CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title : 24 MW Perla Mini Hydel Project, Karnataka, India
Version : 04
Date : 20/04/2012

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A.2. Description of the project activity:

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The purpose of the project is to generate electricity using surplus discharges available in river Netravathi. The generated electricity will be exported to Mangalore Electricity Supply Company Limited (MESCOM), a distribution arm of Karnataka Power Transmission Corporation Limited (KPTCL), a state government owned power utility company.

The project would use the potential energy in a flowing river by diversion weir for running horizontal full kaplan turbines to generate power. The components involved in the hydroelectric scheme consists of construction of intake cum power block, power house, tailrace pool and open tail channel discharging water back into the river, an outdoor yard. The powerhouse consists of five turbine generator sets of capacity 5.0 MW each. The gross electricity generation from the project is 71.5 GWh based on 90% dependable energy and 69.38 GWh would be exported to southern regional grid of India.

The project activity was commissioned on 12 September 2009.

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The project is proposed as a run of the river scheme and the power generation would be carried out through sustainable means without causing any negative impact on the environment. The electricity generated from the hydro resources is clean form of energy and the project displaces the electricity in the carbon intensive southern region grid system. Hence, the project activity would contribute to the real, measurable and long term reduction in Greenhouse Gas (GHG) emission and thus supports climate change mitigation.

View of project participant about the project activity's contribution to Sustainable Development

Ministry of Environment and Forests (MoEF), Government of India, has stipulated social well being, Economic well being, Environmental well being, Technological well being as the indicators for Sustainable Development in the interim approval guidelines for CDM projects. The project activity would contribute to all the above sectors, brief details of which are given below:

- The project activity would generate additional employment to an extent of 100 persons during the construction period, spread over a period of 17 months. Majority of the additional employment opportunities would be for unskilled labour. Hence, unemployed unskilled labour around the project location would benefit directly from the project activity. Besides, the project activity would also generate permanent employment to about 15 persons during the lifetime of the project activity. This direct and indirect employment would not take place in the absence of the project activity.

- Due to the additional employment opportunities, the project activity would also contribute to the alleviation of poverty in the region. Opportunities would be created without any distinction between gender, social class etc. The project proponent would provide necessary facilities such as shelter,

medical facilities, communication, education, good sanitary conditions, etc., for the employed persons during their service to the project.

- The project activity would result in flow of huge financial resources as investment in the project. Significant part of this investment would go into the construction activities. Construction activities would involve prepayment of wages for unskilled labour, purchase of construction material, local construction equipment etc. Further, significant part of the investment would go to the construction equipment and project equipment. This investment flow would have a positive impact on the economy in the region.
- The project activity is generation of electricity using hydro potential available in a river and hence, it would not result in degradation of any resources, cause any negative impact on bio-diversity, resource sustainability, human health etc. Further, the project would not result in environment pollution.
- The projects would result in utilization of environmentally safe and sound technology in small hydroelectric projects. Further, the setting up of this project would demonstrate the harnessing the hydro potential and pave path for setting up such new projects in unused watercourses in future.

As evident from the foregoing, the project activity would contribute to the sustainable development of the host country.

A.3. Project participants:

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Name of Party involved ((host) indicates a host party	Private and/or public entity(ies) project participants (as aplicable)	Kindly indicate if the Party involved wishes to be considered as project participate (Yes/No)
India (Host)	**Private Entity:** AMR Power Private Limited, Hyderabad	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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State: Karnataka

A.4.1.3. City/Town/Community etc:

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District : Dakshina Kannada (South Canara)
Taluk : Bantwal
Village : Perla

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

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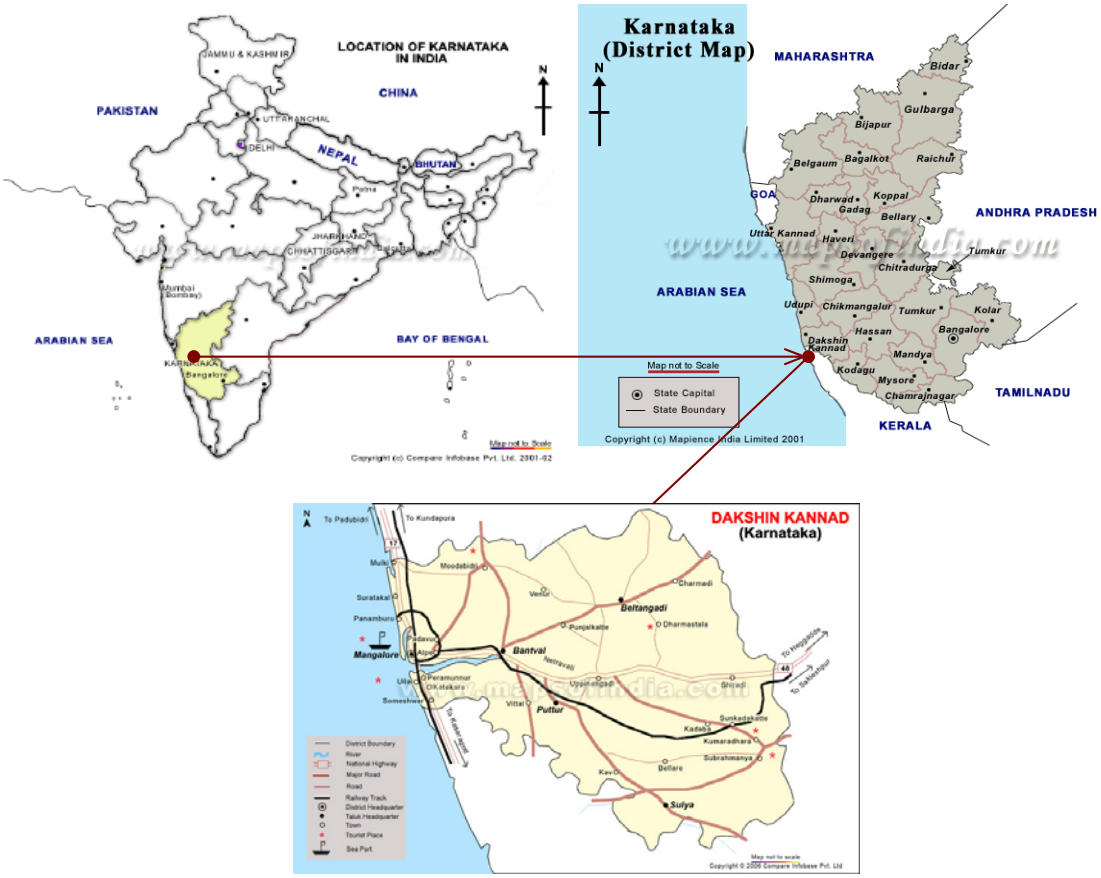
The project site is situated on the left bank of Netravathi river near Perla Village, Bantwal Taluk of Dakshina Kannada (South Canara) District in Karnataka. The project is located at a distance of 9 kms from Bantwal, 17 kms from Uppinangadi towns, 35 kms from Mangalore, the district head quarters. The nearest rail head and airport is at Mangalore. The geographical co-ordinates of the project site are Longitude 75° 05' 40'' East and Latitude 12° 52' 47'' North.

Physical location of the project is marked in the maps below.



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

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Category : **"Energy Industries (renewable / non-renewable sources)"**

Scope Number : **1**

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

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The project is designed to generate electricity for grid system using available water sources. The technology of power generation using hydro resources is by converting the potential energy available in the water flow into mechanical energy using hydro turbines and then to electrical energy using alternators. The generated power would be transformed to match the nearest grid sub-station for proper interconnection and smooth evacuation of power.

No technology transfer is envisaged for the CDM project activity.

Technical details of the project activity

The project would use the potential energy in a flowing river by construction of a diversion weir for running horizontal full kaplan turbines to generate power. The components involved in the hydroelectric scheme consists of construction of intake cum power block, power house, tailrace pool and open tail channel discharging water back into the river, an outdoor yard. Power would be generated at a lower voltage, which would be stepped up to higher voltage level within the project boundary to facilitate interconnection to the existing grid and export of power to MESCOM.

The total capacity of the turbine generators are 25 MW, which would generate electricity at 11 kV level and evacuated at 110 kV level. The annual export of power to the Southern regional grid would be 69.38 GWh from the hydroelectric project.

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Although the installed capacity is 25 MW the Government Order No: EN 443 NCE 2007, Government of Karnataka, Bangalore Dated 4th January 2008 licensed the project electricity export to the grid at 24.75MW. Form – B issued by KPTCL also indicates the plant capacity as 24.75MW only. Accordingly we have considered the net export from 24.75MW for estimation of emission reduction.

Table A.1: Salient Features of the Project

Parameter	Specifications
Hydrology	
Design Discharge	340.4 cumecs
Max Head	9.20 m
Rated Head	8.7 m
Turbine	
Type of hydro turbine	Horizontal Full Kaplan
No. of generating units	5
Capacity of each generating units	5.0 MW
Efficiency	90 %
Rated Speed	158 rpm
Generator	
Type	Synchronous
Rated speed	750 rpm
Generation voltage	11 kV
Power Factor	0.85 (lag)
Efficiency	97.45 %
Frequency	50 Htz

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Power Evacuation	
Transmission Voltage	110 kV Double Circuit ACSR Drake
KPTCL Substation	BC Road
Substation distance from site	10 kms
Substation Voltage	110 kV
Energy (Optimum year)	
Net Energy Export to KPTCL grid	69.38 GWh

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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The chosen crediting period for the project activity is 10 years. It is estimated that the project activity would generate 59,299 Certified Emission Reductions (CER) during the crediting period of 10 years. Annual estimates of emission reductions by the project activity during the above crediting period are furnished below.

Table A.2: Annual Estimation of Certified Emission Reductions (CERs)

Year	Period	Annual estimation of emission reductions (tCO_2 eq.)
1	2008-09	59,299
2	2009-10	59,299
3	2010-11	59,299
4	2011-12	59,299
5	2012-13	59,299
6	2013-14	59,299
7	2014-15	59,299
8	2015-16	59,299
9	2016-17	59,299
10	2017-18	59,299
Total Emission reductions (tCO_2 eq.)		5,92,990*
Total number of crediting years		**10**
Annual average over the crediting period of estimated reductions (tCO_2 eq.)		59,299

**The emissions reductions are conservatively dounded down to the nearest integer.*

In the above table, the year 2008-09 corresponds to the period starting from 01.08.2008 to 31.07.2009. Similar interpretation shall apply for remaining years.

