CDM – Executive Board

CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Title: 5 MW Upper Awa small hydroelectric project, Himachal Pradesh, India

Version: 6, 17th July 2007

A.2. Description of the small-scale project activity:

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The purpose of the project activity is to generate electricity using hydro potential available in Awa Khad, a tributary of river Binwa in Beas basin of Kangra District of Himachal Pradesh. The generated electricity will be exported to Himachal Pradesh State Electricity Board (HPSEB), a state owned power utility looking after electricity generation, transmission and distribution.

The gross annual generation from the proposed power plant is 26.28 GWh and the annual export to the Northern Regional grid is 24.18 GWh. The power generation is carried out through sustainable means without causing any negative impact on the environment and in the process supports climate change mitigation as it leads to emission reductions of 17,480 tonnes of CO_2eq. over the crediting period of 10 years.

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

Ministry of Environment and Forests (MoEF), Government of India, has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects.

1. **Social well being**
2. **Economic well being**
3. **Environmental well being**
4. **Technological well being**

The project activity contributes to the above indicators in the following manner.

- The project activity is proposed in rural area, where mostly tribals are living who is engaged in seasonal agricultural activities. This area is lacking proper medical facilities and dependable power supply. By setting up of the small hydro project in the rural area, power supply is not only improved, and will also lead to the creation of infrastructure in the area, which can be utilized by the villagers. This may leads to improving the quality of life of the local communities.

- *The project leads to alleviation of poverty by generating direct and indirect employment during construction as well as operational lifetime of the project to the local population.*

- Since the proposed project gives employment opportunities to both genders of population, which will not only improve the gender equity among the peoples but also reduces the migration of rural peoples to urban areas.

- With rising hydropower generation and improving efficiencies in distribution of electricity, the project activity offer energy at stable prices for industrial development of the state.

- The project will bring in additional investment to the region which gives financial returns to the local entities which otherwise would not happen in the absence of the project.
- The proposed project will also result in a positive impact on balance of payments due to reduced dependence on imported coal and other fossil fuels.
- The project is a run of the river scheme, which does not involve any impounding of water. Hence neither submergence will occur nor is rehabilitation activity needed.
- Since the project utilizes only hydro potential available in the river for power generation and not any other fossil fuels, the project does not lead to any GHG emissions. Thus the project doesn't have its influence on the microclimate of the region and reduce global warming impacts.
- The construction of the project activity neither alters nor contributes to rising of water level in the stream. Further the project proponent is required under the rules of Government to maintain minimum flow into the stream to maintain local flora and fauna, if any.
- The project will result in utilization of environmentally safe and sound technology in small hydroelectric projects. Further the project demonstrates the harnessing the hydro potential and setting up such new projects in unused watercourses.

The above benefits due to the project activity ensure that the project is contributing to the sustainable development of the region.

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 applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	**Private Entity:** Astha Projects (India) Limited, Hyderabad	No.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

>> India

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

>> State : Himachal Pradesh

A.4.1.3. City/Town/Community etc:

>>
District: Kangra
Tehsil : Palampur
Village : Kalani

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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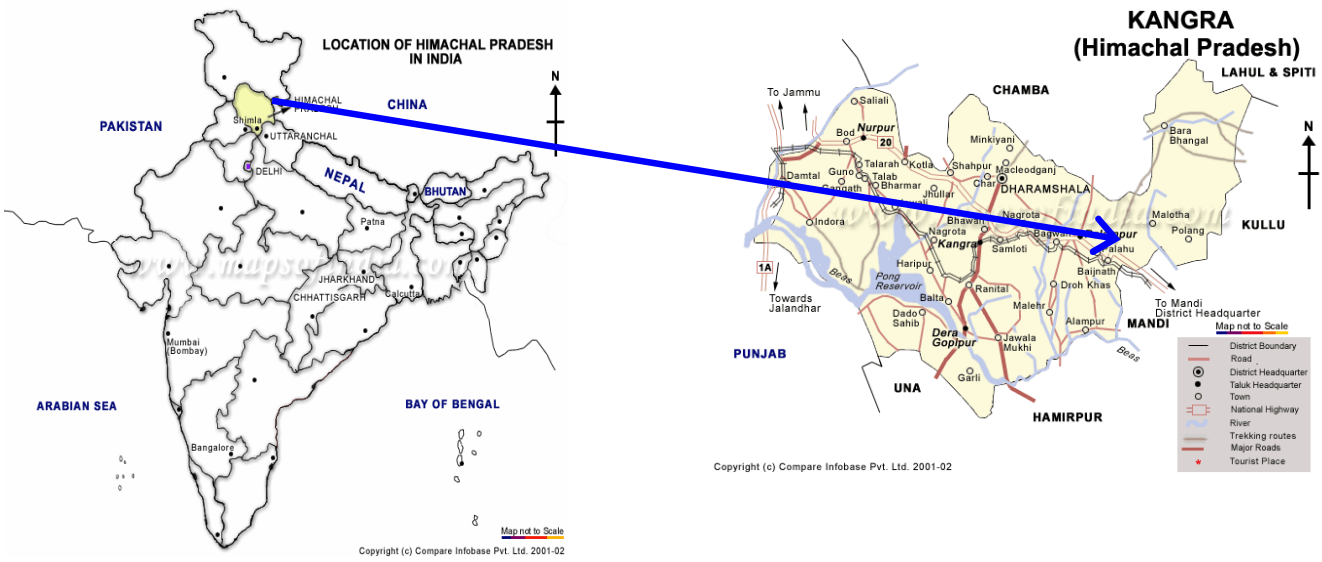
The Upper Awa small hydroelectric project is a run-of-the river scheme for power generation on Awa Khad, a tributary of river Binwa in Beas basin. The project is located near village Kalani, Palampur Tehsil, Kangra District of Himachal Pradesh. The road access to the project site is available up to village Spadeu from Palampur and from there an approach road is required to be constructed to reach the project location. Palampur is about 118 kms from Pathankot, 220 kms from Shimla, the state head quarters. The nearest railway station is 16 kms away at Maranda. The geographical location of the project is between longitude 76^0 35' & 76^0 36' East and latitude 32^0 8' & 32^0 9' North.

The location maps of the project are furnished below:



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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According to Appendix B to the simplified modalities and procedures for small-scale CDM project activities the project activity falls under Type I, Renewable energy projects since the project activity is utilising hydro as the main energy source for electricity generation and the generated electricity is being exported to the regional grid system, the applicable category is I.D., Grid connected renewable electricity generation.

Accordingly, the applicable methodology for the project activity shall be AMS I.D., Version 10, Scope 01, 23 December 2006, which includes hydro for electricity generation for a grid system.

Technical details of the project activity

The technology is converting the potential energy available in water flows into mechanical energy using hydro turbines and then to electrical energy using alternators. The generated power will be transformed (stepped-up) to match the nearest sub-station voltage level for interconnection and smooth evacuation of power.

No technology transfer is envisaged for the CDM project activity.

The proposed project activity shall use the potential energy in a flowing river by diversion weirs for running Pelton Turbines to generate power. The project will utilise height drop of 518 meters. The components involved in the hydro electric scheme consists of construction of a raised drop type trench weir across the stream at elevation, intake chamber, desilting chamber, power channel in the form of cut and cover type, fore bay, penstocks, power station and the tailrace canal discharging water back into the river. Power will be generated at a lower voltage, which will be stepped up to higher voltage level within the project boundary to facilitate export of power to Himachal Pradesh State Electricity Board (HPSEB). The powerhouse is equipped with two Pelton wheel turbine shafts with 2.5 MW each, generates power at voltage of 3.3 kV and will be stepped up to 33 kV before wheeling to the transmission line. The annual export to the Northern regional grid is 24.18 GWh from the project.

