CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT
Version 02 (1 July 2004)

CONTENTS

A. General description of project activity

B. Application of a baseline methodology

C. Duration of the project activity / Crediting period

D. Application of a monitoring methodology and plan

E. Estimations of GHG emissions by sources

F. Environmental impacts

G. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

Enclosures

Enclosure I: Built Margin Calculations

Enclosure II: CER Calculations

Enclosure III: Abbreviations

Enclosure IV: List of References

SECTION A. General description of project activity

A.1 Title of the project activity:

20 MW Kabini Hydro Electric Power Project, SKPCL, India

A.2. Description of the project activity:

>> Subhash Kabini Power Corporation Limited (SKPCL) is promoted by M/s Subhash Projects and Marketing Ltd (SPML) to develop the 20 MW Kabini Hydro Electric Power (KHEP) Project on the existing Kabini Dam in the Mysore district of Karnataka state, India.

The purpose of the project activity is to generate power from a renewable source of mechanical energy earlier lost in the form of discharge of surplus water from the Kabini Dam used for irrigation purposes.

By utilizing the surplus discharge[1] of the irrigation dam the project activity is

- Utilizing the untapped mechanical energy resource, this was otherwise being wasted.
- Contributing to the power requirements of Karnataka Power Transmission Corporation Limited (KPTCL), the Karnataka state grid and thereby positively contributing to economic growth of the state.
- Conserving the environment and its natural resources (like coal, petroleum oils and other fossil fuels) through use of renewable energy
- Reducing Green House Gas (GHG) emissions.

SKPCL's 2x10 MW power project is a hydro-power project, with some distinctions, which makes the project a unique one.

The project has been developed on an existing irrigation dam constructed in 1975. The dam on the River Kabini was primarily designed to hold monsoon water in order to meet the irrigation requirements of the down stream area for the rest of the year. The total irrigation contemplated for Stage I under left and right bank canals was 45749 hectares (1,13,000 acres). The gross storage capacity of the dam was designed to hold 552.7 Million Cubic Meter (M. Cum.) of water, which

[1] The project utilizes the surplus discharge only and will not be using irrigation canal discharge.

corresponds to 21.76 meter level of the dam, with a maximum allowable limit of 21.80 meter. During the lean period, there would be no surplus water and the irrigation water would be discharged through the irrigation canal. During monsoon season the surplus water is discharged into the river. The project activity is envisaged to use this surplus discharge (available primarily during the monsoon season) and not the irrigation canal discharge .

Therefore the primary objective of the project activity is

- To maximise the utilisation of surplus water. The size of the plant is optimally selected at 20 MW (2x10MW). The annual days of full load operation is thus restricted to about 90 days.
- Further to avail the occasional discharge other than monsoon season and lower discharge during non-monsoon season, the plant is designed to operate at around 20% of the rated load. Generally hydro power plants are designed to operate at around 60% - 110%[2] of the rated load to avoid cavitations. In this particular project, certain design modifications have been incorporated in tailrace and the machines in order to operate at a much lower discharge.

The project engenders important local, national and global sustainable development for India.

The KHEP project activity is a renewable energy project, which is also in line with the India's national policy to promote clean power. The Government's clean power diversification strategy includes a multi-pronged strategy focusing on reducing wastage of energy combined with the optimum use of renewable energy (RE) sources, as proposed by the project activity.

The KHEP project activity's contribution towards India's sustainable development is as follows

Environmental Well-Being

Indian economy is highly dependent on "Coal" as fuel, to generate energy and for production processes[3]. Thermal power plants are one of the major consumers of coal in India, and yet the basic electricity needs of a large section of people are not being met. Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, and reducing wastage of energy and the proper use of finite resources in the metallurgical and production process.

[2] Manual on Good Practices in Power Sector(2004), Central Electricity Authority , Government of India, www.cea.nic.in/good_practices/

[3] Annual Report, www.powermin.nic.in/report/

The project substitutes and hence decreases the future need, for coal-based power generation by the grid, thereby reducing carbon dioxide (CO_2) emissions from the Indian electricity sector. Also the associated SPM, SOx, NOx emissions and emission of transportation and excavation of associated fossil fuel are avoided. Therefore power generation from renewable energy sources creates global as well as local air pollutant benefits. The project positively contributes towards the reduction in demand for India's carbon intensive energy resources. This project activity has excellent environmental benefits in terms of reduction in carbon emissions that would have occurred due to electricity generated by an equivalent capacity thermal power plant.

Since the power is generated from the surplus water of an existing irrigation dam there are no negative environmental impacts expected in the case of a Hydro Project with dam construction as one of the installations. The system (River, Irrigation Dam and Flow) behaviour with or without the project activity does not alter at all except that the outcome of the project activity is green power addition to the state grid. It may further be mentioned in the same context, that the carrying capacity of the downstream river is adequate to support any sudden impoundments like the irrigation dam and that has been tested for last 28 years of the existence of the dam.

Social Well-Being:

The project activity is contributing to the grid demand that is necessary for sustenance and development of the society and especially in a power deficit grid like Karnataka[4]. The project activity is also contributing to local job and income creation in the rural area.

Economic Well-Being:

The project utilizes the potential energy in the surplus discharge from the irrigation dam that was being lost. The electricity generated from the project activity converts this waste energy to resource and adds the power to the national economic cycle.

Besides generating local employment necessary for plant operation and maintenance, the project activity itself has contributed to economic cycle due to its equipment, spare parts, and consumables for maintenance.

Therefore this project has contributed to the environmental, economical and social issues by:

- Reducing wasteful potential energy release to environment in the form of water discharge from the dam.
- Generating 54.03 million units of electricity on an annual basis

[4] www.karenergy.com,www.kptcl.com, Statistics at a glance (2003), KPTCL;

- Reducing electricity consumption required for auxiliary consumption to generate equivalent amount of energy in thermal power plants.
- Conserving coal/gas/oil, a non-renewable primary natural resource and energy & resource associated with its processing.
- Making coal/gas/oil available for other important applications
- Reducing GHG (CO_2)
- Reducing pollution level (negligible in comparison to equivalent thermal generation.)
- Contributing to local employment in the area of skilled jobs for operation and maintenance of the equipment.

A.3. Project participants:

- SKPCL has implemented the project and is the project proponent.
- The Subhash Projects and Marketing Limited (SPML) is the project sponsor.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>> The 20 MW Kabini Hydro Electric Power Project is developed on the existing Kabini Dam in Mysore district, Karnataka.

A.4.1.1. Host Party(ies):

>> India

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

>> Karnataka

A.4.1.3. City/Town/Community etc:

>> Heggedadevana Kote Taluk, Mysore District

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

>>

The River Kabini is one of the major tributaries of the River Cauvery. A dam across the River Kabini was constructed in 1975, mainly for irrigation purposes. The irrigation scheme consists of a 28.96m high dam across the River Kabini near Bidarhalli and Beechanahalli villages, in Heggedadevana Kote Taluk, Mysore District, Karnataka State, with gross storage capacity of 552.7 M. Cum. The 20 MW Kabini Hydro Electric Power Project is developed on this existing Kabini Dam.

The entire dam site is well connected by roads (constructed during irrigation dam structure development) and easily approachable from the nearest railway station.


TAJIKISTAN
AFGHANISTAN
PAKISTAN
C H I N A
TIBET
NEPAL
BHUTAN
BANGLADESH
JAMMU & KASHMIR
SRINAGAR
HIMACHAL PRADESH
PUNJAB
HARYANA
DELHI
UTTAR PRADESH
RAJASTHAN
JAIPUR
BIHAR
PATNA
SIKKIM
GANGTOK
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
JHARKHAND
WEST BENGAL
KOLKATA
GUJARAT
MADHYA PRADESH
BHOPAL
CHHATTISGARH
RAIPUR
ORISSA
BHUBANESHWAR
MAHARASHTRA
MUMBAI
ARABIAN SEA
BAY OF BENGAL
HYDERABAD
ANDHRA PRADESH
GOA
KARNATAKA
BANGALORE
CHENNAI
TAMIL NADU
KERALA
LAKSHADWEEP SEA
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLAND (INDIA)
PORT BLAIR
ANDAMAN SEA
THIRUVANATHAPURAM
HASSAN
MANDYA
Piriyapatna
Hunsur
Mysore

t.

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

>> The project activity is 'hydropower project with the existing reservoirs where the volume of the reservoir is not increased'.

The project activity fall in Scope Number 1; Sectoral Scope - Energy industries (renewable - / non-renewable sources) as per "Link of sectoral scopes with approved methodologies (version 02/28.11.03)"

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

>>

The Kabini Hydro Electric Project utilizes the existing Kabini Irrigation Dam's surplus discharge from the head available at dam site to generate electricity. Surplus discharge was found to vary from 50 Cumecs to 170 Cumecs with a varying head of a minimum of 13.38m to a maximum of 21.94m over the year. The project activity entailed an extension of the existing single penstock of 5.49m diameter and constructing a Power House, a Tail Race Channel and an outdoor yard to generate and transmit the electrical power to the Karnataka Power Transmission Corporation Limited (KPTCL) Grid. Two 10 MW Units with 10% overload have been installed. To utilise the low discharge, the turbines and the tailrace have been modified to operate at low load (as low as 20% of rated load), which is not a common occurrence. Similar plants in the state (with similar plant capacity, reservoir capacity and rainfall zone) generate net electricity output of almost double that of the project activity.