A.4.5. Public funding of the project activity:

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The project activity does not involve any public funding from Annex-1 countries.

SECTION B. Application of a baseline and monitoring methodology

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

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Approved consolidated methodology : "Consolidated baseline methodology for grid connected electricity generation from renewable sources", ACM0002
Version : 06
Date : 19 May 2006

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

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The methodology ACM0002 is applicable to grid connected renewable power generation project activities under the following conditions:

1. Applies to electricity capacity additions from
   a. Run-of-river hydro power plants;
   b. Hydro power projects with existing reservoirs where the volume of the river is not increased.
2. New hydroelectric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2.
3. Wind sources;
4. Geothermal sources;
5. Solar sources;
6. Wave and tidal sources;
7. This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.
8. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available; and
9. Applies to grid connected electricity generation from landfill gas capture to the extent that is combined with the approved "Consolidated baseline methodology for landfill gas project activities" (ACM0001).

Applicability

Since the project is proposed only as a run-of-river scheme with a capacity of 25 MW, without having any reservoir and the generated electricity would be exported to the southern regional grid system of India, Conditions 1.a. and 8 of above is applicable to the project.

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Remaining conditions 1.b., 2,3,4,5,6,7,9 are not material to the project activity.

Response and Justification

For Condition 1.a. - Run-of-river hydro power plant

25 MW Perla Mini Hydel project is envisaged across the river Netravathi. The components involved in the hydroelectric scheme consist of intake structure to regulate water into the powerhouse. Powerhouse would house 5 generating units of 5.0 MW each with service bay, control room, office, tailrace pool and open tail channel discharging water back into the river, an outdoor yard. The water intake structure would neither result in storage of water nor affect in any way the volume of water of the river.

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For Condition 8 – Identification of Geographic and System boundaries for the relevant grid

The relevant electricity grid system is Southern Region comprising the state level subsystems of Andhra Pradesh, Karnataka, Kerala, Puducherry, and Tamilnadu. The electricity system is managed by Southern Regional Electricity Board (SREB). Central Electricity Authority (CEA), a central level authority for electricity in India, monitors power generation from all plants connected to the grid system. Hence, the geographic and system boundaries of the southern regional grid system can be clearly identified. The following map depicts the system boundaries of the Southern Regional electricity system.

Fig. B.1. : Power Map of Southern Region as on March 2006

Hence, "Consolidated baseline methodology for grid connected electricity generation from the renewable sources", ACM0002, Version 6 is applicable to the project activity and the selection is justified.

B.3. Description of the sources and gases included in the project boundary

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Project boundary encompasses the physical and geographical site of the renewable energy generation source i.e barrage across river Netravathi, intake structure, powerhouse, tail race channel, tail pool, and outdoor switchyard to the point of power export to the grid which is of 25.86 hectares where the project proponent has full control. Hence, project boundary would be considered within these terminal points.

As per Clause 2, Page No: 3, ACM0002, Version: 06, Spatial extent of the project boundary would include the project site and all power plants connected physically to the electricity system that the project activity (CDM project power plant) would be connected to. Hence, the spatial extent of 25 MW PMHP would cover all power plants in operation and connected to the southern regional electricity system.

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The following gases and sources have been considered in the project activity.

Table B.1: Gases and Sources considered in the project boundary

	Source	Gas	Included/Excluded	Justification / Explanation
Baseline	Grid electricity	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
Project Activity	Electricity generation	CO_2	Excluded	Not applicable, since no emissions occur from project operation.
		CH_4	Excluded	Not applicable since no emissions occur from project operation.
		N_2O	Excluded	Not applicable since no emissions occur from project operation.
	Electricity import/captive generation (DG set)	CO_2	Included	Main source of emissions
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The most plausible baseline scenario identified for the project activity is continuation of current practice i.e. operation of grid connected power sources. As per the approved consolidated methodology ACM0002, since the project activity does not modify or retrofit an existing facility, the applicable baseline shall be the electricity delivered to the grid by the project, which would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM).

The most plausible baseline scenario has been identified using step 1 and step 2 of the tool for demonstration and assessment of additionality.

The possible alternatives to the project activity are as follows:

1. The project activity not undertaken as CDM project activity. The hydro power plant would have been implemented, but without returns from carbon credits.
2. No investment, which means that no power from renewable source would have been produced, and the regional power demand would have been met by sources of the current grid electricity mix (dominated by thermal sources).

The alternative 1 is an unattractive proposition as in the absence of returns from carbon credits, the scenario is not feasible.

The alternative 2 is considered as credible and realistic alternative to the project activity since the project activity is exporting and displacing the equivalent amount of electricity in the carbon intensive grid system. In the absence of the present activity, the equivalent amount of electricity would have been generated by existing or new grid connected power plants.

The above mentioned alternatives are tested for their compliance with the applicable legal and regulatory requirements. All alternatives are found to meet all the legal and regulatory requirements in India. In addition, implementation of the proposed project activity is not restricted by any law.

B.5. 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 (assessment and demonstration of additionality):

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Additionality of the project activity is demonstrated using the "Tool for the demonstration and assessment of additionality", Version 05 as specified by the approved methodology ACM0002 as described below:

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

The purpose of the project is to generate power based on hydroelectricity for sale to the grid. Under this step the project participant shall identify other alternatives.

Sub-step 1a.: Define alternatives to the project activity:

As outlined in Section B4, the plausible alternative scenarios are:

1. Implementation of project activity not undertaken as CDM project activity
2. Power generation from sources of existing grid electricity mix

Based on the analysis explained at B.4 alternative 2 is the most likely scenario in the absence of the project activity. Therefore, project activity passes through Sub-step 1a.

Sub-step 1b.: Consistency with mandatory laws and regulations:

The above mentioned alternatives are tested for their compliance with the applicable legal and regulatory requirements. These alternatives are found to meet all the legal and regulatory requirements in force.

Step 2. Investment analysis

Sub-step 2.a.: Determine appropriate analysis method

The tool for additionality provides the following three options for investment analysis.

Option – I : Simple cost analysis
Option - II : Investment comparison analysis
Option – III : Benchmark analysis
Option - I: Simple cost analysis is not applicable for the project activity as the CDM revenues are not the only means of income. Out of the remaining options, project participants selected Option - III, Benchmark analysis.

sub-step 2.b.: Option III – Apply Benchmark analysis

The Additionality Tool – Ver. 05 released by EB 39, offers 5 benchmarks, from amongst which the PP can choose one to demonstrate the additionality of the project. One of the 5 benchmark/discount rates identified by the Additionality Tool relates to the use of *Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data*.

The benchmark is estimated based on risk free return and risk premium. The risk free return is considered at 7.28%, which is available from Reserve Bank of India. Reserve Bank of India publishes the weighted average yield of Government securities in its Annual Report. As per the Annual Report, the Government Bond rate for the period ended August 2005 was 7.28%. The risk premium is considered at 8.2% based on publicly available sources. Based on the above approach the benchmark has been estimated at 15.48% for the project activity.

Appropriateness of choosing the Country risk premium of 8.2%

Country risk premium of 8.2% was chosen because it was the most conservative of the risk premiums available at the time of decision making. In this context three published studies on risk premium for India were available, viz.,

i) Prof J.R. Verma (2006), Professor of Finance at Indian Institute of Management, Ahmedabad and former Full time Member of Securities and Exchange Board of India study, which have arrived at a risk premium of 8.75%[1].

ii) Prof. Rajnish Mehra (2006), University of California, Santa Barbara and National Bureau of Economic Research, who has arrived at a risk premium of 9.7%[2].

iii) CRISIL (2000) study which has estimated the risk premium at 8.2%[3].

Since of the three published studies, 8.20% is the lowest, the risk premium of 8.2% was chosen. Subsequent study on risk premium (2008) published by Aswath Damodaran, places the risk premium at 8.54%[4]. Using Prof. Verma's risk premium, the benchmark would be 16.03% and based on Prof. Mehra's risk premium, the benchmark would be 16.98% - and hence the chosen bench mark of 15.48% is conservative.

[1] Prof. Jayant R. Verma and Samir K. Barua, *A First Cut Estimate of the Equity Risk Premium in India* Indian Institute of Management, Ahmedabad, can be accessed at http://www.iimahd.ernet.in/~jrvarma/papers/WP2006-06-04.pdf

[2] *The Equity Premium in India*, Prof. Rajnish Mehra, can be accessed at http://www.academicwebpages.com/preview/mehra/pdf/Equity%20Premium%20in%20India.pdf

[3] *Cost of Capital for Central Sector Utilities*, CRISIL Advisory Services can be accessed at http://cercind.gov.in/rep1304.pdf

[4] *Country Default Sprads and Risk Premiums,* Aswath Damodaran, can be accessed at http://pages.stem.nyuedu/~adamadar/New_Home_Page/datafile/ctryprem html

The Approach to the Risk Premium and benchmark calculation have been certified by an independent financial expert and the certificate is furnished to the DOE for verification.

Sub-step 2.c.: Calculation and Comparison of Financial Indicators

IRR is the most commonly used financial indicator by the bankers and investors alike to asses the intrinsic viability of the project. The IRR thus computed, has to be compared with a benchmark indicator.

Total cost of setting up of the project is estimated at Rs. 971.7 millions. The project is funded by way of equity and term loan.

The IRR has been computed with and without CDM revenue.

The assumptions for financial analysis are based on the DPR which was valid at the time of decision making, i.e., July 19th 2005;.

Input value relating to tariff has been taken from PPA and terms of loan from sanction letter received from bank; In this context, it may be stated that though the tariff is valid only for 10 years, the same tariff has been assumed for 20 years even though the probability of tariff getting reduced from the 11th year onwards is high.

Input values in respect of capital expenditure have been based on the quotations and contracts entered into by the company and certificate from the Chartered Accountant.

Investment analysis has been carried out for 20 years, though the project activity has opted for fixed crediting period of 10 years. In computing IRR, depreciation (there are no other non-cash expenditure) has been taken as cash inflow; Interest has been added back in computing the IRR; Salvage value has been accounted for in the terminal year;

One of the cash inflows considered in computing IRR is salvage value; Annex 45 of EB 41 requires the salvage value to include reasonable expectation of the potential profit or loss on the realization of the assets. In the instant case, salvage value has been taken at 5% of the total investment. Salvage value of 5% has been derived from the fact that during the assessment period of 20 years, 95% of the investment is depreciated; the residual value of 5%, therefore, has been considered appropriate. In this context, it is submitted that

a) Financial calculations are invariably based on *going concern* concept, in that it is never presumed that the project would be closed down and the assets would be sold. lock, stock and barrel. The question of profit or loss on sale of asset would arise, only if it is sold. Moreover, even assuming that the assets are sold at the end of 20th year, it is well nigh impossible for any expert to estimate with any degree of certainty as to what would be the realizable value at that point of time as 20 years is too long a period to make any intelligent guesstimate. No formula has been suggested either by any textbook or research articles or by the EB to estimate the realizable value, from where the profit or loss emanate. It is perhaps for this reason that EB suggested,

   "The fair value should be calculated in accordance with local accounting regulations where available, or international best practice".