Brief technical details of the project design are stated below:

Hydrology	
Catchment area at diversion site	18 sq. kms
Design Discharge	1.14 cumecs
Gross head	528 m
Net rated head	518 m
Plant Equipment	
Type of hydro turbine	Pelton Wheel
Type of generator	Synchronous, Brushless
No. of generating units	2
Capacity of each generating units	2500 kW
Generation voltage	3.3 kV
Grid interfacing voltage	33 kV
Frequency	50 Htz

Energy Production	
Gross Energy	26.28 GWh
Auxiliary Consumption (8 %)	2.10 GWh
Net Energy Export to Grid	24.18 GWh

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

>> The project activity will export 24.18 GWh/annum to the Northern Regional grid after auxiliary consumptions from the installed capacity of 5 MW. The average estimated amount of emission reductions are 17480 tCO_2 eq. per annum and it is calculated as 174,800 tCO_2 eq. for the whole chosen crediting period of 10 years.

Year wise generation of emission reduction during the crediting period is shown below.

Year	Period	Annual estimation of emission reductions (tCO_2 eq.)
1	2008	17480
2	2009	17480
3	2010	17480
4	2011	17480
5	2012	17480
6	2013	17480
7	2014	17480
8	2015	17480
9	2016	17480
10	2017	17480
Total Emission reductions (tonnes of CO_2 eq.)		**174,800**
Total number of crediting years		**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 eq.)		**17,480**

In the above table the year 2008 corresponds to 01.01.2008 to 31.12.2008. Similar interpretation shall apply for remaining years.

A.4.4. Public funding of the small-scale project activity:

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No public funding from Annex-I Party is involved in this project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project proponent hereby confirms that the project activity is neither debundled one of a larger project activity nor bundled to form a large scale project activity (> 15 MW). The proposed small-scale CDM project activity is of 5 MW capacity (2 x 2.5 MW) and PDD is developed for this capacity.

The project proponent further confirm that they have not registered any small scale CDM activity or applied to register another small scale CDM project activity within 1 km of the project boundary, in the same project category and technology/measure in the previous 2 years.

SECTION B. Application of a baseline and monitoring methodology

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

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Title : Type I, Renewable Energy Project.
Reference : I.D. Grid connected renewable electricity generation
Version : 10, Scope : 01, Date : 23 December 2006

B.2 Justification of the choice of the project category:

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The proposed project activity is a 5 MW, hydro electric based power project. The project activity is eligible to use the methodology since project activity generates and exports the renewable electricity to a grid system i.e. dominated by thermal energy sources. The capacity of the project activity is well below the qualifying limit project activities under the small scale methodology AMS.I.D i.e. 15MW. Hence, AMS.I.D 'Grid connected renewable electricity generation' is applied for the proposed small scale project activity.

Since, the capacity of the proposed CDM project is only 5 MW, which is well below the qualifying capacity of 15 MW, the project activity is small scale CDM project activity and UNFCCC indicative simplified modalities and procedures can be applied.

The water and power studies carried out for this project demonstrated that the project activity will remain under the limits of SSC throughout the crediting period. To determine the capacities of the power plants two important inputs are required namely the head available and discharge of water in the stream. The hydrology studies carried out for the stream has revealed that the capacity of power generation cannot exceed 5 MW. Further, the power generation capacity of the project activity is limited by the installed capacity of the generator installed in the plant. Hence, the project participant affirms that the capacity of the project would remain as 5 MW and would be within the limits of small scale through out the crediting period.

B.3. Description of the project boundary:

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In accordance with AMS I.D Ver. 10, the project boundary encompasses the physical, geographical site of the renewable generation source.

The project boundary is therefore the physical boundary around the diversion structure, desilting tank, headrace tunnel, fore bay, powerhouse, tailrace and the transmission system till the evacuation point. The power generated from this project is metered and accurately quantifiable.

In addition, the project boundary also includes the connected electricity system, i.e. the Indian northern grid, for the purpose of determining the baseline emission factor for displaced grid electricity. The northern grid covers the Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttaranchal and Chandigarh.

B.4. Description of baseline and its development:

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As per the Para 9 of methodology I.D. Version 10, the baseline emissions are calculated based on the net energy provided to the grid (in GWh /yr) by renewable generating unit, and an emission factor for the displaced grid electricity (in tCO_{2equ} /GWh). The methodology provides following approaches for baseline calculations.

As per paragraph 9 of AMS I.D, it requires that baseline emission factor will be calculated in a transparent and conservative manner based on either

a) Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM 0002.

OR

b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

The project proponent has opted for approach 'b' i.e. weighted average emissions.

Calculation of the baseline emission factor

As explained earlier, the baseline for the project activity is kWh produced by the hydroelectric projects multiplied by an emission co-efficient calculated in a transparent and conservative manner as the weighted average emissions (in kgCO_2/kWh) of the current generation mix of the Northern Region. For this purpose, the generation data published by Central Electricity Authority for the Northern Region was used. Baseline emissions were estimated as explained below.

i : Estimation of emissions from each power generating unit in the baseline

Emissions from each fossil fuel source are estimated using the following formula.

Station Emissions	**=**	**Actual Generation**	**x**	**CEF for fuel**	**x**	**Net Heat Rate**	**x**	**Conversion Factor**	**x**	**Oxidation factor**
tCO_2		**GWh**		**tC/TJ**		**TJ/ GWh**		**(44/12)**		

For the estimation of emissions from each power generating unit in the grid, actual generation data monitored and published by Central Electricity Authority is used. IPCC default emission factors are used for CEF of each fuel type. Since, collecting heat rates for all baseline power generating stations is difficult, only net heat rates as specified by the CEA are considered. This is conservative and reasonable for a small-scale project activity whose generation is negligibly small compared to the total generation of the grid system.

Oxidation factor are used from Revised IPCC 1996 guidelines - default emission factor.

Using the above formula, emissions from each power generating source are estimated. For non-fossil fuel sources such as hydro, wind and nuclear, GHG emissions are not applicable.

ii : Total grid emissions

Total emissions from all stations in the grid are estimated by summation of emissions from all baseline power generating units.

iii : Estimation of baseline emission coefficient

The baseline emission coefficient for the grid is estimated as the weighted average of all existing generation sources using the following formula.

Baseline Emissions Coefficient	=	Total grid emissions/	Total net energy in the system	
tCO_2/GWh		tCO_2	/	GWh

Using the above formula and data for the year 2005-2006, the baseline / emission coefficient is estimated as 723 tCO_2 /GWh. The detailed data underlying this calculation is furnished in the Annex-3.

However the key information and data used to determine baseline scenario (variables, parameters, data sources etc) are listed in the following table.

Table B.1 Key information and data used to determine baseline scenario

Key Parameter	Value	Data Source	Website
Power generation	Power generated by all sources including hydro, wind, nuclear.	All related authentic sources like CEA, Ministry of Power, Govt. of India.	www.cea.nic.in www.powermin.nic.in
CEF for fuel	Carbon Emission factor for each fuel type	Revised 1996 IPCC Guidelines provides default emission factors for fuels	www.ipcc.ch/
Fuel Type	Type of fuel used for individual plant	Ministry of Non-conventional Energy Sources, Govt. of India	www.mnes.nic.in
Oxidation factor	Oxidation factor for each fuel type	IPCC provides default Oxidation factors for fuels.	www.ipcc.ch/
Net heat rate	Net heat rate of individual power plants	CEA and MNES	www.cea.nic.in www.mnes.nic.in
EFy	Baseline emission factor for the project grid	Calculated for power plants in the northern	------

		regional grid	
EGy	Power export to the grid per annum.	Will be taken from plant and HPSEB records.	------

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 small-scale CDM project activity:

A. *Justification for application of simplified methodology to the project activity*

The capacity of the proposed project is 5 MW and the project activity is generation of electricity for a grid system using hydro potential. Hence, the type and category of the project activity meets the criteria specified under I.D. in Appendix B of the indicative simplified baseline and monitoring methodologies for small scale CDM project activities as well as those related to demonstration of additionality for small-scale activities (Attachment A to Appendix B).