The project activity includes the provision of double circuit 66 KV Transmission line from the Generating Station switchyard up to Kadakola / Hunsur grid substation.

The average annual energy generation, based on reservoir operation tables for 40 years, from 1954-55 to 1993-94 is of the order of 72.7 MU in a 50% dependable year and 52.80MU in a 90% dependable year.

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 primary objective of the KHEP project activity is to generate electricity from surplus water from an irrigation dam to supply to Karnataka grid with zero project emissions. The KHEP project activity will generate gross electricity of 54.3 MU per annum and with 0.14 MU of auxiliary consumption and 0.14MU of transformer losses, the project activity will export to KPTCL grid net electricity of 54.03 MU per annum. No transmission and distribution losses are considered as the project activity is exporting power at high voltage of 66 kV.

Without the KHEP project activity, the same energy load would have been taken-up by Karnataka grid mix and emission of CO_2 would have been occurred due to combustion of conventional fuels like coal, resulting in a higher combined margin carbon intensity factor for the grid. The export of 20MW of clean electricity to the fossil fuel dominated grid by the KHEP project activity will result in GHG reductions over the crediting period, as the project would avoid an equivalent grid-generated GHG emissions.

Therefore, a conventional grid-generated energy equivalent of 540.3 million kWh for a period of 10 years in Karnataka would be replaced by exporting power from the KHEP project activity with projected CO_2 emission reduction of 4,49,682 tonnes over a 10 year credit period.

The SKPCL has implemented the KHEP project activity over and above the national or sectoral requirements. The GHG reductions achieved by the project activity are additional to those directed by the governmental policies and regulations.

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

>>

Sl. No.	Operating Years	CO_2 Emission Reductions (tones of CO_2)
1.	June, 2003 – March, 2004	33726
2.	April, 2004 – March, 2005	44968
3.	April, 2005 – March, 2006	44968
4.	April, 2006 – March, 2007	44968
5.	April, 2007 – March, 2008	44968
6.	April, 2008 – March, 2009	44968
7.	April, 2009 – March, 2010	44968
8.	April, 2010 – March, 2011	44968
9.	April, 2011 – March, 2012	44968
10.	April, 2012 – March, 2013	44968
11.	April, 2013 - May, 2013	11242

A.4.5. Public funding of the project activity:

>> No public funding from parties included in Annex – I is available for the project activity.

SECTION B. Application of a baseline methodology

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

>>
Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources
Reference: Approved consolidated baseline methodology ACM0002/Version 01, Sectoral Scope: 1, 3 September 2004.

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

>>

The 'ACM0002: Consolidated methodology for grid-connected electricity generation from renewable sources' may be applied to grid-connected renewable power generation project activities which are electricity capacity addition from the Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.

The KHEP project activity is a grid connected hydro-power project, which is developed on an existing irrigation dam where the volume of the reservoir is not increased. The project activity exports electricity to the Karnataka Power Transmission Corporation Limited (KPTCL) comprising of power generated through other sources such as coal and gas based thermal power plants, hydro power stations, renewable energy sources including like small/micro hydro projects and bagasse/biomass based cogeneration/power projects. The project activity is envisaged to use only surplus discharge (available primarily during the monsoon season) and not the irrigation canal discharge.

ACM0002 is therefore the most suitable approved methodology available for the KHEP project activity.

Further, ACM0002 also requires the KHEP project activity to meet the following applicability criteria:

"The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;"

As mentioned above, the KHEP project activity feeds power to KPTCL – Karnataka Power Transmission Corporation Limited. KPTCL is a company wholly owned by the Government of Karnataka mainly vested with the functions of transmission of power in the entire State of Karnataka. KPTCL serves the consumers of different categories spread all over the Karnataka State covering an area of 0.192 million square kilometers.

KPTCL purchases power from Karnataka Power Corporation Limited, which generates and operates major power generating projects in the state consisting Hydel, Thermal and other sources. KPTCL also purchases power from Central Government owned generating stations like National Thermal Power Corporation, Neyvelli Lignite Corporation and the Atomic Power Stations at Kalpakkam and Kaiga.

KPTCL encompasses the spatial extent of the power plants catering to Karnataka state that can be dispatched without significant transmission constraints. KPTCL is therefore the geographical and system boundary (project electricity system). The information on the characteristics of KPTCL is available and has been used to calculate at the Electricity Baseline Emission Factor.

This baseline methodology shall be used in conjunction with the approved monitoring methodology ACM0002 (Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources).

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

>>

As per the Approved consolidated baseline methodology ACM0002 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources SKPCL is required to:

(i) Establish additionality as per "Tool for the demonstration and assessment of additionality" as provided in Annex I: to the Executive Board – 16 meeting report. Information/data related to industry practice and other regulatory and project related documents have been used to establish the additionality of the KHEP project activity. Details of demonstration of additionality are a part of Section B.3.

(ii) Calculate baseline emissions that would have occurred in the baseline scenario in absence of KHEP project activity due to an equivalent electricity generation by the operation of grid-connected power plants and by the addition of new generation sources as per the guidance provided in

ACM0002/Version 01 dated 3 September 2004. The following section presents the overview of the steps followed and the key information and data used to apply ACM0002 to the KHEP project activity and calculate the baseline emission factor and the baseline emissions thereafter.

Baseline

SKPCL conducted the Investment Analysis of the KHEP project activity (For details of the Investment Analysis of KHEP project activity please refer to Section B.3). The SKPCL management approved the KHEP project activity after taking into consideration the revenue stream generated through sale of certified emission reductions (CERs) in the investment analysis.

Under no project (baseline) scenario the electricity requirements of Karnataka would be met by the KPTCL comprising of fossil fuel based thermal (coal, gas and diesel based), hydro and nuclear power plants and by the addition of new generation sources.

The baseline emissions and the emission reductions from KHEP project activity are estimated based on the quantum of electricity to be exported by the KHEP project activity to the KPTCL and the Baseline Emission Factor (BEF) of the chosen grid calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the three steps given below.

Calculation of electricity baseline emission factor

STEP 1. Calculate the Operating Margin emission factor ($EF_{OM,y}$)

As per Step 1, the Operating Margin emission factor(s) ($EF_{OM,y}$) is calculated based on one of the four following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As per the methodology 'Dispatch Data Analysis' (1c) should be the first methodological choice. However, this method is not selected for OM emission factor calculations due to non-availability of activity data.

'Simple OM' (1a) 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 Simple adjusted OM (1b) and Average OM (1d) methods are applicable to project activity connected to the project electricity system (grid) where the low-cost/must run resources constitute more than 50% of the total grid generation.

To select the appropriate methodology for determining the Operating Margin emission factor ($EF_{OM,y}$) for the KHEP project activity, SKPCL conducted a baseline study wherein the power generation data for all power sources in the project electricity system were collected from government/non-government organisations and authentic sources and analysed. The project electricity system – the Karnataka Power Transmission Corporation Limited was found to be dominated by fossil fuel based power plants. The low operating cost and must run resources which typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation constituted less than 50% of the total grid generation and the data in the Table B-1 illustrates the same.

Table B-1: Power generation Mix of Karnataka for five years

Energy Source	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**
Total Power Generation (MU)	26117.52	26520.57	28063.94	28754.00	30722.40
Total Thermal Power Generation (MU)	13116.244	14625.713	17131.231	19760.75	21368.87
Total Low Cost Power Generation[5] (MU)	13001.276	11894.857	10932.709	8993.25	9353.527
Thermal % of Total grid generation	50.22	55.15	61.04	68.72	69.55
Low Cost % of Total grid 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					

SKPCL has therefore adopted the 'Simple OM' (1a) method, amongst the 'Simple OM' (1a), 'Simple adjusted OM' (1b) and 'Average OM' (1d) methods to calculate the Baseline Emission Factor of the chosen grid.

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

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 generation data for various power generating stations for the most recent three years are presented in Tables 3-1, 3-2, 3-3 and 3-4 of Annex 3:

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 $EF_{OM,y}$ is updated based on ex post monitoring.

SKPCL has calculated 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 B-2 presents the key information and data used to determine the Simple OM emission factor.

Table B-2: Data used for Simple OM emission factor

$COEF_{i,j\ y-}$ 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 ($OXID_i$).

Parameters	**2001-2002**			**2002-2003**			**2003-2004**			**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
$OXID_i$	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**

$F_{i\ ,j,\ y}$ - Fuel Consumption – is the amount of fuel consumed by relevant power sources j (where j – power sources delivering electricity to the grid, not including low-operating cost and must-run power plants and including imports from the grid). The Fuel Consumption is calculated based on total generation of the relevant power sources (j) ($\Sigma_j GEN_{j,y}$) , efficiency of power generation with fuel source i (Ei,j)and the Net Calorific Value (energy content) per mass or volume unit of a fuel i (NCV_i).

$GEN_{j,y}$ 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.

Parameters	**2001-2002**			**2002-2003**			**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	
$S_j GEN_{j,y}$ (MU)	14281.8	943.57	1466.1	16962.31	1178.18	1103.73	17364.31	866.37	800.91	Refer to Tables 3-1, 3-2, 3-3, and 3-4: Power Generation Data of Annex 3-Baseline Information

Efficiency of power generation with fuel source in % (Ei,j) -The most important parameter in calculating the 'Fuel consumption' by relevant power sources is the thermal efficiency of the power plant with fuel source i. The methodology requires the project proponent to use technology provider's nameplate power plant efficiency or the anticipated energy efficiency documented in official sources. The design efficiency is expected to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than the nameplate performance would imply. The efficiency of power generation with fuel source is calculated using the most conservative Design Station Heat Rate Value.