As per the normal practice in the region, common practice adopted by financial institutions in India had been used in the calculation of IRR. The article of D. Gregg Dight only proves that Indian financial institutions adopt international practices in computing salvage value.

b) While D. Gregg Dight recommends considering 5% as salvage value, OECD, recommends ignoring the value altogether, with justification. While elaborating on the discounting period, the Manual of Industrial Project Analysis in Developing Countries published by Development Centre of Organization for Economic Cooperation and Development (OECD) states,

"In practice the period is often made equal to the life of the equipment with the longest life span in the plant. Thus, its residual value at the end of the period can be regarded as nil and all that remains is the value of the site and buildings, if any. It should be noted that in view of the remoteness in time here, the influence of any error in estimating this residual value on the profitability of the project will be very small"[5]

c) The logic of inclusion of salvage value is based on the fact that when the return from the project is computed, the entire benefit of investment should be accounted for. It is for the same reason that EB also has recommended the consideration of residual value *in the terminal year*. A cursory glance at the rationale given (Annex 45 of EB 41, item 4) reads as follows:

"Net Present Value (NPV) or Internal Rate of Return (IRR) calculations are designed to calculate the return on the cost of investment, *in cases where the capital expenditures have not been fully devalued this should be reflected as a cash inflow. Not to apply a residual value would imply that the project must repay the full value of the capital expenditure before the value of this expenditure had been consumed*" (emphasis added)

EB has been categorical in stating that even where the capital expenditures have not been fully devalued what needs to be provided is the residual value. A comparison of the EB's directions and the salvage value provided in the calculations would reveal that, EB's directions have been followed in letter and spirit.

d) Therefore consideration of residual value as salvage value was deemed appropriate in the case of a hydro project as in a hydro project the assets such as civil works and electro mechanical equipment are specific to the project activity and are made to order. There may not be any realizable value as far as civil works are concerned which are mostly RCC structures and their dismantling cost would be more than the scrap value. It is possible that electro mechanical equipment may fetch certain amount depending on the condition of the equipment, but having worked for 20 years, it is highly doubtful whether any hydro power plants would find *utility*[6] in the asset. That apart, it could be noticed that no provision has been made for major maintenance or rehabilitation in the projections. As such, the fully worn out machinery would command no value at all at the end of 20 year period.

As per the investment analysis, the IRR works out to 12.91% in the baseline case and is less than the benchmark of 15.48%. The soft copy of financial analysis together with assumptions considered while estimating profitability and cash flows are provided as annexure to the PDD.

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[5] Manual of Industrial Projects analysis for Developing Countries – Methodology and Case studies (Revised edition) – Development Centre of the Organization for Economic Cooperation and Development,P.126

[6] The term 'Utility' has been used in the economic sense to drive home the point that the equipment at the end of 20th year might not be capable of providing the service it is meant to

Thus, it is evident that, the project is not the baseline scenario.

Sub-step 2.d.: Sensitivity Analysis

The robustness of the conclusion drawn above has been tested with reasonable variations in the critical assumptions. The Guidance on the Assessment of Investment Analysis issued by the EB in its 41st Meeting covers two aspects on sensitivity analysis, viz., subjecting those variables which constitute more than 20% of project cost or total project revenue to sensitivity analysis and considering a +/- 10% variations in the identified variables. Accordingly, four scenarios have been identified, viz., variation in project cost, generation by 10%, tariff by 10% and O & M costs by 10% on either side. Besides analysis has also been carried out to indicate at what level of change in the critical parameters, IRR would cross the benchmark return.

In this context, it may be clarified that generation, one of the variable considered for sensitivity analysis, is essentially dependent on hydrological factors. Likewise, what is certain is the tariff for the first 10 years as it is backed by PPA. There is a high degree of uncertainty both with respect to hydrological factors as well as tariff determination in the post 10th year period, which cannot be estimated or quantified with any degree of certainty. What is considered under sensitivity analysis is only the quantifiable element and not the non-quantifiable element, which are discussed under barrier analysis.

The outcome of the sensitivity analysis is given below:

Details	-10%	Baseline	+10%
Benchmark return	15.48%		
Project cost	14.81%	12.91 %	11.30%
Generation (PLF)	11.06%	12.91 %	14.70 %
Tariff	11.06%	12.91 %	14.69%
O & M Costs	13.12%	12.91 %	12.72%

A cursory glance at the sensitivity analysis would prove that the results do not vary irrespective of whether the tariff is subjected to change or the generation as in either case what is subjected to variation is income, which is nothing but a product of generation and tariff. The sensitivity analysis proves beyond doubt that the project is unlikely to be financially attractive even under the most unrealistic optimistic conditions of project cost going down by 10% or PLF going up by 10% or tariff increases by 10% or O & M costs decrease by 10%. In either case, the project IRR remains at 14.82 %, 14.70%, 14.69% and 13.12 % respectively in contrast to the benchmark return of 15.48%.

In this context, one important variable, which could affect IRR, is the variation in the salvage value. In the project the electro mechanical equipment has a longest life span of 30 years. The cost of electro mechanical equipment is estimated at Rs.480 million (approx.). Since investment analysis has been prepared for a period of 20 years, the value for the remaining 10 years has to be accounted for as salvage value, which works out to Rs.160 million. Even if this entire amount of Rs.160 million is included as residual value the project IRR does not go beyond 13.12 % which is well below the benchmark. Figures given above prove with no uncertainty that the project activity is not a business-as-usual scenario. It was against this background that the PP, while taking a decision to invest in the project activity, considered the CDM benefits. The minutes of the meeting of the board of directors where the essentiality of the CDM benefits was discussed is furnished to the DOE for verification. CDM benefits go

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to improve the financial attractiveness of the project activity, as evident from the fact that with CDM benefits, the project IRR in the baseline scenario improves to 15.99 % in contrast the benchmark return of 15.48%. Hence, the project requires CDM benefits to make it financially attractive.

If the Project Cost is reduced by 13.1 % or PLF is increased by 14.5 %, or tariff is increased by 14.5 % % the Project IRR reaches the Benchmark. In the case of O&M even if the cost is decreased by 100% the IRR reaches at 14.86 %. All the scenarios are not possible scenarios since:

- In the project cost civil works and plant and machinery constitute 34% and 49% of the project cost respectively. Other variable are very small. Hence, entire project cost has been considered for the purpose of sensitivity analysis. With high inflation there has been a steep increase in the construction material as well as plant and machinery and therefore the possibility of project cost coming down is not plausible.

- Plausible generation has been considered based on hydrology. 25 year discharge data available for Perla hydro project is used for estimating generation. 25 year data used can fairly represent trend that can be available for future project operation period. 90% dependable energy is taken as the design energy. Since the design energy is considered based on 25 years average, this would represent reasonable estimation and generation going beyond what has been assumed is not considered reasonable.

- Further as the tariff is fixed in the PPA there is no possibility of tariff going up.

  The PPA is available only for 10 years and thereafter the same is subjected for review. Any assumption on tariff applicable from 11th year onwards is highly uncertain today and do not provide a reliable basis for investment decisions. However it is clear that the tariff from 11th year will be substantially lower for the following reasons.

  - By that time there will not be any element of interest as the loans would have been fully paid

  - In the absence of a liberalized electricity market, the PP will have a very weak negotiating position with the state utility who have a strong interest to minimize the tariff. This has been witnessed in the past when the tariff for hydro projects has been reduced from 2.25 per kwh with an escalation of 5% per annum with the base year as 1994-95, then revised to Rs.2.90 per kwh with an escalation of 2% every year. Now the current tariff is Rs.2.80 per kwh without any escalation.

  Evidence to the effect that the tariff would be reduced after the period of 10 years since the project would have recovered fully some of the costs is evident from the order of MERC. MERC has reduced the tariff, which in respect of a wind projects when they came for PPA renewal.

  MERC has categorically stated, "MSEDCL would purchase wind power at the rate of 90% of lowest HT Industrial Energy Tariff, i.e., at the fixed rate of Rs. 1.17 per kWh, with no variation. The Group II wind generators would be required to supply the energy *compulsorily to MSEDCL*. The rate of Rs.1.17 per kWh is the highest proposed rate for purchase of energy and the Commission should suitably fix a *lower tariff* *considering the fact that the cost is fully recovered* by the wind generators and henceforth, *only the Operation and Maintenance and incidental costs are to be recovered* by Group II wind generators". The order of MERC dt.29th November, 2007 is submitted to DOE for verification.

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However for the sake of adopting conservative approach, the project proponent has considered uniform tariff for the entire period of investment analysis.

As the costs are going up every year due to inflation, the costs of O&M coming down is also not a practical scenario. O & M Costs includes salaries and wages, repairs and maintenance, insurance and various other expenses required for the operation as well as maintenance of the plant. As the costs are going up every year due to inflation, possibility of the cost coming down is not expected.

Step 3: Barrier Analysis

Sub-step 3.a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Since the PP has opted for investment analysis, barrier analysis is not considered.

Sub-step 3.b: Show that the identified barriers would not prevent the implementation of atleast one of the alternatives (except the proposed project activity).

Since the PP has opted for investment analysis, barrier analysis is not considered.

Step 4. Common Practice Analysis

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

Sub-Step 4 (a) 1 of the Additionality Tool states,

"Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc."

