products			0.39	0.37	0.31
8	Amogha Power Projects			1.96	2.8	1.81
9	Atria Power Corporation Ltd.			21.34	79.29	54.46
10	Vijaylakshmi Hydro Power Ltd.				1.33	1.83
11	Moodatyagil Power Pvt. Ltd.				0.32	0.52
12	Maruthi Power (Kabini)					1.65
13	Maruthi Power (Hemabhathi)					0.5
14	Kalson Power Tech Ltd.					2.89
15	Graphite India Ltd.					1.31
16	Intrernational Power Corpn. Ltd.					3.32
Total- IPP(Mini-Hydel)				**154.54**	**185.55**	**158.09**
B	**IPP-Co-generation**					
1	Ugar Sugar Ltd.	Bagasse		69.9	51.66	55.48
2	Shamanur Sugars Ltd.	Bagasse		100.02	98.31	111.9
3	Shree Renuka Sugars Ltd.	Bagasse		34.61	26.33	45.96
4	Bannari Amman Sugars Ltd.	Bagasse		57.71	73.82	76.27
5	ICL Sugars Ltd.	Bagasse		13.54	17.17	14.19
6	Prabhulingeshwara Sugars	Bagasse		33.66	38.34	34.07
7	Dandeli Ferro Alloys Limited			4.45	3.57	0
8	Jamkhandi Sugars Limited			0.62	7.14	13.47
9	GEM Sugars			0	8.29	27.59

[7] Installed capacity as on 31st March'2003

Table 2.3 : Power Generation Mix of Karnataka from Private Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
10	Ryatsara Sahakari S.K.N			2.87	5.69	2.76
11	Devengare Sugar Co. Ltd.			0	0	1.67
Total- IPP(Co-Generation)				**317.38**	**330.32**	**383.36**
C	**IPP-Biomass**					
1	Mallavali Power Plant	Rice Husk		13.11	21.78	26.47
2	South India Paper Mills	Coffee Husk, Rice Husk & Copra Shells		12.23	23.55	13.11
3	Bhagarampur Solvets					3.22
4	R.K.Powergen					9.75
5	Samson Distillisers					0.43
Total- IPP(Biomass)				**25.34**	**45.33**	**52.98**
D	**IPP-Wind**					
1	Cepco Wind Farm			7.35	20.27	23.57
2	Topaz Wind Farm			0.93	1.86	2
3	Enercon Wind Farm			2.92	23.21	26.95
4	Prabhat Agri biotech Ltd.				1.08	1.05
5	Panarna Business Centre				0	1.24
6	Panarna Credit & Capital					0.66
7	Texmo Precision and Castings				0	2.87
8	Siddaganga Oil Extractions				0	2.86
9	Fiza Developers and Inner Trade				0.01	2.83
10	Suttatti Enterprise				0	2.48
11	Raja Magnetics Ltd.				0	1.11
12	VXL Systems-II					0.77
13	VXL Systems-I					0.77
14	Kamal Trading Company					0.72
15	Jindal Alluminium-1.9MW					3.23
16	Mayura Steels					0.75
17	Shilpa Medicare					0.64
18	Patel Shanti Steels					0.71
19	Balasaheb IJ Limited					0.69
20	Friends Associate Power Projects					0.74
21	Sharp Pumps (P) Ltd.					0.73
22	Rajnikanth Foundation					0.71
23	RSM Autokast Ltd.					1.49
24	Indan Energy Ltd.					1.48
25	MSPL Ltd. Phase-1					1.99
26	Savitha Chemicals					4.82
27	Elveety Industries					0.57

Table 2.3 : Power Generation Mix of Karnataka from Private Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
28	Jindal Alluminium-6.6MW				2.57	14.59
29	Ghodawat Pan Masala (Enercon)					11.83
30	Ghodawat Pan Masala-NH					9.46
31	Sanjay D. Ghodawat					1.55
32	Shriram Transport Finance					8.73
33	Shriram City Union Finance					3.89
34	Shriram Investments					8.03
35	Texmo Industries EP2					4.51
36	Enercon-Karnataka					46.08
37	Lovely Fragrances					1.83
38	J.N.Investments					0.81
39	Reliance Energy Ltd.			0.89	19.08	20.08
40	Topaz Investments-1.2MW					2.14
41	Cepco Industries-0.6MW				0	1.2
42	Shilpa Medicare-0.46MW					1.5
43	Mohite & Mohita					4.06
44	NEG Mican					6.99
45	Pallavi Green Power					0.56
46	Supreme Power Company					1.46
47	Dee Dee Enterprises					1.4
48	Royal Energy Company					1.08
49	Rangad minerals and Mining Ltd.					1.15
50	MSPL Ltd. Phase-II					3.61
51	Mansukmal Investments					0.29
52	Reliance-BSES					3.06
53	Encon Services Ltd.					4.34
54	Mahe Ltd.					12.17
55	Prime Lables Ltd.					0.36
56	Savita Chemicals (Encon Group)					2.37
57	Sanjay D. Ghodawat (I & II)					0.01
58	BS Charnabasappa & Sons					0.01
59	Associated Autotex Ancilliaries Ltd.					0
60	Good Luck Syndicate					0.01
61	Ghodawat Pan Masala (VVS)					0.02
62	Star Flexi Pack Industries					0.01
63	Shreya Laxmi Properties					0
64	Shraddha Constructions					0
65	VXL Systems 0.6MW (VVS)					0
66	Cepco Industries-1.2MW(VVS)					0
67	Dee Dee Enterprises (Enercon)					2.01