Parameters	**2001-2002**			**2002-2003**			**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	
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)
$F_{i,j,y}$ 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										
Parameters	**2001-2002**			**2002-2003**			**2003-2004**			**Source**
	Coal	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	**Coal**	**Gas**	**Diesel**	
$F_{i,j,y}$ **(tons/yr)**	**8967585**	**167739**	**309744**	**9865550**	**209445**	**233185**	**10099359**	**154015**	**169209**	Calculated
$S_j GEN_{j,y}$ **(MU)**	**16691.47**			**19244.22**			**19031.59**			Refer to Tables 3-1, 3-2, 3-3, and 3-4: Power Generation Data of Annex 3-Baseline Information
Parameters	**2001-2002**			**2002-2003**			**2003-2004**			**Source**
EF (excluding electricity imports from other grids) (ton of CO_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 3-4: Power Generation Data of Annex 3-Baseline Information
Imports from WREB (MU)	**57.32**	**16.16**	**0.00**	Refer to Tables 3-4: Power Generation Data of Annex 3-Baseline Information
Imports from SREB (MU)	**2.52**	**12.56**	**0.00**	Refer to Tables 3-4: 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. Calculate the Build Margin emission factor ($EF_{BM,y}$)

As per Step 2 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 methodology suggests the project proponent to choose one of the two options available to calculate the Build Margin emission factor $EF_{BM,y}$

Option 1:

Calculate 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.

Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2:

For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually ex post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in Option 1 above. 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.

Project participants should use from these two options that sample group that comprises the larger annual generation.

SKPCL has adopted Option 1, which requires the project participant to calculate 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 should consist 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. Project participants are required use from these two options that sample group that comprises the larger annual generation. As per the baseline information data the option (b) comprises the larger annual generation. Therefore for our KHEP project activity the sample group m consists of (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. 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 B-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 ($EF_{CO_2,i}$), 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
$EF_{CO_2,i}$ (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 ,$EF_{CO2,i}$ $OXID_i$, $COEF_{i,m}$ 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) ($S_m GEN_{m,y}$) , 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).				
$SGEN_{m,y}$ *(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
S **GENm,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 NTPC-NVVN, PTCIL and PGCIL (MU)	**1517.62**	Refer to Table 3-5 Power Generation Data for Calculation of Built 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 3. Calculate the Electricity Baseline Emission Factor ($EF_{electricity, y}$)

As per Step 3 the baseline emission factor $EF_{electricity, y}$ is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., w_{OM} = w_{BM} = 0.5), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MU.

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 B-4: Data used for Baseline Emission Factor

Parameters	Values (ton of CO_2/MU)	Remarks

Simple OM, $EF_{OM,simple}$	911.75	Average of most recent 3-years values
BM, $EF_{BM,y}$ (ton of CO_2/MU)	752.81	Value of the base year i.e. 2003-2004
Baseline Emission Factor, EF_y	**832.28**	

Baseline emissions due to displacement of electricity by KHEP project activity

Baseline emissions (BE_y in tCO2) due to displacement of grid-electricity are the product of the Baseline Emissions Factor ($EF_{,y}$ in tCO2/MU) calculated in Step 3, times the electricity supplied by the KHEP project activity to the grid (EG_y in MU), over the crediting period as given below.

$$BE_y = EG_y \,.\, EF_y$$

Electricity generation from the KHEP project activity

The total power generated by the KHEP project activity during the crediting period is based on the power plant's capacity, the plant's annual water availability, available head and operating days of power generation from the project activity per year.

The plant is restricted to operate for 90 days with full load in a year. In order to avail the occasional discharge other than in the monsoon season, the plant is designed to operate at around 20% of the rated load. The KHEP project activity proposes to export 54.03 million units of electricity per annum to the grid. Therefore, a conventional energy equivalent of 540.3 million units for a period of 10 years would be conserved by the project activity and this electrical energy will displace an equivalent amount of electricity that would be generated by the KPTCL grid mix. Without KHEP project activity, the same energy load would have been taken up by power plants of the project electricity system – KPTCL and an equivalent CO_2 emissions would have been occurred due to fossil fuel combustion.

Project Emissions:

As per the ACM0002 there are no project related emissions.

Leakage:

As per the 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). Project participants do not need

to consider these emission sources as leakage in applying this methodology. Therefore SKPCL has not taken leakage into consideration. Neither have they claimed any credits for the KHEP project activity on account of reducing these emissions below the level of the baseline scenario.

Emission Reductions:

The KHEP 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 KHEP 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 the

BEy = Baseline emissions (Please refer to 'Baseline emissions due to displacement of electricity' as given above)

PEy = Project emissions; PEy = 0 for KHEP project activity.

Ly = Emissions due to Leakage. Ly = 0 for KHEP project activity.

The total net emission reductions achieved from the project activity is presented in Section E.5 & E.6 of this PDD.

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:

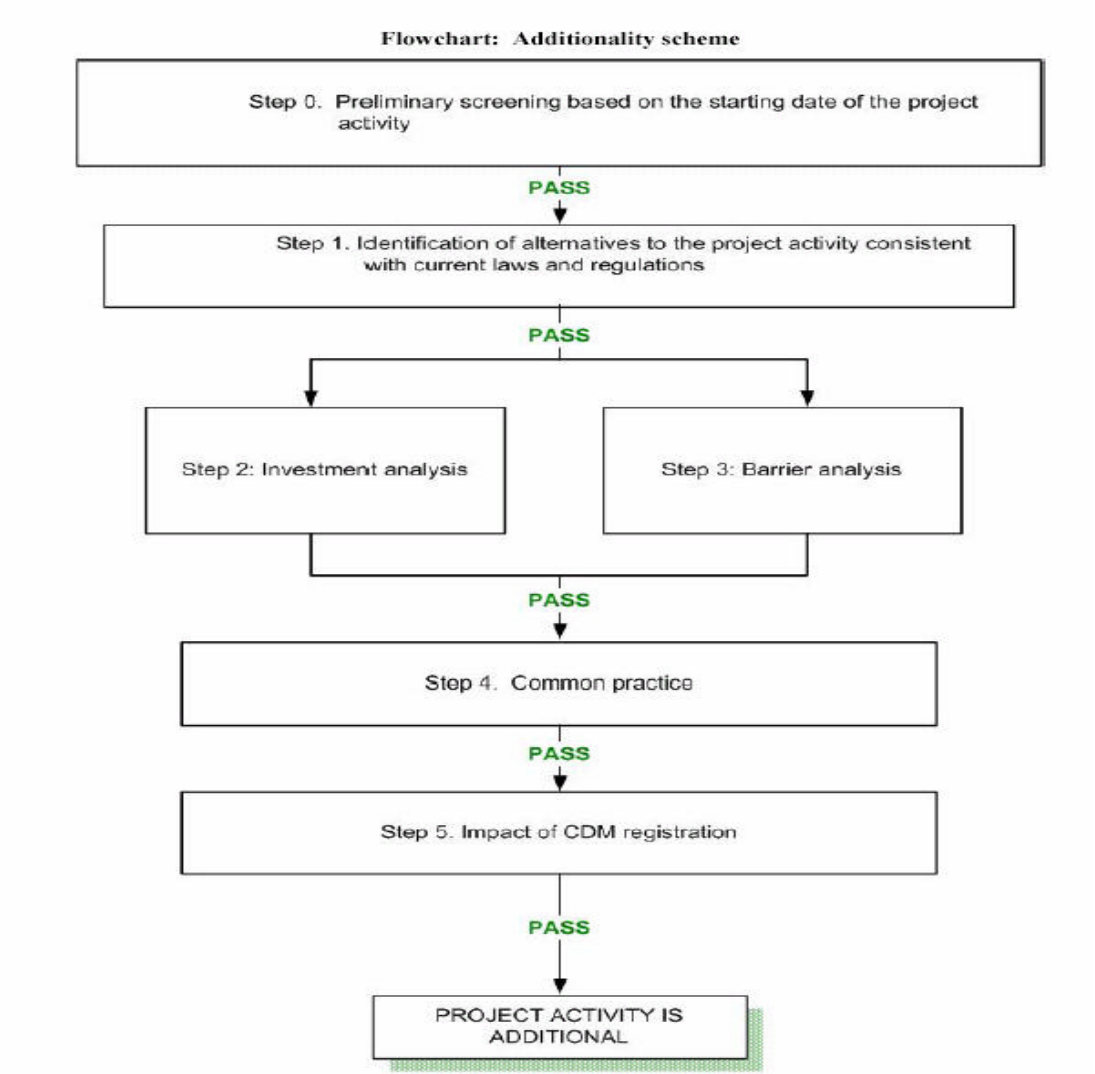
>>

The KHEP project activity is a "hydro power project with existing reservoir where the volume of the reservoir is not increased connected to an electricity grid". It is a renewable energy based power project (with a net CO_2 emission factor of 0 ton CO_2/MU) that exports power to the KPTCL grid. The power generated from KHEP project activity displaces electricity that would have been generated by the operation of the mix of hydro, nuclear and fossil fuel grid-connected power plants in the Karnataka state (with a CO_2 emission factor of 832.28 ton CO_2/MU, calculated as per the guidance in ACM0002/Version 01) in absence of the KHEP project activity.