B. *National Policies and Circumstances*

B.1 National policy on Coal, Lignite, Oil and Natural Gas

The Ministry of Power (MoP), Government of India has set an agenda of providing power for all by the year 2012. To meet the present national deficit of 8.4 %[1] and to achieve the above target, about 100,000 MW of new capacity needs to be added by the end of 2012 to the existing installed capacity of 126,089[2] MW. In line with the Five Year Plan system being followed by the Planning Commission of India, the MoP decided to add about 46,000 MW during the period 2002-2007 and about 61,000 MW during the period 2008-2012. Emphasis has been laid on setting up large pithead stations to avoid high costs associated with transporting high ash bearing Indian coal and over-straining the already stretched rail network.

`To push forward the power sector reforms further, the Government of India has opened up the coal sector for private participation. Captive coal mining is allowed by the Ministry of Coal, Govt. of India to facilitate coal mining by power generating units for their fuel needs. In addition, coal imports are allowed for power projects. This has significantly strengthened the preference of the private sector for coal-based mega power projects over other energy sources.

The Govt. of India has also opened oil and natural gas exploration for private sector participation. In the oil and natural gas sector, both central sector and private sector organisations are involved and already exploring the potential available in India..

B.2 Hydropower Policy in India and Himachal Pradesh

The grid electricity in India today is clearly dominated by thermal generation, predominantly coal. The overall nationwide mix of thermal to hydroelectric power has deteriorated in the past five decades and stands currently at around 83:17[3] (Source www.cea.nic.in as on March 2006).

[1] Page No: 3, Actual Power Supply Position, Central Electricity Authority, Govt. of India, www.cea.nic.in

[2] Page No. 3, Power Scenario at a Glance as on 30th June 2006, Central Electricity Authority, www.cea.nic.in

[3] http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_06_03.pdf

The National Policy on Hydropower Development provides for exploitation of untapped potential located in the Northern and North Eastern States. MoP has developed appropriate strategies to fully exploit the country's hydro potential and accords high priority for its development. MoP has identified some of the potential sites for hydropower development. However, the focus of these initiatives is clearly on large and medium-sized projects (Refer Table B.2).

The levels of industrialisation and power consumption in Himachal Pradesh are relatively low. The state is an important net exporter of electricity within the Northern Grid.

Power generation in Himachal Pradesh is today based exclusively on hydro power. Most of this generation comes from large stations with installed capacities between 100 and 1,500 MW. The total installed capacity of hydro power in the state was 1,471.9 MW as on 30th June 2006[4]. Among this, only 89.5 MW[5] were small hydro schemes with a capacity below 25 MW

Likewise, the capacity additions in Himachal Pradesh in the 10th plan and 11th plan periods are exclusively focused on hydro. Table B.2 provides a breakdown of the capacity additions in the 10th plan and their status. The plan does not include any small hydro schemes in the state, except one unit of 8.7 MW.

B.3 HIMURJA Policy

Himachal Pradesh Energy Development Agency (HIMURJA) is the nodal agency of Government of Himachal Pradesh for development of hydro projects. HIMURJA's main objective is to promote projects less than 5 MW in order to exploit hydro potential and to harness clean form of energy by involving private sector participation. HIMURJA has framed elaborated guidelines for allotment of projects to the private investors and every investor would like to set up a small hydro project in the state has to follow meticulously the guidelines framed.

HIRMUJA has so far signed implementation agreement for about 64 projects for a total capacity of 186.35 MW. Out of these projects only 10 projects with a total capacity of 22.35 MW have been commissioned[6]

[4] Page No: 15, Power Scenario at a Glance for Himachal Pradesh, Central Electricity Authority, www.cea.nic.in

[5] Himachal Pradesh State Electricity Board, www.hpseb.com/hydro_potential.htm

[6] www.himachal.nic.in/himurja/ongprojects..html

Table B.2 Capacity Addition during 10th Plan (As per Planning Commission target for the state – Himachal Pradesh). Source: www.cea.nic.in

Project Name	Type	Status	Installed Capacity (MW)	Capacity Addition During Xth Plan (MW)	Benefits Shares of state (MW)	Commissioned/ slipped during 2002-2007	(MW)	Last Unit Commissioning Date/ (Likely Date of Commissioning)
CENTRAL-SECTOR								
NATHPA JHAKRI	H	S	1500.00	1500.00	547.00	COMM	1500.00	31.03.2004
TEHRI-ST-I	H	S	1000.00	1000.00	28.00			(JUNE,2006)
DHAULIGANGA	H	S	280.00	280.00	10.00	COMM	280.00	17.10.2005
DULHASTI	H	S	390.00	390.00	14.00			(JULY,2006)
CHAMERA-II	H	S	300.00	300.00	47.00	COMM	300.00	26.02.2004
TEHRI ST II PSS	H	S	1000.00	1000.00	28.00	SLIP	1000.00	(2009-2010)
KOTESHWAR	H	S	400.00	400.00	11.00	SLIP	400.00	(2007-2008)
RIHAND -II	T	S	1000.00	1000.00	33.00	COMM	1000.00	24.09.2005
SEWA ST.II	H	C	120.00	120.00	4.00	SLIP	120.00	(2007-2008)
RAMPUR	H	N	400.00	400.00	62.00	SLIP	400.00	(2010-2011)
UNCHAHAR III	T	N	210.00	210.00	8.00			(JULY,2006)
DADRI II	H	N	490.00	490.00	16.00	SLIP	490.00	(2011-2012)
BARSINGSAR LIGN	T	N	500.00	250.00	8.00	SLIP	250.00	(2009-2010)
KAHALGAON-II	T	C	1320.00	660.00	13.00	SLIP	160.00	IN ADD PROJ.
BARH	T	C	1980.00	660.00	20.00	SLIP	660.00	(2009-2010)
NORTH KARANPURA	T	N	1980.00	660.00	18.00	SLIP	660.00	(2011-2012)
TALA REPLACE.	T	S	1020.00	1020.00	52.00			(2006-2007)
CENTRAL-SECTOR TOTAL:-					919.00			
STATE-SECTOR								
LARGI	H	C	126.00	126.00	126.00			(MAY,2006)
KASHANG-I	H	N	66.00	66.00	66.00	SLIP	66.00	(2010-2011)
SMALL HYDRO	H	S	8.78	17.00	17.00			
STATE - SECTOR TOTAL:-					209.00			
PRIVATE-SECTOR								
BASPA-2 *	H	S	300.00	300.00	300.00	COMM	300.00	27.05.2003
DHAMVARI SUNDA	H	C	70.00	70.00	70.00	SLIP	70.00	(2010-2011)
PRIVATE-SECTOR TOTAL:-					370.00			
GRAND-TOTAL:-					1498.00			

C. Additionality

Under UNFCCC simplified modalities, project activity should seek to establish additionality of the project activity as per Attachment A to Appendix B, which lists various barriers, out of which at least one barrier shall be identified due to which the project would not have occurred any way. Project participant identified the following barriers for the proposed project activity.

C.1.: Prevailing practice

In the Indian power sector, the common practice is investing in only medium or large scale fossil fuel fired power projects, which is evident from a host of planned projects that comprises mostly large-scale fossil fuel based power generation projects throughout India. This is mainly due to the assured return on investment, economies of scale and easy availability of finances. This is also true in the Northern Region also.

There are three main indicators proving that investment in small hydro power (defined as plants with a capacity not exceeding 25 MW) is currently neither a common practice in India nor in Himachal Pradesh:

- The total contribution of small hydro to the overall power supply is very small
- The available potential for small hydro has only been tapped to a small degree
- The few small-scale hydro plants existing in the project region (Himachal Pradesh) are different from the proposed project with respect to capacity.

Each of these indicators is analyzed in more details below.