Based on the above and considering the fact that the capacity of the project activity is 25 MW and located in the State of Karnataka, projects with a capacity of 15MW to 25MW have been considered as similar project activities. All the projects compared are run-of-the-river projects in the same region using the same technology. The upper limit of 25 MWs is also in line with the stipulation of the Ministry of New and Renewable Energy (MNRE)[7] treating all projects up to a capacity of 25 MWs as small hydro projects. Any capacity exceeding 25 MWs are called large hydro projects and would come under the jurisdiction of Ministry of Power[8]. The regulation, tariff fixation and incentives etc., are different from SHPs up to a capacity of 25MW and projects above capacity of 25MW as presented in the following table:

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[7] www.mnes.nic.in under sub-menus Programmes/Schemes, Grid Interactive and Off-Grid power, Small Hydro Power

[8] Ministry of Power, Annual Report 2004-05, Chapter 2, page 5, http://www.powermin.nic.in/reports/pdf/ar04_05.pdf

Small Hydro (up to 25MW)	Large Hydro (above 25MW)
Governed by MNRE	Governed by Ministry of Power
Projects Identification: Through self identification	Projects Identification: Identified by state government
Allotment: State government	Allotment: Competitive bidding
Approval: State government	Approval: State and/or central government
Tariff: Based on state government policy for non – conventional energy schemes	Tariff: Tariff is based on Central electrical regulatory commission (CERC) and adopted by state government.
Promotional Incentives: Capital Subsidy	Promotional Incentives: No capital subsidy
As per the Ministry of Environment and Forests, Govt.of India, Notification S.O.1533(E) Dt.14.09.2006 (http://www.envfor.nic.in/legis/eia/so1533.pdf) Schedule 1c, page 10,, projects of capacity less than 25MW do not require environmental clearance.	Projects of capacity 25MW and above require environmental clearance.

Therefore, for the purpose of common practice analysis projects with an installed capacity of 15 to 25 MW have been chosen, which are similar to the project activity and therefore conforms to the Additionality Tool. In order to demonstrate the project activity, i.e., generation of electricity through a small hydro project of 25 MW is not a common practice, reliance has been placed on the published statistics in respect of installations of small hydro projects in India, in the Southern region as well as in the state of Karnataka in relation to the total installed capacity of power generation.

Table B.4: Installed Capacity as on 31st December 2005[9]

Region	Hydro	Thermal	Nuclear	RES	of which SHP	Total	SHP as % of total
All India	32135.05	82061.44	3310.00	6158.32	1705.63	123667.80	1.4%
Southern	11026.39	20133.02	830.00	3829.52	616.01	35818.93	1.7%
Karnataka	3486.40	3303.09	133.59	843.17	274.88	7766.25	3.5%

RES - Renewable Energy Sources
SHP - Small Hydro Projects

As could be seen from the Table B.4 above, the total installed capacity of power projects in India is 123,667.81 MW as on 31st December 2005. Against this small hydro projects in operation in India is 1,705.63 MW, accounting for hardly 1.37 % of the total installed capacity.

In the Southern region, the total installed capacity of power plants is 35,818.93 MW. As against this, small hydro installations accounted for 616.01 MW only indicating that small hydro projects accounted

[9] Page No: 165 (Statement - I), Page No: 167(Statement - III), Annual Report, 2005-06, Ministry of Power, Govt of India

for only 1.71 % of total capacity. On the other hand, in Karnatka, SHPs accounted for about 3.5 %.

The estimated small hydropower potential in the State of Karnataka is about 1500 MW[10] and out of which only 274.88 MW has been tapped so far. Thus, the penetration of small hydro power in Karnataka is quite insignificant.

These proportions of SHPs given above are only in respect of the installed capacities. It is a well known fact that plant load factor (PLF) of the small hydro projects is always less, sometimes as low as below 30%, as compared to the thermal plants.

From the foregoing it could be concluded that SHPs is not a common practice. Moreover, SHPs face higher risks due to natural vagaries. They are also accorded unfavorable power purchase tariffs by State Electricity Regulatory Commission (SERC) as compared to other renewable sources like wind. They also do not get any other fiscal benefits like accelerated depreciation, concessions in excise duties, sales tax etc. (Source: Financial Incentives for Wind, http://www.kredl.kar.nic.in/FISmallHydro.htm, Financial Incentives for Small Hydro, http://www.kredl.kar.nic.in/FIWind.htm)

The project activity is quite different from other hydro projects. Operating head is created by excavating an intake channel with a deep slope of about 6 m in a distance of about 40 m because the river bed maintain a gradual slope and would not provide any operating head for power station. The intake channel only is providing the operating head. This type of barrier is not faced by any other hydro project in Karnataka. This way the project is very different from other similar projects.

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

The 25 MW Perla Mini Hydel Project would also face uncertainty in water availability, as the water allocation to the project would be preceded by the needs of MRPL which is in upstream of the project. Even if any other hydro electric project is constructed in the upstream, the quantum of water to the downstream project will be affected significantly by increase of dead storage and evaporation losses in the upstream project.

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A question that assumes significance in this context is whether public sector investors would implement the project activity if it was not found viable by private promoters. Public sector investors do not prefer small hydro projects. This should be evident from the data given below on the projects implemented by Karnataka Power Corporation Limited and Visveshwaraya Vidyu Nigam Limited

Table B.5.: List of Power Stations under Karnataka Power Corporation Limited[11]

S. No.	Power Station	Capacity (MW)
1.	Sharavathi Generation Station	1035
2.	Gerusoppa Dam Power House	240
3.	Linganamakki Dam Power House	55
4.	Bhadra Right Bank Canal Power House	13.20
5.	Bhadra Left Bank Canal Power House	26
6.	Supa Dam Power House	100

[10] Karnataka Renewable Energy Development Limited, http://www.kredl.kar.nic.in/ProgressReport.htm

[11] www.karnatakapower.com/projects.asp

7.	Nagjhari Power House	855
8.	Kadra Dam Power House	150
9.	Kodasalli Dam Power House	120
10.	Varahi Underground Power House	230
11.	Mani Dam Power House	9
12.	Ghatapragha Dam Power House	32
13.	Almatti Dam Power House	290
14.	Mallapur Mini Hydel Scheme	9
15.	Sirwar Mini Hydel Scheme	1
16.	Kalmala Mini hydel Scheme	0.40
17 .	Ganekal Mini Hydel Scheme	0.35
	Total Capacity (MW)	3,165.95

Table B.6.: List of Power Stations under Vishveswaraya Vidyut Nigam Limited (VVNL)[12]

S. No.	Power Station	Capacity (MW)
1.	Sri K.Sheshadri Iyer Hydro Electric Station (Shivanasamudram)	42
2.	Shimshapura Hydro Electric Station	17.2
3.	Mahatma Gandhi Hydro Electric Station	139.2
	Total Capacity (MW)	198.4

Table B.7.: List of Power Stations under KSCST[13]

S. No	Power Station	Capacity (MW)	Location	Government Order No and date of allotment
01	Karnataka State Council for Science & Technology (KSCST), Indian Institute of Science (IISc), Bangalore	0.02	Elaneeru	DE 67 NCE 98 dated 5.2.1998
	Total	**0.02**		

As could be seen from the above, the large hydro projects accounted for about 99% in the case of KPTCL and 91% in the case of VVNL.

Table B.8.: List of Private Sector Small Hydro Projects Commissioned[14]

S. No	Name of the Developer	Location	Capacity (MW)	G.O. No	Date of commissioning
01.	Bhoruka Power Corporation Limited	Shivapura	18.00	1989	29.11.1992
02.	Gokak Mills Limited	Dhupdal	2.80	PWD 235 PPC 85 (2) dated	4.5.1997

[12] www.karnatakapower.com/projects.asp

[13] Karnataka Renewable Energy Development Limited, http://www.kredl.kar.nic.in/VentureSmallHydro.htm

[14] Karnataka Renewable Energy Development Limitedhttp://www.kredl.kar.nic.in/VentureSmallHydro.htm

				13.9.1989	
03.	Bhoruka Power Corporation Limited	Shahapur scheme 1	1.30	DE 84 PPC 92 dated 20.7.1992	18.3.1997
04.	Bhoruka Power Corporation Limited	Shahapur scheme 2	1.30	DE 84 PPC 92 dated 20.7.1992	18.3.1997
05.	Bhoruka Power Corporation Limited	Shahapur scheme 3	1.30	DE 84 PPC 92 dated 20.7.1992	18.3.1997
06.	Bhoruka Power Corporation Limited	Shahapur scheme 4	1.30	DE 84 PPC 92 dated 20.7.1992	18.3.1997
07.	Bhoruka Power Corporation Limited	Shahapur scheme 5	1.40	DE 84 PPC 92 dated 20.7.1992	28.11.1998
08.	Cauvery Hydro Energy Limited	Shiva	3.00	DE 147 PPC 90 dated 18.9.1992	10.9.1998
09.	Dandeli Steel & Ferro Alloys Limited	Anweri	1.50	DE 84 PPC 92 dated 20.7.1992	4.8.1997
10.	Graphite India Limited	Chunchanakatte	18.00	DE 10 PPC 92 (1) dated 3.2.1992	13.10.1997
11.	Yuken India Limited	Attihalla	0.35	DE 84 PPC 92 dated 20.7.1992	3.7.1998
12.	Energy Development Co. Limited	Harangi	9.00	DE 216 PPC 92 dated 9.11.1992	19.7.1999
13.	Kilara Power Pvt. Limited	Kilara	2.00	DE 84 PPC 92 dated 20.7.1992	31.3.2000
14.	Tungabhadra Steel Products Limited	Malaprabha	2.40	DE 84 PPC 92 dated 20.7.1992	17.9.1999
15.	Murudeshwara Power Corporation Limited	Narayanpur LBC	11.60	DE 154 PPC 94 (3) dated 6.9.1994	14.7.1999
16.	Sandur Manganese & Iron Ores Limited	Hemavathi LBC	16.00	DE 154 PPC 94 (3) dated 6.9.1994	28.7.2000 Out of this 4.00 MW is commissioned on 20.04.2001.
17.	Bhoruka Power Corporation Limited	Rajankollur	2.00	DE 154 PPC 94 (3) dated	6.8.1999

				6.9.1994	
18	Rukmini Steel Industries	Madavamantri	3.00	DE 10 PPC 92 (2) dated 3.2.1992	09.07.2001
19	Atria Power Corporation Limited	Sheshadri Iyer	6.60	DE 28 NCE 96 (26) dated 24.7.1996	August 2001
20	Amogha Power Projects Pvt. Limited	Sri Ramadevarakatte	1.50	DE 28 NCE 96(14) dated 24.07.96	October 2001
21	Atria Power Corporation Limited	Shimsha	12.00	DE 28 NCE 96 (24) dated 24.07.96	3rd unit commissioned on 18.10.2004
22.	Vijayalakshmi Hydro Power Pvt. Limited	Hebbakavadi	1.75	DE 56 NCE 95 dated 16.02.96	03-04-2002
23	Mudabagilu Power Company	Hanumanthapura, Shimoga	0.325	DE 28 NCE 96 (29) dated 24.7.1996	January 2003
24	Kalson Power Tech. Pvt. Limited	Nugu High Level canal, H.D.Kote, BirBirawal Mysore	3.00	DE 216PPC 92 dated 9.11.1992	31.12.2002
25.	Maruthi Power Gen	Kabini RBC	3.00	DE 54 NCE 99 dated 19.7.1999	31/12/2002
26.	Maruthi Power Gen	Hemavathi RBC	1.5	DE95NCE 2000 dated 10.7.2000	31/12/2002
27	Subhash Kabini Corporation Pvt. Limited	Kabini Toe of Kabibni Dam	20.00	DE 154 PPC 94 dated 6.9.1994	24-06-2003
28	Graphite India Limited	Link canal, Near Pee Halli S.R.Patna, Madya,	1.50	DE 84 PPC 92 dated 20.7.1992	17-7-2003
29	Bharuka power corporation limited	9th distributory of Shahapur branch canal near Banathal	1.00	DE 54 NCE 99(E) dated 26.8.1999	30-08-2003
30	International Power Corporation Limited	Kemphole Maranahalle, Sakleshapur ,Hassan	18.00	DE 54 NCE 99 (A) dated 6.8.1999	20-10-2003 20-11-2003 10-01-2005
31	Anjan Power (P) Limited	Mandagere Krishnaraj Peth Mandya	4.5	DE 134 NCE 2000 dated 30.1.2001	September 2004.