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

As per the selected methodology ACM0002, the project proponent is required to establish that the GHG reductions due to project activity are additional to those that would have occurred in absence of the KHEP project activity as per the 'Tool for the demonstration and assessment of additionality' Annex-1 to EB 16 Report. Additionality of project activity as described in the selected methodology (ACM0002) is discussed further.

The flowchart presented in below provides a step-by-step approach to establishing additionality of the project activity.


Flowchart: Additionality scheme
Step 0. Preliminary screening based on the starting date of the project activity
PASS
Step 1. Identification of alternatives to the project activity consistent with current laws and regulations
PASS
Step 2: Investment analysis
Step 3: Barrier analysis
PASS
Step 4. Common practice
PASS
Step 5. Impact of CDM registration
PASS
PROJECT ACTIVITY IS ADDITIONAL

SKPCL demonstrates KHEP project activity additionality as follows

Step 0 - Management Decision for implementing the project activity

SKPCL wishes to have the crediting period starting prior to the registration of their project activity.

SKPCL is required to

a) Provide evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of the registration of a first CDM project activity, bearing in mind that only CDM project activities submitted for registration before 31 December 2005 may claim for a crediting period starting before the date of registration;

The SKPCL's KHEP project activity was commissioned on 24 June, 2003, which falls between 1 January 2000 and the date of the registration of a first CDM project activity which is18th November 2004[6]. SKPCL would provide evidences to establish the same.

SKPCL has prepared all documentation necessary for registration of the CDM project activity in line with ACM0002 and proposes to get the KHEP project activity registered with UNFCCC before December 31, 2005.

b) Provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

SKPCL was aware that the KHEP project activity is a GHG Abatement project, which could avail financial benefits under CDM if the project activity was found to be additional wherein the anthropogenic emission of greenhouse gases by sources are reduced below those that would have occurred in absence of the registered CDM project.

[6] Reference: http://cdm.unfccc.int/Projects/registered.html

SKPCL learnt of KPTCL's proposition to reduce the power tariff rate much below that proposed in the Power Purchase Agreement that was signed between KPTCL and SKPCL for sale of power. The execution team prepared the revised KHEP project activity proposal, which was re-submitted to the top management of KHEP in December 2002. All aspects of the project activity were discussed. The discussions revolved around the financial implications of the revised power tariff rate on the implementation of the project activity and the financial losses SKPCL would need to borne by commissioning the KHEP project activity. One other major point of the discussion was the quantum of emission reductions the KHEP project activity would generate and the financial benefits the KHEP project activity could attain under CDM. In order to arrive at the decision to proceed with the implementation of the project activity, SKPCL management conducted the investment analysis with the CDM revenue estimates as one of the cash in flows that would be made available after sale of the emission reductions. With the CDM revenue as one of the annual cash inflows, the KHEP project activity would be financially attractive for the SKPCL management. The SKPCL management also noted that the CDM revenue computations were based on rough estimates. On these basis, the SKPCL's top management decided to recommend the project activity to the Board of Directors for approval. The KHEP project activity papers were enclosed along with the Board Agenda for the Board Meeting conducted on 26th December 2002. The KHEP project activity received approval and the approval was documented in the Minutes of the Board Meeting. SKPCL chose their project consultants in India to guide them through the KHEP project activity registration process and facilitate the transaction of CERs.

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

In sub-step 1a and 1b, SKPCL is required to identify realistic and credible alternative(s) that were available to SKPCL or similar project developers that provide output or services comparable with the KHEP project activity. These alternatives are required to be in compliance with all applicable legal and regulatory requirements.

SKPCL identified the different potential alternative(s) to KHEP project activity.

The following paragraphs illustrate the alternatives

SPML is in the business of constructing water pumping stations for various government undertakings and municipal corporations and laying of cross country water pipelines for the government agencies. The company proposed to diversify into construction of renewable energy generation through mini hydel-power plants to utilise the expertise they had developed water management. SKPCL management wanted to explore the provision of implementing a hydropower project on the existing irrigation dam on the River Kabini.

Alternative 1- Implementation of the KHEP project activity not undertaken as a CDM project activity;

In this alternative, KHEP project activity is connected to the KPTCL grid and therefore it displaces an equivalent amount of electricity of the grid mix of KPTCL.

Since the KHEP project activity has no project emissions this alternative would not generate carbon dioxide. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

SKPCL may implement KHEP project activity to generate and sell power to KPTCL. This alternative may be a part of the baseline. However as per the investment analysis this alternative is financially less attractive as compared to the Weighted Average Cost of Capital (WACC) of the project activity, which was computed based on the investors' required return on capital. Details of the investment analysis have been conducted as per Step 2: Investment analysis of the "Tool for the demonstration and assessment of additionality".

In absence of KHEP project activity, SKPCL management did not propose to undertake any other project alternatives like coal-fired power station or wind energy power station since SPML had no background and expertise in implementing coal-fired or wind energy based power station. Therefore the only other alternative available is Alternative 2.

Alternative 2- No KHEP project activity; Continuation of current situation

In this alternative, KHEP project activity is not implemented resulting in the continued current grid mix of KPTCL. There is no displacement of electricity of the grid mix of KPTCL.

In Alternative 2 *i.e.* in absence of KHEP project activity, an equivalent amount of electricity would be generated by the power plants comprising the KPTCL grid mix. An equivalent amount of carbon dioxide would be generated at the thermal power generation end. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline. This scenario was the status quo of the existing facility before CDM project implementation.

Step 2 Investment analysis OR Step 3 Barrier analysis

SKPCL proceeds to establish KHEP project activity additionality by conducting the Step 2: Investment Analysis as per ACM0002.

To conduct the investment analysis, SKPCL is required to use the following sub-steps:

Sub-step 2a Determine appropriate analysis method

The KHEP project activity exports electricity to KPTCL as per the Power Purchase Agreement dated 20.08.2001. One of the revenue streams of the KHEP project activity is through sale of electricity to KPTCL. Therefore Option I – Simple cost analysis would not be an appropriate analysis method.

Amongst the other two options – investment comparison analysis (Option II) and benchmark analysis (Option III) SKPCL has adopted the benchmark analysis wherein the weighted average cost of capital (WACC) of the KHEP project activity serves as a benchmark to assess the financial attractiveness of the project activity. Option III assesses if the project's returns are sufficient for SKPCL and other investors to make the initial investment and further bear the associated costs of successfully operating the KHEP project activity over the crediting period of the project.

Sub-step 2b – Option III. Apply benchmark analysis

The KHEP project activity has a high initial capital cost with no high capital investment for the alternative 2 - the continuation of the current situation of the KPTCL grid mix. SKPCL conducted an investment analysis of the KHEP project activity with 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.

SKPCL calculated the KHEP project activity's internal rate of return (IRR) and compared it with the WACC of the KHEP project activity.

Since SKPCL had to use several sources in order to raise capital necessary to implement the KHEP project activity, and each of these sources expected different returns, the WACC was calculated as a weighted average of the different returns to be paid to these sources. The 15.846% WACC of the KHEP project activity was based on the capital investment and the rate of return of each of the investors.

Sub-step 2c – Calculation and comparison of financial indicators

The financial internal rate of return of the KHEP project activity without CDM revenues is 10.8 % which much lower than the 15.846% weighted average cost of capital for the KHEP project activity as required by the investors.

The financial internal rate of return of the KHEP project activity without CDM revenues was calculated based on the following aspects

1. Annual export to KPTCL - 54.03 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 2003-2013. The 2003-2013 period has been selected based on the validity of the Power Purchase Agreement between KPTCL and SKPCL.

The internal rate of return of the KHEP project activity with CDM revenues is 13.05%. Therefore the project activity would only be financially viable if the project activity attains CDM revenue through sale of the emission reductions.

The financial internal rate of return of the KHEP project activity with CDM revenues was calculated based on the following aspects

1. Annual export to KPTCL - 54.03 mu
2. Power tariff rate of KPTCL – INR 3/- per unit with an annual escalation rate of 2%.
3. Annual CER generated – 40,000
4. Exchange rate - 1EURO equivalent to INR 56/-
5. Conservative CER price per ton of CO_2 equivalent.

All financial data used to arrive at the internal rate of return of the KHEP project activity with and without CDM revenues would be provided to the DOE in the process of Validation.

Sub-step 2d. Sensitivity analysis :

The KHEP project activity was found to be sensitive to the following factors –

1. Annual export to KPTCL - 54.03 mu
2. OM Expenses

The sensitivity analysis was conducted for scenarios with variations in each one of the above-mentioned factors and for scenarios with variations in all the above-mentioned factors simultaneously in order to assess the financial attractiveness of the KHEP project activity under such circumstances.