A particular activity can be considered as common practice unless that activity is practiced to a reasonable extent. In order to demonstrate that proposed project activity i.e. generation of electricity through a small hydro project of 5 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 Northern region as well as in the State Himachal Pradesh in relation to the total installed capacity of power generation.

a) Contribution of small hydro to total power supply

The total installed capacity of power projects in India is 126,089 MW MW[7]. Against this small hydro projects in operation in India is 1,748 MW, giving an idea of the contribution of small hydro projects in the total power generation at 1.39%, which is negligible. This percentage is only related to the installed capacities. It is a well known fact that plant load factor of the small hydro projects are always less, some times as low as below 30%, compared to approx. 70 – 90% for the thermal plants.

In the Northern region, the total installed capacity of power plants is 33,957.1 MW[8] against small hydro installations of 525.72 MW[9]. This corresponds to a share 1.55% for small hydro, indicating that small hydro projects account only to a negligible % of 1.55% of total generation in the Northern region. Out of the total installations of small hydro in Northern region, the contribution of Himachal Pradesh is to an extent of 112.2 MW[10] as per HPSEB or 0.26% of the total capacity of power plants in the Northern region.

Another interesting fact is that the installed capacity of hydro projects, basically large projects in India is 32,326 MW[11] against an installed capacity of small hydro projects to an extent of 1,748 MW[12] accounting for about 5% of the total hydro capacity.

b) Tapping potential for Small Hydro

Even in Himachal Pradesh, against the estimated total hydro potential of 20,400 MW, the potential for small hydro projects (below 25 MW) are less than 750 MW[13]. However, the total installed capacity of small hydro power plants are only 112.2 MW and out of which 89.5 MW were constructed by the state owned i.e HPSEB over several years. The remaining was established under the HIMURJA program;

[7] Page No:3, Power Scenario at a Glance, Central Electricity Authority, www.cea.nic.in

[8] Page No: 7, Power Scenario at a Glance for Northern Region, Central Electricity Authority, www.cea.nic.in

[9] Page No: 53, Table 9.2, Annual Report 2005-06, Ministry of Non-conventional Energy Sources, Govt. of India

[10] Himachal Pradesh State Electricity Board, www.hpseb.com/hydro_potential.htm

[11] Power Scenario at a Glance 2006, Central Electricity Authority, www.cea.nic.in/Planning

[12] Annual Report 2004-05, Ministry of Non-Conventional Energy Sources, www.mnes.nic.in/annualreport-04-05

[13] Himachal Pradesh State Electricity Board, www.hpseb.com/hydro-potential.htm

partly as CDM activities (see details below). This means that the existing potential for small hydro in the state has only been tapped to an extent of about 15% over several years, despite the relatively long history of hydro power technology.

c) Analysis of existing plants in the state

The small hydro projects of HPSEB in operation are provided in Table C.1. The analysis shows that the majority of these projects were commissioned well before the year 2000. Given the public ownership and mandate of HPSEB, these projects cannot be directly compared with the proposed project activity. Today the focus of HPSEB is clearly on large-scale hydro projects of several hundred MW. Hence implementation of small-scale project such as the proposed project cannot be considered a common practice of HPSEB:

Table C.1. Details of small hydro projects in operation in Himachal Pradesh

S.No	Name of the Project	River/Khad	Owner	Commiss. Date	Capacity (MW)
	Yamuna Basin				
1	Andhra	Andhra	HPSEB	1987	16.95
2	Gumma SHP	Gumma Khad	HPSEB	2000	3.00
	Total:-				**19.95**
	Satluj Basin				
3	Rongtong	Rongtong	HPSEB	1986	2.00
4	Rukti	Rukti	HPSEB	1979 & 1980	1.50
5	Nogli Stage-I	Nogli	HPSEB	1963, 1969-70, 1974	2.50
6	Chaba	Nauti	HPSEB	1912 & 1919	1.75
7	Ganvi	Ganvi khad	HPSEB	2000	22.50
	Total:-				**30.25**
	Beas Basin				
8	Binwa	Binwa	HPSEB	1984	6.00
9	Baner	Baner	HPSEB	1996	12.00
10	Gaj	Gaj	HPSEB	1996	10.50
	Total:-				**28.50**
	Ravi Basin				
11	Gharola	Gharola	HPSEB	1975	0.05
12	Bhuri Singh P/House		HPSEB	in operation	0.45
13	Sal-II	Ravi	HPSEB	2000	2.00
14	Holi	Ravi	HPSEB	2004	3.00
	Total:-				**5.50**
	Chenab Basin				
15	Sissu	Sissu	HPSEB	in operation	0.10
16	Billing	Billing	HPSEB	in operation	0.20
17	Shansha	Shansha	HPSEB	in operation	0.20

18	Thirot	Thirot	HPSEB	1995-96	4.50
19	Killar	Mahal	HPSEB	1995-96	0.30
	Total:-				**5.30**
	G. Total				**89.50**

(Source: Himachal State Electricity Board, www.hpseb.com)

Apart from the above projects owned by HPSEB, HIMURJA also has facilitated implementation of small hydro projects with private participation. The list is furnished in Table C.2 below. As could be seen from the list, the projects which are comparable with the proposed project activity in terms of capacity, are already registered for CDM. The few existing projects are not necessarily comparable with projects in the range of 5-25 MW, since they involve much lower level of financial and construction barriers.

Therefore, it is justified to say that small hydro projects of the proposed type are not a common practice in the region, which presents a significant barrier.

Table C.2. List of hydropower projects under HIMURJA[14]

S. No	Name of the Project	Capacity
1	Raskat	0.8 MW
2	Titang	0.9 MW
3	Dehar* [15]	5 MW
4	Maujhi* [16]	4.5 MW
5	Ching	1 MW
6	Manal	3 MW
7	Aleo* [17]	3 MW
8	Manjhal	1 MW
9	Baragran	3 MW
10	Salag	0.15 MW
	Total	**22.35 MW**

(Note: * Project activities which are registered with CDM Executive Board)

C.2. Investment Barriers

The area where the project is proposed is an under-developed area requiring development initiatives. There are no infrastructures or proper amenities for the local people. There is no access available to reach the project location. Approach road is being constructed for a length of 4.5 kms from the village upto power house. Since the head available for the project is very high at 550 m and since there is no access to reach weir site as well as water conductor system, a rope way is proposed for movement of civil

[14] www.himachal.nic.in/himurja/ongprojects.html

[15] Reference No: 0035, 18th July 2005, http://cdm.unfccc.int/Projects/registered.html

[16] Reference No: 0098, 6th November 2005, http://cdm.unfccc.int/Projects/registered.html

[17] Reference No: 0244, 14th April 2006, http://cdm.unfccc.int/Projects/registered.html

material to the high altitude. If construction of road for such high altitude is planned, the local environment will get disturbed as construction of a road involves heavy excavation. The further difficulty for the project is that the construction material has to be moved from the forebay to the weir site by Mules. Additionally Mule paths are required to be laid for movement of these mules. In view of these difficulties, the construction material cost is very high. For instance the cost of a sand bag of 100 kg is Rs.6, but the cost of transportation is Rs.120 per trip due to use of Mules.

The proposed project activity involves construction of powerhouse in a hilly terrain with loosely held rocks which poses problems during construction and involves additional investment to pass through the obstacles such as landslides. Heavy snowfall occurs in the period Jan-Feb when no construction activity is possible. Further glaciers sliding will happen during March and April. The area receives highest rainfall in July and August as it falls in Dharmshala range of hills. Construction of the project in the hilly terrain will increase the man-days required for construction and the project construction period will be longer. As there is no communication system available in the area the promoters have to invest additional funds for creating communication facilities.

The project promoters have to make additional investments to develop the necessary infrastructure facilities indicated above before implementation of the project. Hence, the project activity involved investment barriers.

Fig. B.1.: Hilly Terrain with loosely held rocks.

Investment Analysis

An IRR analysis has been prepared for the project activity based on tariff order issued by HPSEB in the Power Purchase Agreement (PPA). The IRR has worked out to 10.79 % without CDM revenue and would improve to 14.05% considering CDM revenue. The Weighted Average Cost of Capital (WACC) has also worked out to 13.04%. The assumptions underlying the IRR are furnished below.