		1-4.5 Mw			
32	S.L.S Power projects Pvt. Ltd.	Across existing anicut 2 kms Sugure Viil, Emmiganur Tq, Bellary 1.5 to 4.5.	4.5	DE 31 NCE 2002 dated 13/06/2002	3.12.2004
33	Sri Lakshmidevi Power Pvt Limited	Across Arkavathi River between 0.0Km to 1.63Km. near Chunchidoddi vill of Knanakapura Tq, B'lore (R) Dist.	10.25	DE/197/NCE/2002 dated 07/10/02.	December 2004
34	M/s Sahyadri Power Company Pvt.Limited	Across 22nd Distributory fo Bhadra RBC near Yadehalli Village,Bhadravathi Tq,Shiimoga Dist.	0.25	DE 125 NCE 96 (8) dated 10.6.1997	January 2005
35	Sandur Power Company Pvt Ltd.	Varahi tail race, Hosangadi, Kundapur Tq, Udupi Dist 15 to 22.5 MW	22.00	DE 154 PPC 94 (3) dated 6.9.1994	One unit of 7.5 MW commissioned on 11.04.2005
36	Trishul Power Private Limited	Bandihole	4.00	DE 304 NCE 2003 dated 17.12.2003	Two units of 2 MW capacity commissioned on 28.07.2005
37	Pioneer Genco Ltd	Across Cauvery river near Shivanasamudram, Malavalli Taluk, Mandya District	24.75	DE 277 NCE 2003. Dated: 15th November 2003	3 units of 8.5 MW capacity commisioned

As evident from the Table B.8 above, the projects in Serial No. 1 to 17 were commissioned before the year 2000 and hence are not eligible for CDM benefits. Projects in Sl. No. 27, 30, 33 have been registered

and projects in Sl. No. 22, 32, 35 are under Request for Registration with CDM Executive Board and most of the remaining projects are under pipeline and yet to pursue CDM benefits.

Against the above background that only projects constructed since 2000 were considered in the common practice analysis. Only projects constructed since 2000 has been considered in the common practice analysis for the following reasons:

a) The regulatory environment changed[15] after 2000. Karnataka Electricity Regulatory Commission (KERC), the statutory regulatory body for regulating power generation and distribution in the State of Karnataka, was constituted only in November 1999.

b) Projects established before 2000 were governed by a tariff structure suggested by Ministry of Non-Conventional Energy Sources. They were entitled to a tariff of Rs.2.25/kWh with a 5% escalation thereon every year with 1994-95 as the base year. Hence, a project set up in 2000 was entitled to a tariff of Rs.2.87/kWh in contrast to which, the candidate project, set up as late as in 2006, was entitled to a tariff of Rs.2.80/kWh only and that too without escalation.

Therefore, projects established before 2000 were subjected to different treatment as compared to projects, which have been established thereafter. It is for these reasons that projects set up after 2000 has been considered in the common practice analysis.

Thus, it should be evident that implementing small hydro project is not a preferred business option of government owned institutions.

Early consideration of CDM

The start date of the project activity is January 25, 2006 (the company executed agreement with civil contractor). The Board passed a resolution on 19 July 2005, wherein it recorded the need for CDM revenues to make the project financially attractive and acceptable. It was estimated by the PP that the investment required to be spent for setting up the project activity would be about Rs.960 million. Based on barriers due to weak hydrology as discussed in the Board Meeting as well as the input values from CERC for hydro projects and probable escalation in investment it was estimated that the IRR for the project would be lower below 10% and hence the need for CDM revenue. The detailed project report that was approved by the State Nodal Agency (KREDL) has firmed up the cost at Rs.971 million. The assumptions made by the PP was found to be realistic since as on March 2008 he has already spent Rs.1115 million and the project is still under implementation. The relevant Board resolution is provided as evidence.

All the steps right from obtaining licenses and permissions from various agencies, execution of power purchase agreement (August 2, 2006) and completing financial closure with banks (September 17, 2006) were taken only subsequent to the decision taken by the Board to consider CDM revenues for the project activity.

As normal with any project, it was only after accomplishing the important tasks, the PP took steps for completing CDM documentation such as approaching Govt. of India, for host country approval (08/01/07) and appointing a DOE for validation (08/03/07). Needless to add, the project runs a risk (of not getting implemented) in the absence of financial closure. The financial closure was completed only on

[15] The tariff structure and the tariff determining authority changed after the year 2000

September 17, 2006. Therefore, it was only after achieving financial closure that the CDM consultant was asked to proceed with the preparation of PDD and take necessary steps for registration of the project activity as CDM project. Hence, it was only when the consultant was ready with the PDD that the DOE was appointed.

Thus, the project satisfies sub-steps 4.a and 4.b.
Thus, all the steps specified above to determine additionality have been satisfied and the proposed CDM project activity is not the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Spatial extent

The 25 MW Perla Mini Hydel project will generate and sell power to the Karnataka grid managed by KPTCL, which is a part of the southern regional grid, comprising the states of Andhra Pradesh, Karnataka, Kerala, Puducherry, and Tamilnadu.

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For the baseline determination, project participants have taken into account CO_2 emissions from electricity generation through fossil fuel, which would be replaced due to the project activity. The spatial extent includes all plants connected physically to the southern regional electricity system to which the CDM project is connected. Power flows within the grid system exists without any significant transmission constraints. The plants in the southern regional grid can be dispatched without any significant transmission constraints. The national grid is under development in India. There are only few interregional transmission lines that generally operate at higher voltage levels and some are also based on DC circuits. Thus, there are constraints related to transmission voltages and nature of current. However, some power transfers do take place over these interregional links. Hence the neighbouring regional grids viz. eastern and western regional grids are considered as Connected Electricity system as defined in ACM0002. These definition help in determining the operating and build margins of the electricity system and to estimate the baseline emission factor of the combined margin. The above definitions are in line with the latest guidance provided by the Meth Panel. The power transferred from connected system to the project system is considered as electricity imports and from project system to connected system is considered exports. As this is lesser than 20%, the average emission rate of the exporting grid is taken into consideration to determine the CO_2 emission factor(s) for net electricity imports ($COEFi_{,j}$, imports) from the connected electricity system.

Baseline

As the project activity does not modify or retrofit an existing electricity generation facility, the baseline scenario is: electricity delivered to the grid by the project that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

The baseline emission factor (EFy) is calculated as a combined margin (CM), consisting of the sum of Operating Margin (OM) and Build Margin (BM) factors.

Central Electricity Authority have worked out baselines for various grids in India and made them publicly available i.e "**CO_2 Baseline Database**", Version 3, 15 December 07 at

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

The Emission reductions from the project activity due to displacement of grid electricity are calculated based on the net quantity of electricity exported by the project activity times the baseline emission factor of the grid. The project electricity system is defined by the spatial extent of the southern regional grid electricity system and power plants connected to the grid system and the same are considered for estimation of baseline emissions. The power flows within the region take place without any transmission constraints. Therefore, the southern regional grid system is appropriate for the project activity.

Southern regional grid consists of independent state level electricity systems including public sector undertakings that exchange significant power within the region depending on the demand. The overall power flows are managed by the SRLDC. Other regions, viz., Northern, Western, Eastern and North Eastern are connected with the Southern grid. The power inflows from and outflows to these regions would constitute imports and exports. The Southern region has considerable amount of imports in to the grid. The baseline Emission factor (including Imports) of southern region published by CEA is considered for calculation of Emission reductions due to displacement of electricity in accordance with the Baseline of ACM 0002.

According to the ACM 0002, grid emission factor is calculated as Combined Margin (CM), comprising the Operating Margin (OM) emission factor and the Build Margin (BM) emission factor. The following procedure was adopted for estimating the grid electricity emission factor:

Step 1 – Calculation of the Operating Margin
Step 2 – Calculation of the Build Margin
Step 3 – Calculation of the grid emission factor (Combined Margin)

Step 1 – Calculation of the Operating Margin

The approved consolidated methodology ACM 0002 recommends the use of dispatch data analysis as the first methodological choice. However, in India availability of accurate data on grid system dispatch order for each power plant in the system and the amount of power dispatched from all plants in the system during each hour is practically not possible. Also, still the merit order dispatch system has not become applicable and is not likely to be so during the crediting period. In view of this it is proposed to apply other choices as suggested in the ACM 0002. Since the power supplied by low cost must run power plants[16] to the southern grid during 2006-07 (28.3%) is clearly below 50%, it was decided to apply the **Simple OM method.**

In the Simple OM method, the emission factor is calculated as generation weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. The data vintage option selected is the *ex-ante* approach, where a 3 year average OM is calculated. The most recent three year CEA data published on the emission factor of southern region is considered,. The CEA baseline is derived using the following formulae to calculate simple OM.