Sl	Parameters	Variation	IRR	% Change	Comments
The financial internal rate of return of the KHEP project activity without CDM revenues					
1.	Annual Export to KPTCL	+10%	14.29%		The IRR of the KHEP project activity is still lower than the WACC benchmark; However the probability of a 10% increase in annual export to KPTCL is not probable. It is unlikely that the hydrological conditions that are available in the KHEP project activity are able to sustain a 10% increase in the annual power generation.
		-10%	7.16%		The IRR of the KHEP project activity is lower than the WACC benchmark.
2.	OM Expenses	+10%	10.18%		The IRR of the KHEP project activity is lower than the WACC benchmark.
		-10%	11.4%		The IRR of the KHEP project

					activity is still lower than the WACC benchmark. However it is unlikely that the OM expenses are reduced by 10% and this option may be discarded.
4.	Combinations	1? +10% 2? -10%;	14.33		The IRR of the KHEP project activity is still lower than the WACC benchmark; however the probability of a 10% increase in annual export to KPTCL and a 10% reduction in OM expenses is not probable. It is unlikely that - the hydrological conditions that are available in the KHEP project activity are able to sustain a 10% increase in the annual power generation. - the OM expenses are reduced by 10%.
		1? -10% 2? +10%	6.51%		The IRR of the KHEP project activity is lower than the WACC benchmark.

The results of the sensitivity analysis conducted confirm that the financial internal rate of return of the KHEP project activity without CDM revenues is much lower than the WACC benchmark for the KHEP project activity as required by the investors, under circumstances which could bring about variations in the critical factors used for the IRR computations in Step 2c.

Hence, the conclusion that the 'KHEP project activity is financially non viable' is robust to reasonable variations in the critical assumption and the CDM revenue the KHEP project activity would obtain through sale of the emission reductions is very crucial to sustain the operations of the project activity.

Step 4. Common Practice Analysis

Step 4-a. Common Practice Analysis

From the Step 2 Investment Analysis, we may conclude that Alternative 2 (No KHEP project activity; Continuation of current situation) is a status quo and does not have impediments that would prevent its implementation. However the Alternative 1 (Implementation of the KHEP project activity not undertaken as a CDM project activity) was found to be less financially attractive without CDM revenue, which would prevent SKPCL from implementing the project activity as elaborated in the step 2 'Investment Analysis'.

SKPCL is further required to conduct the common practice analysis as a credibility check to complement the investment analysis (Step 2). SKPCL is required to identify and discuss the existing common practice through the following sub-steps:

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Karnataka, the eighth largest State in India, is situated on the western edge of the Deccan plateau. The climate and physiography of the region make the state one of the most important in the country with regard to water resources. Karnataka has a traditional irrigation system of impounding surface flow by creating small earthern dams across streams, creeks and rivulets. The average annual yield of the rivers of the Karnataka has been roughly estimated as 98406 m.cum. (3475 Tmc). There are 86 irrigations projects developed in Karnataka to utilize the irrigation potential of the estimated water flow. There are only 9 irrigation projects to have utilized the rivers' potential to generate and export clean power to KPTCL through private sector participation. However it was further observed that these irrigation projects developed through private sector participation were all based on irrigation canal discharge. The KHEP project activity is not based on the irrigation canal discharge. Therefore these 9 hydro projects are not similar to the KHEP project activity and have a different investment climate. KHEP project activity is the first private sector project to be developed on an existing irrigation dam and utilize surplus discharge of Kabini irrigation project for power generation. Therefore out of 86 irrigation projects this is the only project activity to have been developed to utilize surplus discharge to generate power through private participation. There has been no similar project activity with a similar investment climate implemented previously or currently underway and therefore the KHEP project activity is not a common practice.

Sub-step 4b. Discuss any similar options that are occurring:

Since there is no similar project activities with a similar investment climate implemented previously or currently underway this sub-step is not applicable.

Step 5. Impact of CDM registration

The existing power tariff rate rendered the KHEP project activity financially unattractive. The KHEP project activity's returns were lower than the required rate of return of the investors. (Refer to Investment Analysis). However with CDM revenue as one of the annual cash flows, expected after approval and registration, the KHEP project activity's financial viability would improve and the adequacy of returns to the investors would be assured. Therefore SKPCL management took the decision of taking the investment risks and secure financing partially from bank funding and partially through internal accruals so as to invest in the CDM KHEP project activity after computing the proposed carbon financing. Besides the direct financing risk, SKPCL is also shouldering the additional transaction costs such as preparing documents, supporting CDM initiatives and developing and maintaining Monitoring methodology to fulfill CDM requirements. SKPCL, is shouldering a significant market or financial risk and taking a pro-active approach by showing confidence in the Kyoto Protocol/CDM system.

SKPCL's decision to invest

- in the CDM project activity
- in additional transaction costs such as preparing documents, supporting CDM initiatives and developing and maintaining M&V protocol to fulfil CDM requirements

was guided solely by the anthropogenic greenhouse gas emission reductions the project activity would result in and its associated carbon financing the project activity would receive through sale of CERs under the Clean Development Mechanism . The revenue from the CDM funds proves to be vital to project's feasibility and significantly improve the sustainability of the KHEP project activity.

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

>As per the definition of project boundary of ACM0002, 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 (KHEP) is connected to.

Project Site

KHEP project activity boundary covers the point of water supply (penstock entry/ reservoir water level) to the point of power generation and export to the grid, where SKPCL has a full control. Thus, the project boundary includes the reservoir level over the intake, penstock, flow control valves, turbine, generator,

control systems, auxiliary consumption units, synchroniser and the power evacuation system at the project activity site. The KHEP project activity evacuates the power to the state grid. Therefore, those power plants contributing to the Karnataka state grid are taken in the connected (project) electricity system for calculation of baseline emission.

Connected (Project) electricity system - Power plants connected to the electricity system

For the purpose of determining the Built Margin (BM) and Operating Margin (OM) emission factor, as per ACM0002, a (regional) connected electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints.

Indian power grid system is divided into five regions namely Northern, North Eastern, Eastern, and Southern and Western Regions. The Southern Region consists of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Pondicherry and Lakshadweep. Each state has their own power generation plants (State Government owned) managed by respective State Electricity Boards / Corporations.

KHEP project activity is connected to the Karnataka state grid (KPTCL). KPTCL is the selected project electricity system due to following reasons:

(a) KPTCL by themselves decides on the amount of demand to be catered, the amount of energy to be produced and purchased, the source of power, the cost of electricity (purchase and selling price), net power cuts and subsequently the generation mix and may therefore be considered as an isolated system boundary. These decisions are independent as long as the state grid maintains the 'grid discipline'. This grid mix is entirely managed by the KPTCL.

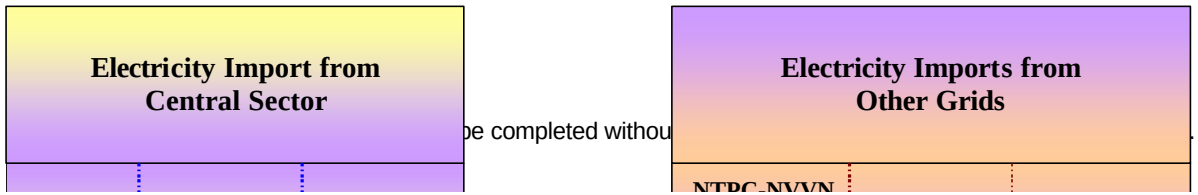
(b) Further the KHEP project activity is too small to have a significant impact on the national grid or regional grid in terms marginally effecting changes in the generation and dispatch system (operating margin) or delay future power projects that may be commissioned during the crediting period (build margin) in the national or northern regional grid. The project activity, a 20 MW hydro power plant, is 0.018% of national grid capacity (107,877 MW) and 0.069% of the northern region's grid capacity (28,750 MW) and 0.38 % of state grid capacity (5,196.77 MW) as on 31st March, 2003. Therefore, the principal effect of the project activity would be on the lowest level of the grid *i.e.* the carbon intensity of the Karnataka state grid.

(c) The Karnataka state grid is the most realistic choice of the grid for the KHEP project activity also because the power generated in this region is dispatched in their jurisdiction without significant transmission constraints. Karnataka state grid (KPTCL) is power deficit. However the historical and actual records of KPTCL suggests that the electricity imports power from other states to KPTCL grid are much less than 20% of the total electricity, hence, the grid

acts as an island with less influence from power generated by other states. The inter-grid transmission of electricity is restricted due to poor transmission and distribution infrastructure. Due to poor infrastructural support inter-regional and inter-state grid transmission of power is limited and Karnataka state may be treated as an isolated grid.

The Current Delivery System of Karnataka is demonstrated below in Figure 1.

Figure 1 Flow Chart of Current Delivery System of Karnataka



In Karnataka, power transmission is managed by Karnataka Power Transmssion Corp. Limited (KPTCL), Banglore. State Government's thermal power generation plants are managed by the state authority Karnataka Power Corporation Ltd. (KPCL) and Vishveswaraya Vidyuth Nigama Limited (VVNL). Karnataka Power Corporation Ltd. (KPCL) is a wholly owned Government of Karnataka undertaking, entrusted with the responsibility of construction, operation and maintenance of power projects in the State of Karnataka for the last three decades. VVNL owns and operates the thermal and hydel power stations in Karnataka which were commissioned by erstwhile Karnataka Electricity Board between 1956 and 1999.

In addition to the state govt. owned power generation plants, there are private owned power generation plants exporting power to KPTCL and central government (government of India) owned power generation plants managed by Government of India Enterprises like National Thermal Power Corporation Ltd., Nuclear Power Corporation Ltd., National Hydro Electric Power Corporation Ltd. *etc*. Power generated by all central generation units is being fed to the grid (Southern Grid), which is accessible to all states forming part of the southern grid. Power mix may be thermal, hydro, wind, nuclear. In India, nuclear power generation is allowed only by central sector organisations.