Table 2.3 : Power Generation Mix of Karnataka from Private Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
68	Miscellaneous IPPs				26.66	
Total- IPP(Wind)				**12.09**	**94.74**	**269.63**
Private Sector Total				**509.35**	**655.94**	**864.06**
Data Source: KPTCL						

Table 2.4 : Power Generation Mix of Karnataka from Central Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
A.	**Central- Thermal**					
1	NTPC-SR	Coal		3255.45	3689.19	3006.56
2	NTPC-ER	Coal		846.52	1616.36	571.23
3	NTPC-NVVN			0	0	112.88
4	NTPC-Talcher 2&3	Coal		0	0	835.85
5	NLC	Lignite		2004.73	2265.66	2082.99
6	NLC Expansion-I	Lignite		0	0	452.41
7	PTCIL			379.92	190.57	819.66
8	PGCIL-SREB			0	297.24	1404.74
Total- Thermal				**6486.62**	**8059.02**	**9286.32**
B	**Central-Nuclear**					
1	Madras Atomic Power Station (MAPS)			431.09	158.63	96.9
2	KAIGA Generating Station			627.17	852.1	829.82
Total- Nuclear				**1058.26**	**1010.73**	**926.72**
C	**Imports from Other Grids**					
	SREB					
1	KSEB			0	0	0
2	APTRANSCO			2.52	12.56	0
3	TNEB			0	0	0
	Sub-Total			**2.52**	**12.56**	**0**
	WREB					
1	MSEB			0.59	4.19	0
2	Goa			0	1.18	0
3	CSEB			0	0.14	0
4	MPEB			0	7.12	0
5	GEB			0	3.53	0
6	WREB			56.73	0	0
	Sub-Total			**57.32**	**16.16**	**0**
	Hydro-T.B. Dam					
1	T.B.H.E			29.65	14.75	6.91
	Sub-Total			**29.65**	**14.75**	**6.91**
Total- Imports from Other Grids				**89.49**	**43.47**	**6.91**

Table 2.4 : Power Generation Mix of Karnataka from Central Generating Stations						
Sl.No.	Name of Power Plant	Fuel	Installed Capacity	Net Generation in MU		
			(MW)	2001-02	2002-03	2003-04
Central Sector Total				7634.37	9113.22	10219.95
Data Source: KPTCL						

The data of Table 2.5 given below are used for BM emission factor ($E_{FBM,y}$).

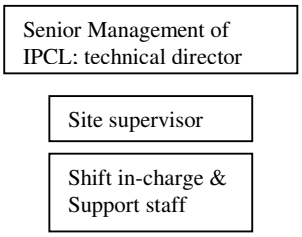
Table 2.5: Power Generation data of the Sample Group for Calculation of Built Margin						
Sr.No.	Power plant name / location	Unit No.	Fuel Type	Capacity	Year of commissioning	MU
				(MW)		2003-2004
1	RTPS-VII	7	Coal	7x210	2003-2004	1504.33
2	NTPC-NVVN		National Generation Mix		2003-2004	112.88
3	IPP-Wind		Wind		2003-2004	178.56
4	IPP-Biomass		Biomass		2003-2004	13.4
5	IPP-Mini Hydel		Mini Hydel		2003-2004	9.67
6	IPP-Co-generation		Co-generation		2003-2004	1.67
7	NLC Expansion-I		Lignite		2003-2004	452.41
8	Almatti Dam Power House		Hydel		2003-2004	0.45
9	NTPC-Talcher 2&3	3	Coal		2003	835.85
10	IPP-Wind		Wind		2002-2003	18.47
11	IPP-Mini Hydel		Mini Hydel		2002-2003	2.35
12	IPP-Co-generation		Co-generation		2002-2003	27.59
13	Chakra		Hydel		2002-2003	455.38
14	PGCIL-SREB		National Generation Mix		2002-2003	1404.74
15	IPP-Wind		Wind		2001-2002	72.6
16	IPP-Biomass		Biomass		2001-2002	39.58
17	IPP-Mini Hydel		Mini Hydel		2001-2002	56.27
18	IPP-Co-generation		Co-generation		2001-2002	16.23
19	NTPC-ER		Coal		2001-2002	571.23
20	Taneer Bhavi Power Company		Naphtha	220	2000-2001	866.37
TOTAL						6640.03
20% of Total Gross Generation						6144.48
Data Source: KPTCL						