[16] Defined as Hydro, Geothermal, wind, low cost biomass, nuclear and solar generation plants in the ACM 0002. (ref foot note 3 page 4).

$$EF_{OM,simple,y} = \frac{\sum F_{i,j,y} \times COEF_{i,j}}{\sum GEN_{j,y}} \quad (1)$$

Where:

$EF_{OM,simple,y}$ is emission factor of the Operating Margin by Simple method, in tCO_2/MWh

$F_{i,j,y}$ is the quantity of fuel *i* consumed by plant j in year y in tons of fuel *i*

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel *i* for relevant power plant *j* in the year in tCO_2/tons and

$GEN_{j,y}$ is the generation from power plant *j* in the year in MWh

Table 1: Operating Margin[17]

Most recent three years	2004/05	2005/06	2006/07
Operating Margin* (OM) in t CO_2 / GWh	1000.9	1007.9	1000.3
Average of 3 years		**1003.93**	

* including imports

Source: CDM Carbon Dioxide Baseline Data base, Version 3, 15 December 2007(www.cea.nic.in)

Step 2 – Calculation of the Build Margin

ACM 0002 offers two options for determination of build margin emission factor: *ex ante* and *ex post* determination of the Build Margin (BM). Option 1 is selected wherein the build margin emission factor is calculated *ex- ante* based on most recent information available on plants already built for sample group *m* in southern Region. This simplifies the monitoring procedures, but also offers a conservative approach of BM calculation. The sample group *m* shall be the one having higher power generation between (a) five power plants that have been built most recently and (b) the capacity additions in the electricity system that comprises 20% of the system generation built most recently. It is found that the option (b) has higher generation compared to option (a). Hence option (b) is selected.

Build Margin emission factor is determined as below:

Build Margin (BM)	**705.46**	tCO_2 / GWh

Step 3 – Calculation of the baseline emission factor (Combined Margin)

The baseline emission factor in year *y* is calculated as the simple average of the OM and BM emission factors, i.e. OM and BM are each weighted with 50%. As noted above, the resulting Combined Margin is fixed ex ante for the duration of the crediting period:

$$EF_y = w_{OM} \bullet EF_{OM,y} + w_{BM} \bullet EF_{BM,y}$$

Combined Margin (CM) Simple average of OM and BM	**854.7**	tCO_2 / GWh

[17] CEA published CO_2 data base,
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Project emissions:

The project activity is a hydro resources based power generation and there is no possibility of direct emission from power generation of project. However, the possible project emissions for a hydro power project would be based on the two basic sources as described below

- Project emission due combustion of fossil fuels in DG set
- Project emission due to import of electricity from the grid system

The following equation is used to calculate the total project emissions of the activity during the year *y*.

$$PE_y = PE_{FF,y} + PE_{EC,y}$$

Where

PE_{FFy} = Project emission due to the combustion of fossil fuels in DG set during the year *y*

$PE_{EC,y}$ = Project emissions due to import of electricity from grid system during the year *y*

Project emissions due to the combustion of fossil fuels (DG set)

The project activity would install a diesel generator of capacity 320 KVA to meet the electricity requirements during off season and for emergency requirements etc., emissions out of usage of fossil fuel (diesel) will be accounted as project emissions based on the following equation.

$$PE_{FF,y} = FF_{i,y} \cdot COEF_i$$

Where

PE_y Project emissions from combustion of fossil fuel (DG set) in the project activity during the year *y*

$F_{i,y}$ Quantity of fossil fuel type *i* combusted (DG set) during the year *y*

$COEF_i$ Carbon dioxide emission factor of the fuel type *i*

Project emissions due to import of electricity from the grid system

- The project activity may import electricity from the grid system during off season (non availability of water) and emergency situation. The electricity imports from the grid system for the purpose of project activity are accounted for project emissions. However, the import of electricity would be from the same grid system to which the project activity exports electricity.

The following equation is used to calculate the project emission from import of grid system.

Error! Bookmark not defined $PE_{EC,y} = EG_{import,y} \cdot EF_y$

Where

$EG_{import,y}$ = Onsite electricity consumption of the project activity imported from the grid system during the year *y*

EF_y = CO_2 Emission factor for the grid system during the year *y*

Leakage
As specified in ACM0002, project participants do not need to consider leakage in applying this methodology.

Emission Reductions

The emission reductions are calculated as per the following equation as specified in ACM0002.

The project activity mainly reduces carbon-di-oxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reductions ERy by the project activity during a given year y is the difference between baseline emissions (BEy), project emissions (PEy) and emissions due to leakage (Ly) as follows.

$ERy = BEy - PEy - Ly$

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	EF_y
Data unit:	t CO_2/GWh
Description:	is the CO_2 emission factor for the electricity displaced (grid) due to the project activity during the year *y* in t CO_2/GWh
Source of data used:	CEA published value. (Average of Simple operating margin (3 years) and Build margin)
Value applied:	854.7 (2006-07)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The CEA is the prime authority for Indian power sector for determining the guidelines and norms. The authority publishes all the data relevant to the Indian power sector. The CO_2 data base for Indian power sector published by CEA is made available publicly and established in accordance with the guidelines of UNFCCC. Hence, the application of data published by CEA is transparent and conservative.
Any comment:	

Data / Parameter:	$EF_{co2,i}$
Data unit:	*tCO_2/TJ*
Description:	CO_2 emission factor of each fuel type i
Source of data used:	IPCC default values / India's Initial National Communication to UNFCCC (INC)
Value applied:	Diesel : 74.1 (Source: IPCC)
Justification of the choice of data or	IPCC values have been used for diesel since no country specific data is available.

description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$Oxid_i$
Data unit:	*Not applicable (constant)*
Description:	Oxidation Factor of each fuel type *i*
Source of data used:	IPCC default values
Value applied:	Diesel : 1
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC 2006 values have been used for both fuel types since no country specific oxidation factors are available, and considering 100% fuel combustion efficiency is more conservative, since, it estimates maximum possible emissions from fuel combustion as project emissions.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline Emissions

The baseline emissions of the project activity are calculated based on the amount of electricity displaced in the carbon intensive grid system. Hence, the following formula is applied for estimation of baseline emissions.

$BE_y = EF_y * EG_y$

The anticipated electricity export from the project activity during the year *y* is 73.20, multiplied with CEA published emission factor (Combined Margin) for southern region grid 854.7 tCO_2/GWh. The resultant baseline emissions are estimated as below.

BE_y = 69.38 * 854.70 = 59,299 t CO_2

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Project emissions:

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$$PE_y = PEFF_y + PE_{EC,y}$$

Project emissions due to co-firing of Fossil fuels ($PEFF_y$)

The project emissions due to the combustion of diesel (DG set) are considered as zero for estimation of ex-ante calculations of emission reductions. However the quantity of diesel combusted in the project activity will be monitored during each year of crediting period (B.7.1) and deducted from baseline emissions, provision has been made in Section B.6.1 by providing formula to calculate project emissions. Since estimation of quantity of diesel consumption is unpredictable before the commencement of actual operation of the project and also to simplify the ex-ante calculations of emission reductions, excluding project emissions is considered reasonable.

PE_y = 0 tonnes * 74,000 kg CO_2/TJ

$PEFF_y$ = 0 tCO_2

Project emissions due to import of electricity from the grid system ($PE_{EC,y}$)

The project activity would implement the necessary equipment to import the electricity from grid system. The project activity may import the electricity from grid system during off season and/or emergency situations. For the purpose of calculating ex-ante calculation of emissions reductions, the electricity imports from the grid system are considered zero, which would simplify the emission reduction calculations. The corresponding amount of emissions from the grid electricity consumption will be estimated every year during the crediting period and deducted from the baseline emission.

$$PE_{EC,y} = EG_{import,y} \cdot EF_y$$

$PE_{EC,y}$ = 0 * 854.70 = 0 t CO_2

Total project emissions:

Project emissions (PE_y) = 0 + 0 = 0 tCO_2

Emission reductions

Emission reductions from the project activity is estimated as the difference between baseline emissions, project emissions and leakage.

$$ER_y = BE_y - PE_y - L_y$$

ER_y = 59,299 - 0 - 0 = 59,299 t CO_2

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Summary of the ex ante estimation of emission reductions are furnished below.

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission Reductions (tCO_2e)
2008-09	0	59,299	0	59,299
2009-10	0	59,299	0	59,299
2010-11	0	59,29	0	59,299
2011-12	0	59,299	0	59,299
2012-13	0	59,299	0	59,299
2013-14	0	59,299	0	59,299
2014-15	0	59,299	0	59,299
2015-16	0	59,299	0	59,299
2016-17	0	59,299	0	59,299

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2017-18	0	59,299	0	59,299
Total	**0**	**592,990**	**0**	**592,990**

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B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	GWh
Description:	Electricity supplied to the grid by the project during the year, y
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	69.38 (anticipated)
Description of measurement methods and procedures to be applied:	Measured monthly using calibrated meters and aggregated annually.
QA/QC procedures to be applied:	Meters will be calibrated as per industry standards of host country. Sales records to the grid and other records are used to ensure consistency.
Any comment:	Electric power exported to the grid will be measured by Main meter and Check meter by both AMRPPL and MESCOM as specified in the PPA and records maintained. To be cross-checked with monthly invoices or receipts of payments.

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Data / Parameter:	$EG_{Gross,y}$
Data unit:	GWh
Description:	Total quantity of Electricity generated from the project activity during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	71.5
Description of measurement methods and procedures to be applied:	Measured monthly using calibrated meters and aggregated annually.
QA/QC procedures to be applied:	The Meters used for reading the Gross electricity generation will be calibrated as per industry standards of host country (India).
Any comment:	

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Data / Parameter:	$EG_{import,y}$
Data unit:	GWh
Description:	Onsite electricity consumption of the project activity imported from the grid system during the year *y*
Source of data to be used:	On-site measurements and monthly bills
Value of data applied for the purpose of calculating	0 GWh (projected)

expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measured monthly using calibrated meters and aggregated annually.
QA/QC procedures to be applied:	The Meters used for reading the electricity imports will be calibrated as per industry standards of host country (India). The electricity bills raised by MESCOM can be used to ensure consistency.
Any comment:	Electricity imported from grid will be measured by Main meter and Check meter by both AMRPPL and MESCOM as specified in the PPA and records maintained. To be cross-checked with monthly invoices or receipts of payments.