Table C.3. Assumptions underlying IRR

Project Cost	Rs. 291.70 millions
Means of Finance - Share Capital - Term Loan	 Rs. 72.9 millions Rs. 218.8 millions
Gross Energy Generation	26.28 GWh
Annual Net Energy Export	24.18 GWh
Electricity Tariff	Rs. 2.50 /kWh without escalation.
Operation & Maintenance	2 % of project cost with 5 % escalation per annum
Interest on Term Loans	11.75 %
Loan Repayment Period	9 years
Moratorium	1 year from COD
Interest on Working Capital	12.5 %
Book Depreciation	10.27
Income Tax (MAT)	8.415 %
Tax Holiday	10 years
Emission Factor	723
CER Price	Euro 8
Exchange Rate INR = Euro	55

Also, a sensitivity analysis has also been made for the project activity considering four probable scenarios which is furnished in Table C.4 below.

1. Increase in Generation by 5 %
2. Decrease in Generation by 5 %

Table C.4. Financial Indicators

S. NO	SCENARIO	IRR (%)
1.	Increase in Generation by 5 %	12.09
2.	Decrease in Generation by 5 %	9.45

As could be seen from the above, the IRR is less than the benchmark return which is worked out at 13.04 %. After considering the CDM revenue, IRR crosses the benchmark return. This indicates that, the CDM revenue is very significant for the project activity.

C.3 Lack of Infrastructure

The project location is underdeveloped and hence basic infrastructure such as roads, electricity, communication, transportation, proper and civic amenities are not available. The project promoter is required to develop these facilities investing substantial sum of money before implementation of the project.

As the location is far off and inaccessible it is difficult to provide necessary technical skills and spares in case of breakdowns, necessitating long shutdown requiring heavy expenditure and loss of revenue. Access to skilled manpower is difficult due to poor accommodation, transport and recreational facilities.

C.4 Geological Risks

C.4.1. Land Slides:

In the rainy season, heavy rain falls are common, resulting in a risk of land slides which can damage the access roads, power supply, and project infrastructure such as RCC laggings, steel ribs etc. The resulting damages are multiple and include delays in the construction, repair cost for physical damages, as well as loss revenues if plant operation is affected.

C.4.2. Earthquakes:

The project site is located close to the epicenter of Kangra earthquake occurred in the year 1905 and it falls under seismically active zone V. The possibility of geology changing frequently cannot be ruled out in this area, which may impose severe obstructions in the functioning of tunnel and powerhouse.

C.5 Hydrological Risks

Project activity is proposed on a small stream which is a tributary with a very limited water flow, often snow fed and the power generation is possible whenever there is water flowing in the stream and there is a high uncertainty with regard to the availability of water resources in the stream. This will result in an uncertainty with respect to the return on investment. Whereas in the case of conventional power plants based on fossil fuels, the return on investment is assured due to the assured supply of fuel throughout the year. Water flow is estimated based on Baira Nala located at a distance of 15 kms. The actual gauge data is available only for short period and cannot be relied for construction of hydroelectric project. The project participants have to consider only the simulated data and arrived the dependability based on the data available for nearby catchments. This is a risk as the nearby catchments characteristics such as run-off; absorption, ice, etc. cannot be exactly studied at the feasibility stage. Hence, a possibility of error in the calculation of discharges cannot be ignored for energy calculations and lack of exact data on flows is a barrier for investments in hydroelectric sector. Further, the weir has been designed for a flood discharge calculated by conventional methods. In the absence of any upstream project, the possibility of flash floods occurring cannot be ruled out. This is a potential risk for the project activity.

D. Early Consideration of CDM

The project proponents perceived that the above hard ships could be mitigated to certain extent by relying on revenues from CDM at initial stage of commencement of the project activity. The participants have appointed Zenith Energy Services (P) Limited, Hyderabad (then Zenith Corporate Services (P) Limited) as consultant for registration of project under CDM much early to the start date of the project activity. Necessary evidence will be given to the DOE for verification.

Hence, the proposed project is additional and not the same as the baseline scenario and would not have occurred without the CDM. CDM revenues are expected to leverage the project economics and have an influence on the decision to implement the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

The project activity is generation of electricity using hydro potential and exporting the same to the grid system, which is also fed by other fuel sources such as fossil and non-fossil types. Emission reductions due to the project activity are considered to be equivalent to the emissions avoided in the baseline scenario by displacing the grid electricity. Emission reductions are related to the electricity exported by the project and the actual generation mix in the grid 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.

Calculation of the baseline emission factor

As explained earlier, the baseline for the project activity is kWh produced by the hydroelectric projects multiplied by an emission co-efficient calculated in a transparent and conservative manner as the weighted average emissions (in $kgCO_2/kWh$) of the current generation mix of the Northern Region. For this purpose, the generation data published by Central Electricity Authority for the Northern Region was used. Baseline emissions were estimated as explained below.

i : Estimation of emissions from each power generating unit in the baseline

Emissions from each fossil fuel source are estimated using the following formula.

Station Emissions	=	Actual Generation	x	CEF for fuel	x	Net Heat Rate	x	Conversion Factor	x	Oxidation factor
tCO_2		GWh		tC/TJ		TJ/ GWh		(44/12)		

For the estimation of emissions from each power generating unit in the grid, actual generation data monitored and published by Central Electricity Authority is used. IPCC default emission factors are used for CEF of each fuel type. Since, collecting heat rates for all baseline power generating stations is difficult, only net heat rates as specified by the CEA are considered. This is conservative and reasonable for a small-scale project activity whose generation is negligibly small compared to the total generation of the grid system.

Oxidation factor are used from Revised IPCC 1996 guidelines - default emission factor.

Using the above formula, emissions from each power generating source are estimated. For non-fossil fuel sources such as hydro, wind and nuclear, GHG emissions are not applicable.

ii : Total grid emissions

Total emissions from all stations in the grid are estimated by summation of emissions from all baseline power generating units.

iii : Estimation of baseline emission coefficient

The baseline emission coefficient for the grid is estimated as the weighted average of all existing generation sources using the following formula.

Baseline Emissions Coefficient	=	Total grid emissions/	Total net energy in the system	
tCO_2/GWh		tCO_2	/	GWh

Using the above formula and data for the year 2005-2006, the baseline / emission coefficient is estimated as 723 tCO_2 /GWh. The detailed data underlying this calculation is furnished in the Annex-3.

However the key information and data used to determine baseline scenario (variables, parameters, data sources etc) are listed in the following table.

Table B.1 Key information and data used to determine baseline scenario

Key Parameter	Value	Data Source	Website
Power generation	Power generated by all sources including hydro, wind, nuclear.	All related authentic sources like CEA, Ministry of Power, Govt. of India.	www.cea.nic.in www.powermin.nic.in
CEF for fuel	Carbon Emission factor for each fuel type	Revised 1996 IPCC Guidelines provides default emission factors for fuels	www.ipcc.ch/
Fuel Type	Type of fuel used for individual plant	Ministry of Non-conventional Energy Sources, Govt. of India	www.mnes.nic.in
Oxidation factor	Oxidation factor for each fuel type	IPCC provides default Oxidation factors for fuels.	www.ipcc.ch/
Net heat rate	Net heat rate of individual power plants	CEA and MNES	www.cea.nic.in www.mnes.nic.in
EFy	Baseline emission factor for the project grid	Calculated for power plants in the northern regional grid	------
EGy	Power export to the grid per annum.	Will be taken from plant and HPSEB records.	------

As per AMS I.D, the baseline emissions are calculated as the net electricity generated by the project activity, multiplied with the baseline emission factor for the project grid derived in Section B.4:

$$BE_y = EG_y \times EF_y$$

where:

BE_y *Baseline emissions in year y (t CO_2)*
EG_y *Electricity exported by the project activity to the grid (GWh)*
EF_y *Baseline emission factor for the project grid (t CO_2/GWh)*

Values obtained when applying the above formulae are provided in the following table.