Annex 4

MONITORING PLAN

Project Management Plan:

A CDM project team is constituted with participation from relevant departments. People are trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity check data collected, emissions reduced etc. On a weekly basis, the monitoring reports are checked and discussed by the seniors CDM team members/managers. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On monthly basis, these reports are forwarded to the management level.



Technical Director: Overall responsibility of compliance with the CDM monitoring plan.
Site Supervisor: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation
Shift In-charge: Responsibility of daily report generation

Data Monitoring:

The methodology requires monitoring of the following:

- Electricity generation from the project activity;
- Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with .Consolidated baseline methodology for grid-connected electricity generation from renewable sources. (ACM0002);
- Data needed to recalculate the build margin emission factor, if needed, consistent with consolidated baseline methodology for grid-connected electricity generation from renewable sources. (ACM0002);

Completeness-

For Electricity generation data: The project activity has installed the latest state of art monitoring and control equipment that measure, record, report, monitor and control various key parameters. Real time data collection happens using these control systems. An hourly log of data is also prepared by the shift in-charge. A daily report of aggregation of these data is also prepared. Parameters monitored are the total power generated, power exported to the grid and auxiliary power generated (other parameters like head availability, grid issues, frequency etc are also maintained hourly).

For data requirement to calculate OM & BM: KPTCL publishes yearly reports regarding the performance of the power plants attached to state grid. Apart from KPTCL, CEA and MOP and SREB also publish yearly power plants performance data.

Reliability-

For Electricity generation data: automatic control meters regarding power generation and exports are regularly maintained. The regular plant operating & maintenance procedures also include process of regular meter testing, calibration & maintenance.

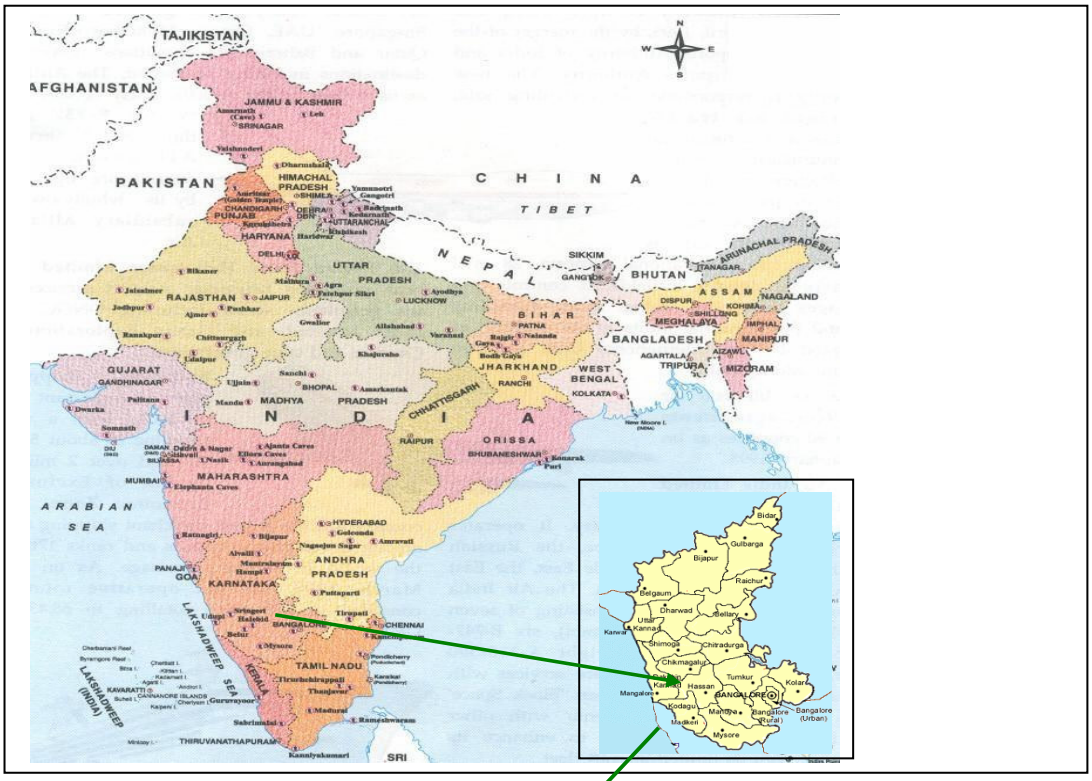
Daily generation reports are consolidated every month and a monthly report is submitted to KPTCL for billing purposes. Actual power generation data is also metered using power output meter maintained by KPTCL. Every three months KPTCL calibrates these meters. The billing invoices and meter readings by KPTCL could be used to validate the data accuracy.