Data / Parameter:	$FF_{i,y}$
Data unit:	*Liters per year*
Description:	Quantity of fossil fuel type *i* combusted in the project plant during year *y*
Source of data to be used:	On-site measurements and fuel issuance log books
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 (since the consumption of HSD and resultant emissions would be very low, the value is considered '0' for simplification of emission reduction calculations. However, the parameter would be monitored ex-post and used to determine the emission reductions every year during the crediting period)
Description of measurement methods and procedures to be applied:	The total quantity of HSD consumed will be measured on regular basis using dip stick/ level gauge or store issues. Hence, the total quantity of HSD procured and quantity of HSD consumed is considered for estimation of project emissions.
QA/QC procedures to be applied:	The data recorded can be cross checked against the fuel purchase receipts.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

As detailed in Section B.7.1., electricity supplied to the grid by the project activity would be monitored using calibrated meters. The project would employ latest state of art microprocessor based high accuracy monitoring and control equipment that measure, record, report, monitor and control various key parameters like electricity generation by the project, auxiliary power consumption and other process parameters. The monitoring and controls would be the part of the Distributed Control System (DCS) of the entire plant. Necessary standby meters are also provided for critical parameters. The Main and Check meters would be installed at the project site. All meters would be calibrated and sealed as per the industry practices/PPA at regular intervals. Hence, high quality is ensured with the above parameters. Sales records would be used and kept for checking consistency of the recorded data.

The Power Purchase Agreement signed by the Project Participants and the MESCOM would provide procedures for monitoring the energy fed to the grid, emergency preparedness, calibration of monitoring equipment, company's operation and maintenance responsibilities etc. The same would be adopted for GHG audits and would form part of the monitoring plan.

Further detailed Monitoring plan is furnished in Annex 4 of the PDD.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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Date of completion of the application of baseline study and monitoring methodology: 10/02/2007

Name of the responsible Entity: **Zenith Energy Services (P) Limited, Hyderabad.**

Contact information of the above entity is provided below.

Organization:	Zenith Energy Services (P) Limited
Street/P.O. Box, Building:	10-5-6/B, My Home Plaza, Masabtank,
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 028
Country:	India
Telephone:	+91- 40- 2337 6630, 2337 6631
Fax:	+91- 40- 2332 2517
E.mail:	zenith@zenithenergy.com
URL:	www.zenithenergy.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli
Mobile	+91- 9849408485
Direct Fax	+91- 40- 2332 2517
Direct Telephone	+91- 40- 2337 6630, 2337 6631
Personal E.mail	**mohan@zenithenergy.com**

The project proponent has appointed the above-mentioned as the CDM consultant and official contact entity and the same is not a project participant listed in the Annex 1 of the PDD.

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:

>>

25/01/2006

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

>>

30 years

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

C.2.1. Renewable crediting period

>>
Not chosen

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

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
15/10/2008 or from the date of registration of the project activity whichever occurs later

C.2.2.2. Length:

>>
10 y – 0 m

SECTION D. Environmental impacts

>>

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

>>
As per the prevailing regulations of the Host Party i.e. India represented by the Ministry of Environment and Forests (MoEF), Govt. of India and also the line ministry for environmental issues in India, Environmental Impact Assessment (EIA) studies need not to be conducted for the projects costing less than Rs. 1000 millions[18][19] Since the total cost of the project is only Rs.971.70 millions, the project activity doesn't call for EIA study.

Also, S.O. 1533[20], dated 14th September 2006, Ministry of Environment & Forests (MoEF), Govt. of India, states that the hydroelectric projects with less than 25 MW need not to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities. However the project activity is required to get permission from Karnataka State Pollution Control Board for setting up of the project. The project proponents have obtained necessary clearance in this regard.

[18] Sub Para (b) of Para 3, S.O. 60 (E), Environment Impact Assessment Notification, Ministry of Environment and Forests, Govt. of India dated 27th January 1994.
[19] Amendments made on 13th June 2002 vide S.O. 632 (E), Ministry of Environment and Forests, Govt. of India
[20] Page No: 10, Section 1(c), River Valley Projects, Ministry of Environment & Forests (MoEF), Govt. of India, http://envfor.nic.in/legis/eia/so1533.pdf

The project activity is not likely to have any impact on the environment either during construction phase or post project implementation. During the construction as well operation phase it would be ensured that air quality is not effected, noise levels are maintained and there is no effect on water resources, land and ecology.

D.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:

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As required for the approval from the Karnataka State Pollution Control Board (KSPCB), the project participants have conducted Rapid Environmental Impact Assessment (REIA). AMR Power Private Limited (AMRPPL) has entrusted the Centre for Symbiosis of Technology, Environment & Management (STEM), Bangalore to carry out a Rapid Environmental Impact Assessment (REIA) study of the 24 MW Perla Mini Hydel project which is summarized in Table D.1 & Table D.2 below. The objective of the REIA study is to identify, predict and assess the likely environmental impact of the Perla Mini Hydel project during its construction and operational stages. The REIA study also aims at developing an appropriate Environment Management Plan (EMP) for mitigating adverse environmental impact of the project, if any. As per the assessment of the project proponent, no negative environmental impacts would result as a result of the project activity. Documentation will be made available to the DOE for validation.

The project has already obtained approval and clearance from the KSPCB. Copy of the environmental clearance is available for validation.

Table D.1.: Construction Phase: Potential Impacts and Mitigative Measures

S. No	Environmental Components	Potential Impacts	Source of Impacts	Mitigative Measures	Remarks
1.	Air Quality	Increased SPM concentration in ambient air.	Construction equipment, vehicular traffic, excavation, concreting etc.	Vehicular check; water spraying for dust suppression.	Minor negative but temporary.
2.	Noise	Increased noise levels.	Construction equipment, various construction activities.	Equipment selection & maintenance, usage of ear plugs/muffs by the construction workers.	Minor negative impact but temporary.
3.	Water	Demand of water supply in addition to extraction from borewells. Local increase in suspended solids.	Construction equipment, concrete mixing & curing, cleaning, workers domestic needs dust suppression etc. Erosion due to excavation activities.	Equipment selection, steam curing, high pressure hose for cleaning. Plantation around site before construction. Recharge of borewell.	Minor negative impact on surface water, No impact on ground water.
4.	Land	Construction wastes, unstable slopes, soil erosion	Construction waste (excavated material)	Appropriate waste disposal measures; slope stabilization and greenbelt development.	Minor negative impact on land use, Minor negative on soil quality.
5.	Aesthetics	Land clearance, construction waste.	Construction activities and waste.	Appropriate waste disposal and greenbelt development. Alternative passages.	Minor negative.
6.	Terrestrial Ecology	Impact on top soil & existing ecosystem in the vicinity of the site.	Construction activities in a 5 km stretch.	Low noise generating equipment, soil binding vegetation, greenbelt development. Providing passages.	Minor negative and temporary.
7.	Aquatic Ecology	Change in flow, Increase in suspended	Construction activity of diversion canal, powerhouse	Providing rocky boulders/structures near the powerhouse to restore the original habitat to	Short term minor

				solids and TDS	and tailrace canal.	the extent possible.	negative impact.
8.	a.	Socio-Economic Factors	Population	No impact.	Construction jobs.	Employing local people, providing proper facilities and community services for the workers.	No impact.
	b.		Education	No impact.	None	Employing local people.	No impact
	c.		Employment	Increase in direct & indirect employment opportunities	Operational phase direct & indirect project and social requirements, development of the site as picnic spot.	Employment of local people to the extent possible.	Moderate positive.
	d.		Infrastructure Facilities & Community Services	Disturbance of existing infrastructure & community services	Construction activities.	Alternative arrangements.	No impact.
9.		Population displacement and rehabilitation.		None.	No displacement of population.	----------	No impact.

Table D.2.: Operational Phase: Potential Impacts and Mitigative Measures

S. No	Environmental Components	Potential Impacts	Source of Impacts	Mitigative Measures	Remarks
1.	Air Quality	None	Occasional vehicular movement	Green Belt development, usage of good quality fuels.	No impact
2.	Noise	Increased noise levels but below the prescribed standard.	Operation of noise generating equipment like turbines, pumps & compressors	Equipment will be provided with noise reduction measures such as acoustic barriers, vibration pads etc. Maintenance routine for the equipment. Green Belt development.	No impact.
3.	Water	None	None	Minimize water usage by water conservation, reuse of treated sewage for greenbelt irrigation. No discharge of untreated wastewater into the river. Mandatory flows shall be maintained.	No impact.
4.	Land	None	Project activities.	Development of a systematically managed green belt to maintain ecology of the area. Appropriate disposal of solid waste, garbage.	No impact on land use, No impact on soil quality.
5.	Aesthetics	Better environment	Development of project site as picnic spot.	Development of greenery and site as picnic spot.	Minor Positive impact.
6.	Terrestrial Ecology	Minor loss of trees, Obstruction to animals to access the river.	Project activities	Green belt development. Providing suitable access to river for animals.	No impact.
7.	Aquatic Ecology	Change in flow, passage for fishes.	Diversion of flow.	Mesh of appropriate size will be provided at the inlet points of the intake canal to prevent entry of fish along with water into the turbines.	Minor impact and temporary.
a.	Socio- Population	Small increase in population	Direct/Indirect job opportunities, secondary services.	Employment of local people to the extent possible.	No impact.
b.	Socio- Education	None.	None	Employment of local people to the extent possible.	No impact

8.	c.	Economic Factors	Employment	Better employment opportunities	Operational phase direct & indirect project and social requirements, development of the site as picnic spot.	Employment of local people to the extent possible.	Moderate positive.
	d.		Infrastructure Facilities & Community Services	Improvement in infrastructure facilities & community services	Operation phase project and social requirements.	---------	Minor positive
9.		Population displacement and rehabilitation		None	No displacement of population.	----------	No impact.

SECTION E. Stakeholders' comments

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

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Before implementing any project, project investors / developers need to identify the stakeholders, prepare necessary documents, approach the identified stakeholders directly and obtain required clearances / approvals. The stakeholders after review of documents and investment profile, will accord approvals / licences or send comments in writing to project investors for further clarifications / corrections. In case they are not satisfied with the project design or they feel that the project impacts any of the local environment / social / economical environments, they will not issue clearances / approvals and stop the implementation of the project.

The project promoters have conducted stakeholders meeting at the project site at Shambur Village, Bantwal Taluk, Dakshina Kannada District, Karnataka State on 18th March, 2007 and the members present were, the Managing Director of AMR Power, project advisor for AMR Power, Gampanchayat members and village populace. There were no comments from the village populace and the grampanchayat members. The Managing Director of the company assured the villagers that the company would take up all need based activities for the overall development of the village.

Identification of the Stakeholders:

The project participants identified the following stakeholders for the project activity.