S. No.	Year	Power Export	Emission Factor	Emission Reductions
		GWh	tCO_2/GWh	tCO_2
1	2008	24.18	723	17,480
2	2009	24.18	723	17,480
3	2010	24.18	723	17,480
4	2011	24.18	723	17,480
5	2012	24.18	723	17,480
6	2013	24.18	723	17,480
7	2014	24.18	723	17,480
8	2015	24.18	723	17,480
9	2016	24.18	723	17,480
10	2017	24.18	723	17,480
Total Emission Reductions				**174,800**

In the above table, the year 2008 corresponds to 01.01.2008 to 31.12.2008. Similar interpretation shall apply for remaining years.

Project emissions

No project emissions are applicable to the proposed small scale hydro electric power project, since the electricity generation is based on hydro resources, which does not involve in combustion or generation of emissions from fossil fuels. Hence, the baseline emissions will be equivalent to the emission reductions in the project activity.

Leakage:

No leakage emissions are considered for the proposed project activity since no energy generating equipment is transferred from another activity and/or the existing equipment is transferred to another activity.

Emission Reductions:

Since the project emissions as well as the leakage are zero, the emission reductions are equal to the baseline emissions. These are calculated based on the monitored net amount of electricity supplied to the grid, and the baseline emission factor.

ER_y = BE_y - PE_y - L_y

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

Data / Parameter:	EF_y
Data unit:	t CO2/GWh
Description:	CO_2 emission factor for the regional grid system
Source of data used:	CEA published grid emission factors
Value applied:	723 tCO2/GWh (2005-06)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Central Electricity Authority (CEA) values have been used for authenticity of the data, available publicly by Govt of India with a view to obtain uniformity of approach in the country towards a common objective.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>> Baseline emissions

Baseline emissions calculated as explained in section B.6.1 above are summarised as below.

BE_y = 24.18 * 723

BE_y = 17,480 tCO_2/GWh

Project emissions

No project emissions are applicable

Leakage

No leakage is applicable

Emission reductions

ER_y = BE_y - PE_y - L_y

ER_y = 17,480 - 0 - 0

ER_y = 17,480 tCO_2/GWh ($ER_y = BE_y$)

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 (Season)	Estimation of Project activity Emissions	Estimation of baseline emissions	Estimation of Leakage	Estimation of emission reductions
2008	0	17480	0	17480
2009	0	17480	0	17480
2010	0	17480	0	17480
2011	0	17480	0	17480
2012	0	17480	0	17480
2013	0	17480	0	17480
2014	0	17480	0	17480
2015	0	17480	0	17480
2016	0	17480	0	17480
2017	0	17480	0	17480
Total	**0**	174,800	**0**	174,800

In the above table the year 2008 corresponds to 01.01.2008 to 31.12.2008. Similar interpretation shall apply for remaining years

B.7 Application of a 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
Source of data to be used:	On-site measurements
Value of data	24.18GWh
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. Sales records to the grid and other records are used to ensure consistency
Any comment:	

Data / Parameter:	EG_{grossy}
Data unit:	GWh
Description:	Electricity supplied to the grid by the project
Source of data to be used:	On-site measurements
Value of data	26.28Gwh
Description of measurement methods	Measured monthly using calibrated meters and aggregated annually

and procedures to be applied:	
QA/QC procedures to be applied:	Meters will be calibrated as per industry standards. Sales records to the grid and other records are used to ensure consistency
Any comment:	

Data / Parameter:	$EG_{Auxiliaryy}$
Data unit:	GWh
Description:	Electricity supplied to the grid by the project
Source of data to be used:	On-site measurements
Value of data	2.10 GWh (8%)
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. Sales records to the grid and other records are used to ensure consistency
Any comment:	

Data / Parameter:	$EG_{import,y}$
Data unit:	GWh
Description:	Grid electricity import to the project activity during the year y
Source of data to be used:	On-site measurements
Value of data	0 GWh
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 the industry standards. Project proponent will pay to the HPSEB based on the meter reading recorded in the import meter. The maintenance and/or other quality control measures are taken by HPSEB, since any false reading in the meter is a financial loss to HPSEB. Hence, HPSEB give high priority in quality control of the import meter. Since, the data item is not under the control of project proponents, no QA/QC procedures are provided here.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

This monitoring plan is developed in accordance with the modalities and procedures for small-scale CDM project activities and is proposed for grid-connected small hydroelectric project being implemented in Karnataka state in India. The monitoring plan, which will be implemented by the project proponent, describes about the monitoring organisation, parameters to be monitored, monitoring practices, QA and QC procedures, data storage and archiving.

Monitoring Organisation

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the Board of Directors. The Board may delegate the same to a competent person identified from one of the four proponents for the purpose. The identified person, in the rank of General Manager, will be the in charge of GHG monitoring activities. A team of experienced personnel in various disciplines will assist the General Manager with experience in plant operation, measurements and management. The primary responsibility of the team is to measure, monitor, record and report the information on various data items to the General Manager, in accordance with the applicable standards. Periodic calibration of various instruments used in the monitoring of GHG related data and record keeping of the same also will be the responsibility of the team.

The responsibility of review, storage and archiving of information in good condition lies with the General Manager. General Manager will undertake periodic verifications and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions. The General Manager will review the data collected by the team and suggest corrective actions wherever required. An internal audit report will be prepared for review by the Board of Directors which will be later submitted for verification by an independent entity (DOE). Board of directors will examine the internal audit reports and will in particular take note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to the standards.

The team including the General Manager will be appointed by the Boards of Directors of the companies, in advance before the start of project operations. The General Manager will report to the boards of directors and seek guidance in case of conflicts or difficulties in order to maintain the monitoring organisation in good spirit.

Parameters Requiring Monitoring

This monitoring plan requires monitoring of all parameters indicated in section B.7 Necessary documents required for verification of the data will be maintained for later archiving. Using the power exported to the grid, emission reductions will be estimated as illustrated in Section B6.3 Emission reductions generated by the project will be monitored at regular intervals and will be reported to the board of directors.

QA & QC Procedures

The projects employ latest state of art microprocessor based high accuracy monitoring and control equipment that will measure, record, report, monitor and control of various key parameters of the plants. These monitoring and controls will be the part of the Control Systems of hydroelectric plant. Necessary standby meters or check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated and sealed as per industry practices at regular intervals. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. Sales records will be used and kept for checking the consistency of the recorded data.

CDM – Executive Board

Data Storage & Archiving

All the data items monitored under the monitoring plan will be kept for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

The monitored data will be presented to an independent verification agency or DOE to whom verification of emission reductions is assigned.

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

>>

The baseline for the project activities are constructed according to 9.b. i.e. weighted average emissions of the current generation mix (in $kgCO_2eq./kWh$), applicable for Type I.D CDM project activities, as contained in Appendix B of simplified modalities and procedures for small scale CDM project activities.

Date of completion of Baseline: 23/02/2007

Name of the person / entity determining the baseline: Zenith Energy Services (P) Ltd., Hyderabad

Contact details are given 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- 23325803
Personal E.mail	mohan@zenithenergy.com

The above entity is not a project participant.

CDM – Executive Board

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:

>>
15/01/2006

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

>>
30 years

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

Fixed crediting period

C.2.1. Renewable crediting period

Not chose

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:

>>
01/01/2008

C.2.2.2. Length:

>>
10 y – 0 m

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>
As per the Ministry of Environment & Forest (MoEF), Government of India, Environmental Impact Assessment (EIA) studies need not to be done for the projects less than US $ 21.74 millions. Since the total cost of the proposed project is only US $ 6.34 millions and also comes under the small-scale category of CDM projects as per UNFCCC guidelines, doesn't call for EIA study. However prior to

implementation, the projects shall notify to the Himachal Pradesh State Environment Protection & Pollution Control Board (EPPCB) for necessary evaluation and approval

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:

>>

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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No specific public consultation / participation requirements are specified in Indian statutes for setting up of small-scale industries. However, there are certain procedural requirements, which every project investor needs to follow before implementing any project.