Power generated by state owned generation units and private owned generation units would be consumed totally by respective states. But the power generated by central sector generation plants will be shared by all states forming part of the grid in fixed proportion.

For calculations of baseline, the individual power plants of KPTCL are taken under project electricity system boundary.

Since the (fixed) central sector shares are electricity transfers from connected electricity systems to the project electricity system they are defined as electricity imports. As per the ACM0002, emission factor of the exporting grid, is to be calculated as per Step 1, 2, and 3 if the imports exceed 20% of the total generation in the project electricity system. The central sector power plants contributing to the central share power generation of Karnataka state grid, which may be defined as electricity imports are 25.64% of the total generation for 2003-2004. Therefore these electricity imports have been considered as a part of project electricity system boundary and the emission factor of the baseline is calculated as per Step 1, 2 and 3.

There are some electricity transfers from NTPC-NVVN, PTCIL, PGCIL, WREB and SREB. However, their contributions to the grid mix of KPTCL are as low as 7.61% of the total generation for 2003-2004. As per the ACM0002, emission factor of the exporting grid is to be calculated as the average emission rate of the exporting grid, if and only if the net imports do not exceed 20% of the total generation in the project electricity system. Therefore these electricity imports have

been considered as a part of project electricity system boundary and the emission factor of the baseline is calculated as the average emission rate of the National Grid, Western Region Grid and the Southern Region grid.

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:

>>

Please refer to section B2 in conjugation with Annex 3: Baseline Information. The final draft of this baseline section was prepared by SKPCL along with the project consultants in April 2005.

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:

>>

December, 2002.

The SKPCL management approved the KHEP project activity in Dec, 2002. The KHEP project commenced electricity production on 24 June 2003.

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

>> Life time of the project : 30 years

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

For the KHEP project activity, the preferred credit period opted is for 10 years.

C.2.1. Renewable crediting period

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

>> NA

C.2.1.2. Length of the first crediting period:

>> NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> 24th June, 2003

C.2.2.2. Length:

>> 10 years

SECTION D. Application of a monitoring methodology and plan

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

>>

Title: Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources
Reference: Approved consolidated monitoring methodology ACM0002/Version 01, Sectoral Scope: 1, 3 September 2004.

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

>>

>> KHEP 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 SKPCL has used the 'Approved monitoring methodology ACM0002' in conjugation with the 'Approved baseline methodology ACM0002' for the KHEP project activity.

The ACM0002 methodology requires the project participant to monitor power generation units exported to the grid. Since the KHEP project activity is a grid connected renewable energy project, emission reduction quantity is dependent on the net units exported to the grid, which will avoid generation of equivalent power by the carbon intensive KPTCL grid mix. Therefore the KHEP project activity's monitoring requirements are in line with the 'Approved monitoring methodology ACM0002',which is the most suitable monitoring methodology applicable for the KHEP project activity.

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

Project emission associated to KHEP 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.)

>>

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. EG_y	Electricity supplied to the grid by the KHEP project activity	SKPCL records/ KPTCL records	MWh	Directly Measured	Hourly measurement and monthly recording	100%	Electronic	
2. EF_y	CO_2 emission factor of the grid	KPTCL/CEA	tCO_2/ MWh	Calculated	Yearly	100%	Electronic	Calculated as weighted sum of OM and BM emission factors as per Step 3 of ACM0002
3. $EF_{OM,,y}$	CO_2 operating margin emission factor of the grid	KPTCL/CEA	t CO_2/ MWh	Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated as Step 1 of ACM0002

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
4. $EF_{BM,y}$	CO_2 build margin emission factor of the grid	KPTCL/CEA	t CO_2/ MWh	Calculated	Once at the beginning of a crediting period	100%	Electronic	Calculated as Step 2 of ACM0002
5. $F_{i,j,y}$	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

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
6. $COEF_{i,j,y}$	CO_2 emission factor of each fuel type i,	IPCC/local	t CO_2 / 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. $GEN_{j,y}$	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.)

>>

>>With reference to ACM0002, baseline emissions are estimated as under

Calculation of electricity baseline emission factor

An electricity 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 must be based on data from an official source (where available) and made publicly available.

STEP 1. Calculate the Operating Margin emission factor(s)

Out of four methods mentioned in the ACM0002, Simple OM approach has been chosen for calculations since 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 (2001-2002, 2002-2003 & 2003-2004) .

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

where

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

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

$F_{i,j,y}$ - Is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y , calculated as given 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 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

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

NCV_i - Is the net calorific value (energy content) per mass or volume unit of a fuel i

$E_{i,j}$ - Is the efficiency (%) of the power plants by source j

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \otimes EF_{CO2,i} \otimes OXID_i$$

where

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

$EF_{CO2,i}$ Is the CO_2 emission factor per unit of energy of the fuel i

$OXID_i$ Is the oxidation factor of the fuel

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 Table 3-5 of 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 electricity baseline emission factor $EF_{electricity,y}$ 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.

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

where

BE_y - Are the baseline emissions due to displacement of electricity during the year y in tons of CO_2

EG_y - Is the electricity supplied to the grid by the KHEP project activity during the year y in MWh, and

EF_y - Is the 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).

Not Applicable

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.):								

>>

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 KHEP project activity. Further, the methodology ACM0002 too requires the project participants not to consider emission sources as leakage. Therefore this section is Not Applicable

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 KHEP project activity during a given year *y* is as under.

$$ER_y = BE_y - PE_y - L_y$$ where

ER_y - Are the emissions reductions of the project activity during the year y in tons of CO_2

BE_y - Are the baseline emissions due to displacement of electricity during the year y in tons of CO_2

PE_y - Are the project emissions associated with KHEP

L_y - Are the emissions sources as leakage

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.
Baseline Emissions		
1. EG_y - Electricity supplied to the grid by the KHEP 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. EF_y - CO2 emission factor of the grid	Low	This is calculated based on the parameters 3. EFOM,y and 4. EFBM,y.
3. $EF_{OM,y}$ - CO2 operating margin emission factor of the grid	Low	This is calculated based on the parameters 5. Fi,j,y , 6. COEFi,j,y and 7. GENj,y..
4. $EF_{BM,y}$ - CO_2 build margin emission factor of the grid	Low	This is calculated based on the parameters 5. Fi,m,y , 6. COEFi,m,,y and 7. GENm,,y..
5. $F_{i,j,y}$ / $F_{i,m,y}$ - Amount of fossil fuel i, consumed by each power source/ plant in year y	Low	This is calculated based on the parameters 2. NCVi, 6. Ei,j/Ei,m and 7. GENm,,y..
6. $COEF_{i,j,y}$ / $COEF_{i,m,y}$ - CO2 emission factor of each fuel type i,	Low	Please refer to point 3.
7. $GEN_{j,y}$ / $GEN_{m,y}$ - Electricity delivered to the grid by power source j/m in year y	Low	This is based on authentic grid data.

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

>>

SKPCL has implemented an operational and management structure in order to monitor emission reductions and any leakage effects, generated by the KHEP project activity.

SKPCL has formed a CDM team/committee comprising of persons from relevant departments, which will be responsible for monitoring of all the parameters mentioned in this section. The CDM team also comprises of a special group of operators who are assigned the responsibility of monitoring of different parameters and record keeping as per the monitoring plan (ref. Annex 4). 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.

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

>>

>> SKPCL along with guidance from the project consultants.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

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

E.2. Estimated leakage:

>>

The main emissions potentially giving rise to leakage in the context of hydro electric sector projects are emissions arising due to activities such as power plant construction. As per the methodology ACM0002, project participants do not need to consider these emission sources as leakage in applying this methodology. Therefore no emissions related to leakage have been considered in the KHEP project activity.

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

>>

>> Total KHEP project activity emissions are zero over a 10 year credit period.

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

>>

Sl. No.	Operating Years	Baseline Emission Factor (tCO_2 / MU)	Baseline Emissions (tCO_2)
1. .	June, 2003 – March, 2004	832.28	33726
2. .	April, 2004 – March, 2005	832.28	44968
3. .	April, 2005 – March, 2006	832.28	44968
4. .	April, 2006 – March, 2007	832.28	44968
5. .	April, 2007 – March, 2008	832.28	44968
6. .	April, 2008 – March, 2009	832.28	44968
7. .	April, 2009 – March, 2010	832.28	44968
8. .	April, 2010 – March, 2011	832.28	44968
9.	April, 2011 – March, 2012	832.28	44968
10.	April, 2012 – March, 2013	832.28	44968
11.	April, 2013 - May, 2013	832.28	11242

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

>>

Sl. No.	Operating Years	Baseline Emissions (tCO_2)	Project Emissions (tCO_2)	CO_2 Emission Reductions (tCO_2)
1.	June, 2003 – March, 2004	33726	0	33726
2.	April, 2004 – March, 2005	44968	0	44968
3.	April, 2005 – March, 2006	44968	0	44968
4.	April, 2006 – March, 2007	44968	0	44968
5.	April, 2007 – March, 2008	44968	0	44968
6.	April, 2008 – March, 2009	44968	0	44968
7.	April, 2009 – March, 2010	44968	0	44968
8.	April, 2010 – March, 2011	44968	0	44968
9.	April, 2011 – March, 2012	44968	0	44968
10.	April, 2012 – March, 2013	44968	0	44968
11.	April, 2013 - May, 2013	11242	0	11242

Total Estimated Emission Reductions: 4,49,682 over 10 year crediting period.