Table E.1. Identified Stakeholders and their Functions

Stakeholder Name	Function of Stakeholder
Karnataka Renewable Energy Development Limited (KREDL) (www.kredl.kar.nic.in)	Policy implementation body in respect of renewable energy projects in Karnataka. KREDL reviews the project documentation and accords clearance for utilizing renewable energy sources in the state
Karnataka Power Transmission Corporation Limited (KPTCL) (www.kptcl.com)	The state owned electricity utility company that manages the electricity transmission in Karnataka state. Any electricity generation project proposed in Karnataka shall approach KPTCL for power evacuation arrangements.
Mangalore Electricity Supply Company Limited (MESCOM)	A Govt. of Karnataka undertaking, engaged in the purchase, supply and distribution of electricity. Both MESCOM and the project proponent shall sign a Power Purchase Agreement, before implementing the project.
Karnataka State Pollution Control Board (KSPCB) (www.kspcb.kar.nic.in)	A statutory local body that oversees the pollution control aspects in the state. Any project activity shall obtain clearance from the KSPCB before implementation.
Irrigation Department (www.waterresources.kar.nic.in)	Is part of Government of Karnataka and overseas utilization of water in the state of Karnataka.
Local Village Panchayat	Elected statutory body of the local populace will issue NOC for implementing any project in the jurisdiction of the panchayat.

Stakeholders' Involvements

Department of Energy

- The Department of Energy, Govt. of Karnataka has issued consent for setting up of the project initially for 2 MW vide G.O. No: **DE/294/NCE/2004** dated 13th September 2004 and later enhanced to 24 MW vide G.O. **No: 183/NCE/2005** dated 19th July 2005.

- Implementation Agreement is executed between AMRPPL and Govt. of Karnataka on 30th July 2005.

Power Purchase Agreement
The proponent has entered into Power Purchase Agreement (PPA) with Mangalore Electricity Supply Company Limited (MESCOM) vide **N0: SEE(C&RP)/EE(RA)/AO/PPC/06-07/13144-145** on 2nd August 2006.

KREDL
Karnataka Renewable Energy Development Limited (KREDL) has issued its clearance for the project vide **KRED/06/Perla/2006/1218** dated 3rd June 2006.

KPTCL
Karnataka Power Transmission Corporation Limited (KPTCL) has given the approval for evacuation of power from the project vide **No: CEE(P&C)/SEE(PLG)/EE(PSS)/AEE-1/F-270/CYS-51** dated 28th July 2006.

Pollution Control Board
The Karnataka State Pollution Control Board (KSPCB) has issued 'Consent for Establishment' to the project vide **KSPCB/RO(MNG)/EO/DEO/AEO/LG/2006-07/30** dated 12th April 2006.

Fisheries Department
The project has obtained the clearance from Department of Fisheries, Govt. of Karnataka on 15th February 2006.

Gram Panchayat
The project has obtained 'No Objection Certificate (NOC)' from local village panchayat on 21st January 2006.

Financial Closure
The proponent has achieved financial closure with State Bank of India, Industrial Finance Branch, Hyderabad on 17th August 2006, with State Bank of Mysore, Industrial Finance Branch, Hyderabad on 7th September 2006 and with State Bank of Hyderabad, Overseas Branch, Hyderabad on 17th September 2006.

E.1.C.: Stakeholders' Comments
The project participants have already consulted and approached the above stakeholders for implementation of the project. No negative comments have been received from them. Necessary clearances / approvals have already been released in favour of the project.

Also, the local stakeholders meeting shall be competed before submitting the proposed project activity to a DOE for validation.

E.2. Summary of the comments received:

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No comments have been received on the project.

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

>>

No comments have been received; hence, no action taken report is applicable

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AMR Power Private Limited
Street/P.O. Box:	Plot No: 1071, Road No.44, 91 Jubilee Hills,
Building:	
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	560 037
Country:	India
Telephone:	+91- 40- 32915858
Fax:	+91- 40- 2355 5503
E-Mail:	cpurushotham@greenkogroup.com
URL:	
Represented by:	
Title:	Vice President
Salutation:	Mr.
Last Name:	Choppakatla
Middle Name:	
First Name:	Purushotham
Department:	
Mobile:	
Direct Fax:	+91- 40- 23555503
Direct Tel:	+91- 40- 32915858
Personal E-Mail:	cpurushotham@greenkogroup.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project does not propose to receive any public funding from the Official Development Assistance (ODA) or other funds provided by any Annex I countries.

Annex 3

BASELINE INFORMATION

The detailed baseline information are furnished in section B of PDD.

Annex 4

MONITORING INFORMATION

This monitoring plan is designed for the 25 MW Perla Mini Hydel project which is being implemented in Karnataka, India and this monitoring plan describes about the monitoring organisation, parameters and variables, monitoring practices, QA and QC procedures, data storage and archiving etc. Project participants would implement this monitoring plan right from the start of the implementation of the project.

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Monitoring Structure

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data would rest with the Board of Directors who might delegate the same to the General Manager or an internal auditor.

The primary responsibility for the data measurement as per the monitoring plan would be carried out by the General Manager and necessary reports would be generated for the management i.e., Board of Directors or its committee for review.

The management would review the data collected with reference to the criteria determined in the Monitoring Plan and also suggest corrective actions wherever required. Management would also examine the internal audit reports independent of the Plant Manager's report. Management would in particular take note of deviations in data over the norms and monitor that the corrective actions have resulted in adherence to the standards. It would also be the responsibility of General Manager to report to the management about the compliance of management's instructions on corrective actions.

The company would introduce an internal audit system for the GHG compliance. The internal auditor appointed for the purpose would be an individual already working in the hydro power plant and would be imparted with necessary expertise for conducting GHG audits The person so appointed as an internal auditor would be given clear instructions about his scope of work and reporting requirements. He would carry out the GHG audit on quarterly basis or as required by the monitoring plan. His report would indicate the compliance requirements and achievements. He would work directly under the control of the Board of Directors and all his reports would be addressed to the Board directly. The internal auditor in particular would report any non-compliance of corrective actions by the operating staff to the management.

Metering and Communication

Metering

The delivered energy would be metered by the Parties at the high voltage side of the step up transformer installed at the project site.

Metering Equipment

Metering equipment would be electronic trivector meters of accuracy class 0.2 % required for the Project (both Main and Check meters). The Main meter would be installed and owned by the company, whereas the Check meter would be installed and owned by the MESCOM as per the provisions of power purchase agreement. Dedicated core of both CT's and PT's of required accuracy would be made available by the company to MESCOM during the first week of every month. The metering equipment would be maintained in accordance with electricity standards. Such equipment would have the capability of

recording half hourly and yearly readings. The company would provide such metering results to MESCOM.

Meter Readings
The monthly meter readings (both Main and Check meters) would be taken jointly by the Parties on the first day of the following month as per the practice of MESCOM. At the conclusion of each meter reading an appointed representative of the MESCOM and the Company would sign a document indicating the number of kilowatt-hours indicated by the meters.

Inspection of Energy Meters
All the Main and Check energy meters (export and import) and all associated Instrument Transformers installed at the project would be of 0.2 % accuracy class. Each meter would be jointly inspected and sealed on behalf of the Parties and would be interfered with by either party only in the presence of the other Party or its accredited representatives.

Meter Test Checking
The Main and Check meters would be tested for accuracy as per the requirements of MESCOM provided in the power purchase agreement. The portable standard meter would be owned by MESCOM at its own cost and expenses and tested and certified at least once every year against accepted laboratory standard meter in accordance with the electricity standards. The meters would be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 % accuracy class. The consumption registered by the main meters alone would hold good for the purpose of billing as long as the error in the main meter is within the permissible limit.

Interconnection and Metering facilities
The company would provide dedicated core for the check metering. Both the main meter and the check meter would be installed nearest to the PT in the outdoor yard and would be housed in a suitable weatherproof cubicle.

Communication Facilities
The company would install and maintain at its communication facilities such as fax and telecommunication facilities to the project to enable receipt of data at the Load Dispatch Centre.

Parameters Requiring Monitoring

This monitoring plan requires monitoring of all parameters indicated in section B.7.1 of the PDD. Necessary documents required for verification of the data will be maintained for later archiving. Using the power exported to the grid, and also consumption of diesel for DG set operation, emission reductions will be estimated as illustrated in Section B.6.3. Emission reductions generated by the project will be monitored at regular intervals.

Methodology adopted for determining baseline emission factor is the **combined margin emissions** of the generating mix in the Southern regional grid system, which will represent the intensity of carbon emissions of the grid system. The baseline emission factor is adopted from the "CO_2 Baseline Database" published by CEA for the latest available year for the Southern grid and the same is used for the future projections; although this will be reviewed each year based on data published by CEA. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

QA and QC Procedures

The project would employ latest state of art microprocessor based high accuracy monitoring and control equipment that measure, record, report, monitor and control various key parameters like generation by the project, auxiliary consumption and other process parameters. The monitoring and controls would be the part of the Distributed Control System (DCS) of the entire plant. Necessary standby meters are also provided for critical parameters. The main meter and check meter would be calibrated and sealed as per the industry practices/PPA at regular intervals. Hence, high quality is ensured with the above parameters. Sales records would be used and kept for checking consistency of the recorded data.

The baseline emission factor is taken from CEA published data. Hence, quality control of the data is not under the control of project proponent and no QA/QC procedures are applicable.

Leakage Monitoring

The project activity is a renewable energy type and it utilizes flowing water for power generation and it does not involve any GHG emissions. No leakages are involved in the project activity.

Data Storage and Archiving

All the above parameters monitored under the monitoring protocol would be kept for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later.

The monitored data would be presented to the DOE to whom verification of emission reductions has been assigned.

Necessary formats / tables / log sheets etc. would be developed by the project participants for monitoring and recording of the data and would be made part of the registered monitoring protocol.

Procedures for handling emergencies in the project:

Plant will employ the complete fire hydrant systems and fire extinguishers. Security personnel and plant staff will be given extensive training on using of these equipments. The training will be provided by fire safety equipment suppliers.

The operating personnel will be trained in handling emergency situations. Whenever any alarming situation occurs in electrical / electronic equipments, the operating personnel are instructed to shut down the system immediately and they are required to operate fire extinguishers (such as dry foam) to control the fire.

Mitigation measures in post emergency scenario

Since the project is a hydro electric plant, the only possible emergency situation is due to fire in the control room, which is handled by fire extinguishers such as CO_2 cylinders, the pollution effect on the environment will be negligible. Hence, no specific post emergency measures are proposed, expect refreshing the air in the control room.