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.

Government of Himachal Pradesh had made it mandatory for all the projects to go for public consultation before start of the project. It should be publicized in national and vernacular dailies and invites objections / comments from the public during a period of 60 days before issuing license. Based on the feedback the Government of Himachal Pradesh will decide whether the project to be sanctioned or withheld.

Identification of Stakeholders

Stakeholder Name	Function of Stakeholder	Description of Involvement
Himachal Pradesh Government Energy Development Agency (HIMURJA)	A state nodal agency and policy implementation body in respect of renewable energy projects in Himachal Pradesh. HIMURJA reviews the project documentation and accords clearance for utilizing renewable energy sources in the state.	Issues clearance for setting up the project in Himachal Pradesh utilizing hydro potential available at the proposed site.
Himachal Pradesh State Electricity Board (HPSEB)	The state owned electricity utility company that manages the electricity generation and distribution in Himachal Pradesh	Accords techno-economic clearance to the project, purchases power from the project by executing Power Purchase Agreement to determine the tariff and other terms.

	state. Any electricity generation project proposed in Himachal Pradesh shall approach HPSEB for power evacuation arrangements. Both HPSEB and the project proponent shall sign a Power Purchase Agreement, before implementing the project.	
Electricity Regulatory Commission of Himachal Pradesh (ERCHP)	The state owned electricity regulatory body responsible for tariff fixation, grievance redressing etc. throughout the state of Himachal Pradesh.	Electricity Regulatory Commission of Himachal Pradesh (ERCHP) makes a public announcement in local dailies for public comments on the project before according clearance for the tariff and export of power into HPSEB grid. Announcement will kept open for 60 days. It considers public comments in its approval process before giving approval.
Himachal Pradesh State Environment Protection & Pollution Control Board (EPPCB)	A statutory local body that oversees the pollution control aspects in the state. Any project activity shall obtain clearance from the EPPCB before implementation.	Issues 'Consent for Establishment' before starting the construction of the project and issues 'Consent for Operation' before commissioning of the project.
Department of Irrigation, Govt. of Himachal Pradesh	Is part of Government and overseas utilization of water	Accords clearance for utilizing water resources in Himachal Pradesh state.
Ministry of Environment & Forests, Govt. of India	Part of Government responsible for overseeing utilization of forest land.	Provides permission for utilizing forestland for construction of the project.
Local Village Panchayat	Elected statutory body of the local populace	Accords permission for setting up of the project under the jurisdiction of the village

Stakeholders' involvements

Himachal Pradesh State Electricity Board (HPSEB)

- Himachal Pradesh State Electricity Board (HPSEB) has accorded Techno-Economic Clearance (TEC) to the 5 MW Upper Awa small hydroelectric project vide **HPSEB/CE(P)/CC – Upper Awa/2004 – 1486 - 95** dated 17th August 2005.
- Himachal Pradesh State Electricity Board (HPSEB) has issued its Consent for power evacuations to the project vide **No: TCH/U-57/05/326-27** dated 13th April 2004.
- The company has entered into a Power Purchase Agreement (PPA) with HPSEB on 12th July 2006.

Govt. of Himachal Pradesh

- Dept. of Non-conventional Energy Sources, Govt. of Himachal Pradesh has notified about 5 MW Upper Awa project in newspaper vide **No: MPP-F(2)-49/2004(NES)** dated 7th February 2005 on 28th February 2005 and welcomed objections and representations with respect to the project within a period of 60 days.

- The project has entered into a Memorandum of Understanding (MoU) with Govt. of Himachal Pradesh on 29th November 2004.

- The project has entered into Implementation Agreement (IA) with Govt. of Himachal Pradesh on 22nd December 2005.

EPPCB

Himachal Pradesh State Environment Protection & Pollution Control Board (EPPCB) has issued 'Consent for Establishment' to the project vide **EPPCB/Upper Awa SHEP – Kangra/2006/4013-17** dated 3rd March 2006.

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Department of Irrigation & Public Health

Department of Irrigation & Public Health, Govt. of Himachal Pradesh has issued 'No-Objection Certificate (NOC)' vide **EE/IPHDP/WA/NOC/2005-5329-30** dated 12th July 2005.

Local Gram Panchayat

The 5 MW Upper Awa small hydroelectric project has obtained 'No-Objection Certificate (NOC)' on 18th April 2005 from local Gram Panchayat.

MoEF

The project has obtained clearance from Ministry of Environment & Forests (MoEF), Govt. of India for diversion of forests land vide **F. No: 9-HPB574/2005-CHA/42** dated 22nd December 2005.

Stakeholders' comments

All stakeholders have issued their clearance, consents, approvals, suggestions for setting up the project and no comments were received against the continuance of the project.

E.2. Summary of the comments received:

>>

No negative comments are received on the project activity, which is evident from the licences / approvals / clearances accorded to the project activity by the stakeholders.

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

>> Since no comments are received, no report is applicable

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	M/s Astha Projects (India) Limited
Street/P.O.Box:	Road No: 78,
Building:	Plot No: 226, Phase-III, Jubilee Hills
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 033
Country:	India
Telephone:	+91- 40- 2354 6500, 2354 6600
FAX:	+91- 40- 2354 7700s
E-Mail:	asthapower@rediffmail.com
URL:	--
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Reddy
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from the parties included in Annex I is involved in the project activity.