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

>>

Please refer to Enclosure – I and Enclosure II

SECTION F. Environmental impacts

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

>>

The Ministry of Environment and Forests (MoEF), Government of India has under the Environmental (Protection) Act 1986 promulgated a notification on 27 January 1994 (amended on 04/05/1994, 10/04/1997, 27/1/2000 and 13/12/2000) making environmental clearance mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule I of the notification. EIA clearance is required from the central government, for 29 categories of industries of which river valley projects including hydel power is category 1. Karnataka Power Corporation Limited (KPCL), the first licencing holder, have conducted a comprehensive EIA study for the KHEP Project and received the clearance from MoEF. The project proponent, SKPCL, has also carried out a separate EIA study by Institute for Catchments Studies and Environmental Management, Bangalore, India.

Detail of site and surroundings of the Project

The KHEP project has been developed beside the existing Kabini Dam constructed for irrigation purposes serving the areas covered under the villages of Bidrahalli and Becchanahalli of Heggadadevena Kote Taluk of the Mysore District, Karnataka State. The major construction in any Hydel power project is the construction of dam, which already exists from the year 1975. Hence, the KHEP project activity did not require any major construction work, which required any resettlement and rehabilitation of population. There has been no disturbance to any natural set-up nor was there any additional submergence of land caused. Moreover the site is not prone to earthquakes.

The land on which construction was carried out is composed of granite and gneiss rock therefore there was no possibility of the area experiencing any induced seismicity.

The KHEP project contemplates to utilize only the surplus water available at dam site after meeting the irrigational needs. Surplus water varying from 50 (m^3/s) to 170 (m^3/s) and head varying from minimum of 13.38 m on to maximum of 21.94 m is available over the year. The water for power generation would be released generally after the water level at dam site has crossed the mark of 21.80 m. Therefore, it is clear that the primary purpose of the dam is to harness water for irrigation and when surplus water is available power would be generated.

The site neither covers any forest area nor any further evacuation of trees or vegetation was required for construction purposes. The EIA study reveals that there are no rare, threatened, endangered or migratory fishes available in the river stretch of the KHEP project site. So far no endangered species of birds or animal has been noticed at the KHEP project site. The EIA expert's reports summarises the KHEP project site to be fit for Hydropower generation and there will be no adverse environmental impact due to diversion of surplus water from the reservoir and again back to the river below.

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:

>>

The comprehensive EIA study addressed all the parameters of environmental assessment study as per Environmental (Protection) Act 1986 guidelines. The EIA team collected and analyzed various seasonal data during the field visits to the KHEP project site, including information about ecological, socio-economic impacts on the people living around the KHEP project area. The significant finding and major Environmental Management Plans of the EIA conducted are detailed below.

The environmental impacts by the KHEP project activities were categorized into:

- Impact during construction phase
- Impact during operational phase
- Impact during maintenance phase

Construction phase		
Activity: The construction activities of the KHEP project activity were to be undertaken mainly at the toe of the existing Kabini Dam. The Kabini Hydel scheme mainly involved construction of penstock, powerhouse and tailrace channel along with outdoor yard.		
Environmental Impacts	Recommendations:	Implementation:
The construction phase does not include any significant negative impact on the environment.		
Since the construction activities have been undertaken mainly at the toe of the existing Kabini Dam there would be no additional submergence of forest or other lands are involved in the KHEP project.	Hence, soil conservation and afforestation programme are not required to be assisted.	
Also there is no rehabilitation of population as there is no dislocation of population. The colony that will be built up during construction work is a temporary arrangement and has no significant effect on the environment.	The colonies should be far away from the KHEP project site for safety reasons.	
	As far as possible, blasting had to be avoided as it causes vibration of nearby construction leading to fractures.	The civil engineers of Subhash Kabini Power Corporation Limited (SKPCL) adopted control blasting procedure under

		supervision of National Institute of Rock Minerals, NIRM-Kolar.

Environmental Impacts	Recommendations:	Implementation:
	Disposal of unutilized excavated materials had to done systematically	The unutilized excavated materials were dumped in terraces and contained between toe walls, which are above the highest flood level. In such areas afforestation was also being carried out with suitable native plants.
	Since all the construction had to be at the toe of the dam, the presences of aquatic life demanded careful attention at the time of excavation.	
Operational phase		
Activity: The KHEP project utilizes only the surplus water available after meeting the irrigational requirement for which the dam has been constructed primarily. The power generation scheme does not include any storage dam weir plan action. After generating electricity at the turbine end, the water would be discharged into the river.		
Environmental Impacts	Recommendations:	Implementation:
There is no effect on the physical or biological properties of the river-water.	However, precautions should be taken while diverting the water into the penstock in order to avoid any entry of aquatic life into the project system and causing deaths.	During construction of intake suitable screens have been introduced at the upstream of gate to avoid any entry of aquatic life and migratory fishes moving into the downstream.

During the operation of turbines and generators, the noise would be almost minimal and no radiant heat would be generated.	The best way to mitigate the minimal noise is to plan four-line greenery in the form of hardy native plants with good crown coverage that will act as a buffer.	
Socio-Economic Impacts	Recommendations:	Implementation:
The development of the KHEP project would contribute to the socio-economic and aesthetic betterment of the local people and also its surrounding areas.		
There is no settlement of residential areas near the KHEP project site. The villages are at distance away from the site; therefore unusual health problems will not be encountered or is anticipated.		
Maintenance phase		
Activity: The KHEP project maintenance work would be carried out twice in a year.		
	Restoration of the abused sites including dumping sites and excavated areas should be levelled with debris.	

Till date, the power needs of the state are increasing by leaps and bounds. With hydro power and its major benefits – it is renewable, it produces negligible amounts of greenhouse gases, and it can easily adjust the amount of electricity produced to suit the grid demand - implementation of power scheme at the toe of the existing dam becomes an essential feature to ameliorate the state's economy and support electricity deficiency in an environment friendly manner.

SECTION G. Stakeholders' comments

>>

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

>>

SKPCL identified the people, groups and organisations that were interested or have got involved with the KHEP project implementation as stakeholder. SKPCL sent a communication to all the identified stakeholders about the KHEP project activity. They conducted open consultation where all the stakeholders were given an opportunity to present their views and opinions regarding the KHEP project. All these consultation processes were aimed at

- transparency
- accountability
- flexibility
- increased stakeholder awareness of project related issues
- broad stakeholder input and involvement
- efficiency and effectiveness
- promotion of stakeholder confidence
- understanding of stakeholder perspectives.

Identification of Stakeholders

The stakeholders identified for the KHEP project are as under.

- Elected body of representatives administering the local area (village *Panchayat*)
- Karnataka Power Transmission Corporation Limited (KPTCL)
- Karnataka Electricity Regulatory Commission (KERC)
- Karnataka Renewable Energy Development Agency (KREDA)
- Karnataka Pollution Control Board (KPCB)
- Ministry of Environment & Forest (MoEF), Government of India
- Ministry of Non Conventional Energy Sources (MNES)
- Non-Governmental Organisations (NGOs)
- Consultants
- Equipment Suppliers

Stakeholders list includes various government and non-government parties, which are involved with the KHEP project activity at various stages of its implementation.

SKPCL's took into consideration the following aspects during the stakeholder consultation process:

- The information was provided to all the stakeholders in manner they clearly understand who is consulting and why, the way in which decisions would be made (and by whom) and the type of consultation to be undertaken.

  SKPCL communicated to the relevant stakeholders their plan to implement the KHEP project. Representatives of SKPCL approached the Village Panchayat and the NGOs seeking for their comments and supports for the KHEP project.
- Targeted consultation was conducted as felt appropriate

  Applications for getting necessary clearances and approvals for the KHEP project were also sent to the above mentioned government organisations.
- Comments from stakeholders were taken into consideration and was given due weightage in the company's course of action.

G.2. Summary of the comments received:

>>

Non-government parties

Elected Body of Representatives (village Panchayat)/ Local Populace

The village panchayat / local elected body of representatives administering the local area are a true representative of the local population in a democracy like India. Hence, their consents / permissions to set the KHEP project were necessary. SKPCL has completed the necessary consultation and documented their approval for the KHEP project.

Local population comprises of the local people in and around the KHEP project area. The roles of the local people are as a beneficiary of the KHEP project. The construction of the KHEP project and continuous operation included local manpower working at the plant site. Since, the KHEP project provided good direct and indirect employment opportunities the local populace is encouraging and providing complete support to the KHEP project.

The KHEP project does not require any major displacement of any local population. It is set up on an existing dam necessary for irrigation. Further since, the distance between the electrical substation for power evacuation and the plant is not very high, the installation of transmission lines would not create any inconvenience to the local population. In addition, the local population is also an indirect consumer of the power that is supplied from the KHEP plant. This is essentially because the power sold to the grid is expected to improve the stability in the local electricity network.

Thus, the KHEP project would not cause any adverse social impacts on local population rather would help them improve their quality of life. Therefore KHEP project received complete support from the local populace.