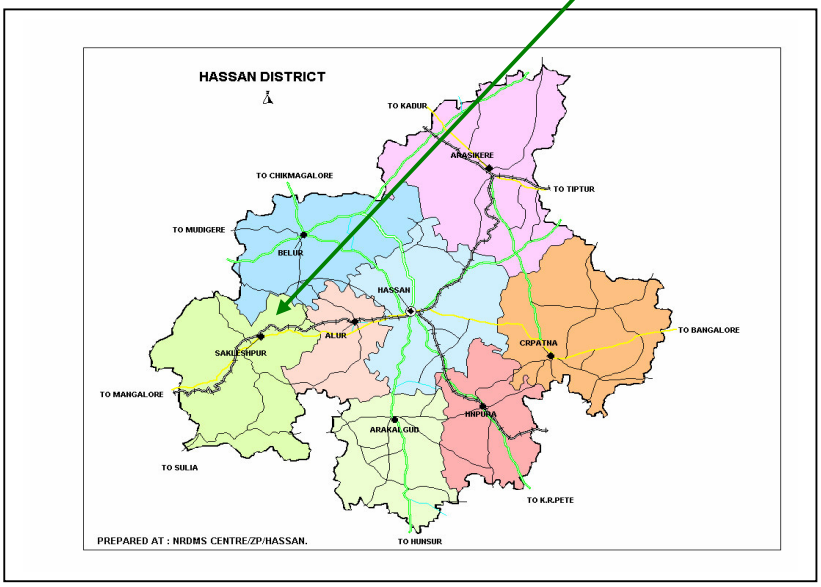
Frequency-

The measurement is recorded and monitored on a continuous basis. An hourly log is prepared every hour by the shift in-charge. At the end of the day, hourly data is aggregated in a daily report.

Annex 5

LOCATION MAP





Annex 6

Glossary

%	Percentage
BM	Build Margin
BEF	Baseline Emission Factor
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Carbon Emission Reduction
CM	Combined Margin
CO_2	Carbon Di Oxide
DNA	Designated National Authority
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
GHG	Green House Gases
GWh	Giga Watt Hour
Gwh/ Year	Giga Watt Hour per Year
IPCC	Intergovernmental Panel on Climate Change
IPCL	International Power Corporation Limited
IPPs	Independent Power Producers
IRR	Internal Rate of Return
Kg / kWh	Kilo Gram per Kilo Watt Hour
kg CO_2 equ/kwh	Kilo Gram Carbon Di Oxide equivalent per Kilo Watt Hour
kg/kwh	Kilo Gram per Kilo Watt Hour
KERC	Karnataka Electricity Regulatory Commission
KMHS	Kemphole Mini Hydel Scheme
KP	Kyoto Protocol
KPCL	Karnataka Power Corporation Limited
KPTCL	Karnataka Power Transmission Corporation Limited
KREDA	Karnataka Renewable Energy Development Authority
KV	Kilo Volt
kw	Kilo Watt
kWh	Kilo Watt Hour
M	Meter
M & P	Modalities and Procedures
M & V	Monitoring and Verification
M Cum.	Million Cubic Meter

Mkwh	Million Kilo Watt Hour
MNES	Ministry of Non-Conventional Energy Sources
MoEF	Ministry of Environment and Forests
MU	Miilion Units
MW	Mega Watt
NCV	Net Calorific Value
NTPC	National Thermal Power Corporation
NTPC-NVVN	National Thermal Power Corporation – Vidyut Vyapar Nigam Limited
OECD	Organisation for Economic Co-operation and Development
OM	Operating Margin
OM Expenses	Operation and Maintenance Expenses
PGCIL	Power Grid Corporation of India Ltd
PTCIL	Power Trading Corporation of India Limited
R.T.P.S	Raichur Thermal Power Station
Rs.	Indian Rupees
SREB	Southern Regional Electricity Board
T & D	Transmission and Distribution
UNFCCC	United Nations Framework Convention on Climate Change
VVNL	Vishveswaraya Vidyuth Nigama Limited
WACC	Weighted average cost of capital
WREB	Western Regional Electricity Board

Annex 7

LIST OF REFERENCES

Website of United Nations Framework Convention on Climate Change, http://unfccc.int

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