Annex 3

BASELINE INFORMATION
Baseline Emission Factor Calculation for the Year 2005-06

BASELINE INFORMATION

Power Plants	Owner	Installed capacity (MW)	Fuel	Actual net generation (GWh) 2006	Net heat rate kcal/kWh	IPCC / Local Emission Factor tC/TJ	Oxidation Factor	Emission factor tCO2/GWh	Emissions tCO2
Delhi									
I.P. Station	DVB	247.5	Coal 1D	**984.65**	3744	26.13	0.98	1469	1446875
Bakreswar	DVB	135	Coal 1D	**574.47**	3560	26.13	0.98	1397	802658
I.P.GT	DVB	180	Gas HBJ	**1277.57**	2061	15.30	0.995	481	614363
I.P.WHP	DVB	102	Gas HBJ	**463.36**	2061	15.30	0.995	481	222822
Pragati CCGT	DVB	330.4	Gas HBJ	**2298.07**	2061	15.30	0.995	481	1105105
Badarpur	NTPC	720	Coal 1D	**5380.6**	2717	26.13	0.98	1066	5737643
HARYANA									
F'Bad extn	HPGC	180	Coal 4F	**787.31**	4212	26.13	0.98	1653	1301509
Panipat	HPGC	1360	Coal 4F	**8174.48**	2934	26.13	0.98	1152	9413117
WY.Canal	HPGC	62.4	Hydro	**259.06**	0	0.00		0	0
F'Bad CCGT	NTPC	430	Gas HBJ	**2952.8**	2061	15.30	0.995	481	1419954
HIMACHAL									
Geri bata	HPSEB	60	Hydro	**193.5**	0	0.00	0	0	0
Sanjay Bhabh	HPSEB	120	Hydro	**574.29**	0	0.00	0	0	0
Bassi	HPSEB	60	Hydro	**259.46**	0	0.00	0	0	0
Benwa	HPSEB	6	Hydro	**33.58**	0	0.00	0	0	0
Andhra	HPSEB	17	Hydro	**62.54**	0	0.00	0	0	0
Thirot	HPSEB	4.5	Hydro	**3.93**	0	0.00	0	0	0
Ghanvi	HPSEB	22.6	Hydro	**69.81**	0	0.00	0	0	0
Gaj	HPSEB	10.5	Hydro	**51.29**	0	0.00	0	0	0
Baner	HPSEB	12	Hydro	**43.59**	0	0.00	0	0	0
Baspa	Baspa-JHP	300	Hydro	**1166.99**	0	0.00	0	0	0
Malana	Malana	86	Hydro	**337.45**	0	0.00	0	0	0
Dehar	BBMB	990	Hydro	**3122.71**	0	0.00	0	0	0
Pong	BBMB	396	Hydro	**1730.72**	0	0.00	0	0	0
Baira Siul	NHPC	198	Hydro	**790.96**	0	0.00	0	0	0
Chamera	NHPC	540	Hydro	**2338.17**	0	0.00	0	0	0
Chamera II	NHPC	300	Hydro	**1490.49**	0	0.00	0	0	0
Nathpa Jhakr	SJVNL	1500	Hydro	**4053.73**	0	0.00	0	0	0
J&K									
Pampore GT	JKEB	175	Diesel	**8.92**	2929	20.20	0.99	898	8008
Lower Jhelum	JKEB	105	Hydro	**496.17**	0	0.00	0	0	0
Upper sindh	JKEB	127.6	Hydro	**214**	0	0.00	0	0	0
Gandharbal	JKEB	15	Hydro	**31.49**	0	0.00	0	0	0
Chenani	JKEB	33	Hydro	**16.53**	0	0.00	0	0	0
Mohara	JKEB	9	Hydro	**0.96**	0	0.00	0	0	0
Kargil	JKEB	3.8	Hydro	**6.5**	0	0.00	0	0	0
Sewa	JKEB	9	Hydro	**12.13**	0	0.00	0	0	0
Stanka	JKEB	4	Hydro	**1.67**	0	0.00	0	0	0
Salal	NHPC	690	Hydro	**3480.86**	0	0.00	0	0	0
URI	NHPC	480	Hydro	**2724.51**	0	0.00	0	0	0
Dulhasthi	NHPC	0	Hydro	**0**	0	0.00	0	0	0
PUNJAB									
Bhatinda	PSEB	440	Coal 2W	**2359.19**	2908	26.13	0.98	1141	2692592
Leh.MOH	PSEB	420	Coal 2W	**3145.93**	2407	26.13	0.98	945	2971928
Ropar	PSEB	1260	Coal 2W	**9329.31**	2541	26.13	0.98	997	9303950
shanan	PSEB	110	Hydro	**508.95**	0	0.00		0	0
Anandpur sal	PSEB	134	Hydro	**721.77**	0	0.00		0	0
Ranjit sagar	PSEB	600	Hydro	**2013.22**	0	0.00		0	0
UBDC	PSEB	91.5	Hydro	**531.18**	0	0.00		0	0
Mukerian	PSEB	207	Hydro	**1239.25**	0	0.00		0	0
Bhakra	BBMB	1325	Hydro	**5721.68**	0	0.00		0	0
Ganguwal	BBMB	83.6	Hydro	**580.42**	0	0.00		0	0
Kotla	BBMB	84.6	Hydro	**490.95**	0	0.00		0	0

RAJASTHAN									
Kotla	RRUVNL	1045	Coal 4F	**8297.75**	2620	26.13	0.98	1028	8532471
Suratgharh	RRUVNL	1250	Coal 2W	**9951.25**	2490	26.13	0.98	977	9725013
Ramgharh GT	RRUVNL	76	Gas HBJ	**435.95**	2061	15.30	0.995	481	209641
Ramgharh ST	RRUVNL	37.8	Gas HBJ	**0**	2061	15.30	0.995	481	0
RP Sagar	RRUVNL	172	Hydro	**314.46**	0	0.00		0	0
J.Sagar	RRUVNL	99	Hydro	**228.58**	0	0.00		0	0
Mahi Bhajaj	RRUVNL	140	Hydro	**218.49**	0	0.00		0	0
AnoopGargh	RRUVNL	9	Hydro	**1.9**	0	0.00		0	0
Suratghargh	RRUVNL	4	Hydro	**0**	0	0.00		0	0
RMC Mangro	RRUVNL	6	Hydro	**0**	0	0.00		0	0
ANTA GT	NTPC	413	Gas HBJ	**2809.1**	2061	15.30	0.995	481	1350850.9
RAPS	NPC	740	Nuclear	**4305.98**	0	0.00		0	0
UP									
Obra	UPRUVNL	1550	Coal 3E	**5572.93**	3073	26.13	0.98	1206	6721394
Panki	UPRUVNL	220	Coal 4F	**954.04**	3186	26.13	0.98	1250	1192959
Hganj B	UPRUVNL	450	Coal 4F	**519.37**	3697	26.13	0.98	1451	753598
Paricha	UPRUVNL	220	Coal 4F	**763.18**	4298	26.13	0.98	1687	1287380
Anpara	UPRUVNL	1630	Coal 3E	**11560.19**	2717	26.13	0.98	1066	12327296
Rihand	UHPC	300	Hydro	**546.35**	0	0.00		0	0
OBRA	UHPC	99	Hydro	**231.38**	0	0.00		0	0
Matallia	UHPC	30	Hydro	**143.41**	0	0.00		0	0
Ganga Canal	UHPC	15.6	Hydro	**34.09**	0	0.00		0	0
Khara	UHPC	72	Hydro	**328.57**	0	0.00		0	0
E.Y.Canal	UPHPC	6	Hydro	**1.63**	0	0.00		0	0
Singrauli STP	NTPC	2000	Coal 3E	**15503.1**	2717	26.13	0.98	1066	16531847
Rihand	NTPC	2000	Coal 3E	**10585.66**	2717	26.13	0.98	1066	11288098
Unchahar	NTPC	840	Coal 3E	**7041.1**	2717	26.13	0.98	1066	7508330
Dadri	NTPC	840	Coal 2W	**6768.3**	2717	26.13	0.98	1066	7217428
Tanda	NTPC	440	Coal 4F	**3330.1**	2717	26.13	0.98	1066	3551077
Auraiya GT	NTPC	652	Gas HBJ	**4281.4**	2061	15.30	0.995	481	2058856
Dadri GT	NTPC	817	Gas HBJ	**5394.4**	2061	15.30	0.995	481	2594080
NAPS	NPC	440	Nuclear	**2138.35**	0	0.00		0	0
UTTARANCHAL									
Ramganga	USEB	198	Hydro	**333.3**	0	0.00		0	0
Khatima	USEB	41.4	Hydro	**165.04**	0	0.00		0	0
Pathri	USEB	20.4	Hydro	**98.49**	0	0.00		0	0
Chibro	USEB	240	Hydro	**804.96**	0	0.00		0	0
Khodri	USEB	120	Hydro	**378.83**	0	0.00		0	0
Chilla	USEB	144	Hydro	**659.18**	0	0.00		0	0
Maner Bhali	USEB	90	Hydro	**455.21**	0	0.00		0	0
Dhakrani	USEB	33.9	Hydro	**164.65**	0	0.00		0	0
Dhalipur	USEB	51	Hydro	**236.13**	0	0.00		0	0
KJLHAL	USEB	30	Hydro	**160.92**	0	0.00		0	0
Mohamadpur	USEB	9.3	Hydro	**36.4**	0	0.00		0	0
Tanakpur	NHPC	120	Hydro	**483.17**	0	0.00		0	0
Dhauli Ganga	NHPC	280	Hydro	**314.45**	0	0.00		0	0
CHANDIGARH									
Chand DG	CEAN.UT.DG	2	Gas	**0**	2061	15.30	0.995	481	0
Total		32770.4		**179662.91**					**129890843**

Summary

	Year - 2005/06		
	Gen	Emissions	%
Hydro	41714.1	0	23
Coal	111583	120307163	62
Gas	19913	9575672	11
Disel	9	8008	0
Nuclear	6444	0	4
Total	**179663**	**129890843**	**100**
Avg $\sum EF_{Baseline}$		**723**	

References:

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Annex 4

MONITORING INFORMATION

Monitoring information is already provided in section B.7.2

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