Non-Governmental Organisations (NGOs), Consultants, Equipment Suppliers

Several Non-Governmental Organisations (NGOs) got involved with the KHEP project during various stages of its implementation. They have provided complete support to the KHEP project activity.
Project consultants were involved in the KHEP project to take care of various pre contract and post contract project related activities like preparation of Detailed Project Report (DPR), preparation of basic and detailed engineering documents, preparation of tender documents, selection of vendors / suppliers, supervision of project implementation, successful commissioning and trial runs.
SPML supplied the equipments as per the specifications delivered as scheduled and SKPCL successfully commissioned the plant

Government parties

Karnataka Electricity Regulatory Commission (KERC), Karnataka Power Transmission Corporation Limited (KPTCL) and Karnataka Renewable Energy Development Agency (KREDA),

Karnataka Electricity Regulatory Commission (KERC) is the state's apex body of power with the responsibility to regulate all aspects of the electricity sector in an objective, professional and transparent manner, safeguard consumers' interests and ensure reliable, least – cost power supply as a basic input for the economic and social development of the state.
They have issued their consent for the installation of hydel power plant of 20 MW capacity under section 21 (4) of Karnataka electricity reform act 1999 read with section 44 of the Indian Electricity Supply Act 1948.
As an importer of the power, the KPTCL is a major stakeholder in the KHEP project activity. They hold the key to the commercial success of the KHEP project. KPTCL has already cleared the KHEP project and SKPCL has already signed Power Purchase Agreement (PPA) with KPTCL.
Karnataka Renewable Energy Development Agency (KREDA) is the agency which implements policies in respect of non-conventional renewable power projects in the state of Karnataka. KHEP project activity has received necessary consents from KREDA.

Karnataka Pollution Control Board (KPCB)

Karnataka Pollution Control Board (KPCB) and Environment Department of Government of Karnataka have prescribed standards of environmental compliance and monitor the adherence to the standards. The KHEP project received the No Objection Certificate (NOC) from KPCB for commissioning of the plant. SKPCL has also received the Consent to Operate from KPCB.

Ministry of Non Conventional Energy Sources (MNES)

The government of India, through Ministry of Non-conventional Energy Sources (MNES), has been promoting energy conservation, demand side management and renewable energy projects including wind,

small hydro and hydro / bio-mass power. SKPCL's effort in implementing the hydro power project is appreciated by them.

Designated National Authority - Ministry of Environment & Forest (MoEF), Government of India,

The Ministry of Environment & Forests is the Designated National Authority of India. The government of India, through Ministry of Environment and Forests (MoEF) are encouraging project participants to take up such Climate Change initiatives. SKPCL has submitted the Project Concept Note and Project Design Document to the MoEF for Host Country Approval.

Stakeholders' Comments

SKPCL has already received the all necessary approvals and consents from various authorities, required for the KHEP project implementation like Karnataka Electricity Regulatory Commission, Karnataka Power Corporation Limited.

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

>>

The SKPCL's representatives met with the various stakeholders for appraisal and support. They were commended for their voluntary action toward environmental development and energy efficiency measures undertaken in this KHEP project activity involving generation of electricity by utilisation of the mechanical energy of the surplus discharge of the existing Kabini Dam.

The relevant comments and important clauses mentioned in the KHEP project documents/clearances like Detailed Project Report (DPR), environmental clearances, power purchase agreement, local clearance were considered while preparation of CDM project development document.

The KHEP project activity has received positive comments from the non-government parties. Further, SKPCL has complied with all the applicable conditions to KHEP project activity implementation detailed in the consents and agreements.

As per UNFCCC requirement the PDD will be published at the validator's web site for public comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Table-1-1: Project Proponent	
Organization:	Subhash Kabini Power Corporation Limited
Street/P.O.Box:	Village:Pokhra, Tehsil: Heggadadvana; Dist: Mysore
Building:	8/2 Ulsoor Road Bangalore
City:	Banglore
State/Region:	Karnataka
Postfix/ZIP:	560 042
Country:	India
Telephone:	+91 80 25595515
FAX:	+91 80 25595580
E-Mail:	skpcl@spml.co.in
URL:	www.subhashpower.com
Represented by:	
Title:	Finance Controller and Company Secretary
Salutation:	Mr
Last Name:	Subramanian
Middle Name:	Ganapathy
First Name:	S.
Department:	
Mobile:	-
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Table-1-2: Host Country	
Organization:	Climate Change Cell, Ministry of Environment & Forest, Government of India
Street/P.O.Box:	Lodhi Road
Building:	Paryavaran Bhawan, CGO Complex

City:	New Delhi
State/Region:	New Delhi
Postfix/ZIP:	110003
Country:	India
Telephone:	011-24362252
FAX:	011 24363577
E-Mail:	rksethi@menf.delhi.nic.in
URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Sethi
Middle Name:	K.
First Name:	R.
Department:	Climate Change
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding for this project.

ANNEX 3

BASELINE INFORMATION

The data of Table 3-1, 3-2, 3-3 and 3-4 given above are used for Simple OM emission factor ($EF_{OM,simple,y}$).

Table 3-1 : 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[7]**					
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[8]**					
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 3-2 : Power Generation Mix of Karnataka from Independent Power Producers

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

[8] 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[9]**					
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 3-3 : 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
10	Ryatsara Sahakari S.K.N			2.87	5.69	2.76
11	Devengare Sugar Co. Ltd.			0	0	1.67

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

Table 3-3 : 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
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
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

Table 3-3 : 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
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
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 3-4 : 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**
Central Sector Total				**7634.37**	**9113.22**	**10219.95**
Data Source: KPTCL						

The data of Table 3-5 given below are used for Simple BM emission factor ($E_{FBM,y}$).

Table 3-5: 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

The aim is to enable KHEP project activity to have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions.

The project activity's revenue is based on the units exported as measured by power meters at plant and check meters at the high-tension substation of the KPTCL. The monitoring and verification system mainly comprise of these meters as far as power export is concerned. The export of electricity will be through invoices to KPTCL. The invoices, based on meter readings will also be covered in the regular finance audit.

The KHEP project activity has employed the latest state of art monitoring and control equipment that measure, record, report, monitor and control various key parameters. Parameters monitored are the total power generated, power exported to the grid and auxiliary power generated. These monitoring and controls will be the part of the Distributed Control System (DCS) of the entire plant.

The instrumentation system of the KHEP project activity comprises of microprocessor-based instruments of reputed make with desired level of accuracy. All instruments will be calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

The quantity of emission reduction units claimed by the project activity is only a fraction of the total generated emissions, which depends on the actual generation mix of the grid in a particular year. KPTCL publishes yearly reports regarding the performance of all power generation units. Hence, authentic data related to the measurements, recording, monitoring and control of the generation mix of the KPTCL network is ensured.

The KPTCL report contains all information regarding type of generation like hydro, thermal, nuclear, renewable *etc*., installed capacity, de-rated capacity, performance of generating unit, actual generation, capacity additions during the year, *etc*. which can be used for verification of generation mix and emission factors for baseline calculation for a particular year.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:

- Frequency
- Reliability
- Registration and reporting

As the emission reduction units from the project are determined by the number of units exported to the grid (and then multiplying with appropriate emission factor) it becomes important for the project to monitor the net export of power to the grid on real time basis.

Frequency of monitoring

The KHEP has installed all metering and check metering facilities within the plant premises as well as in the grid substation where exported power is connected to the grid. The measurement is recorded and monitored on a continuous basis by both KPTCL and SKPCL through DCS.

Reliability

The amount of emission reduction units is proportional to the net energy generation from the project. Thus the final KWh meter reading is the final value from project side. All measurement devices will be of microprocessor based with best accuracy and will be procured from reputed manufacturers. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result all power measuring instruments must be calibrated once a year for ensuring reliability of the system. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration. Therefore the system ensures the final generation is highly reliable.

Registration and reporting

Registration of data is on-line in the control cabin through a microprocessor. However, hourly data logging will be there in addition to software memory. Daily, weekly and monthly reports are prepared stating the generation. In addition to the records maintained by the SKPCL, KPTCL also monitors the power exported to the grid and certify the same.

No other project specific indicators are identified that affect the emission reductions claims.

Enclosure III

ABBREVIATIONS

%	Percentage
BM	Build Margin

BEF	Baseline Emission Factor
CAIA	CERUPT Alternative Investment Analysis
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
H.T.	High Tension
Hz	Hertz
IPCC	Intergovernmental Panel on Climate Change
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
KHEP	Kabini Hydro Electric Power
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
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
RSPM	Respirable Suspended Particulate Matter
SKPCL	Subhash Kabini Power Corporation Limited
SPM	Suspended Particulate Matter
SPML	Subhash Projects and Marketing Limited
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

Enclosure IV

LIST OF REFERENCES

Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)

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

UNFCCC decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol

UNFCCC, Clean Development Mechanism, CDM Project Design Document (CDM-

PDD) version 02 (in effect as of: 1 July 2004)

UNFCCC, Clean Development Mechanism, Approved consolidated baseline methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 / Version 01; Sectoral Scope: 1, 3 September 2004.

UNFCCC, Clean Development Mechanism, Annex 1, Tool for the demonstration and assessment of additionality EB 16 Report;

Detailed project report on Kabini Hydro Electric Power project Activity

KHEP project activity proposal, 2002

Board Agenda for the SKPCL Board Meeting, 26th Dec, 2002

Website of Central Electric Authority (CEA), Ministry of Power, Govt. of India- www.cea.nic.in

Communications from KPTCL, 2005

Water Resources Department, Government of Karnataka ; waterresources.kar.nic.in

Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, www.mnes.nic.in

Power Purchase Agreement between SKPCL and KPTCL;

Stakeholders Comments, (2003), SKPCL