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 : 10 MW bundled Luni–III & Luni–II hydroelectric projects for a grid system at Sri Sai Krishna Hydro Energies Private Limited in Kangra District, Himachal Pradesh.

Version : 01

Date : 22/07/2008

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

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The purpose of the 10 MW bundled Luni – III & Luni – II hydroelectric projects is to generate clean electrical energy in a sustainable manner, optimising the utilization of renewable hydro resource in order to meet the power demand in the state of Himachal Pradesh.

The bundled small hydroelectric projects Luni - III & Luni – II are proposed as run of the river schemes across Luni Khad, a tributary of river Binwa in Baijnath Tehsil, Kangra District of Himachal Pradesh. The proposed projects generates about 43.80 GWh in which 40.30 GWh will be exported to HPSEB Dehan substation under Power Purchase Agreement (PPA), thereby improving the quality and energy availability under the service area of the substation.

The projects are designed to generate electricity for grid system using available water sources. The technology for power generation process using hydro resources is 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 will be transformed to match the nearest grid sub-station for proper interconnection and smooth evacuation of power. The renewable and clean form of electricity generated from the hydro resources (project) would not involve in generation of any form of GHG emissions and the project will displace the electricity in the carbon intensive northern region grid system, thereby reduces the GHG emissions into the atmosphere.

Since the project activity generates electricity through sustainable means, it will not cause any negative impact on the environment and reduces the GHG emissions into the atmosphere, there by contributes to the climate change mitigation efforts.

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 activities contribute to the above indicators in the following manner:

a) The project activities results in alleviation of poverty by generating direct and indirect employment during construction of the project as well as during operation. The projects create

indirect employment opportunities for about 170 unskilled workers for a period of 18 months which otherwise would not have happened in the absence of the projects. In addition, the projects create direct permanent employment for about 35 people for operation of the projects.

b) Project activities will be implemented in rural areas, and the nearby villages in the proximity of the project zones do not have proper roads and other infrastructure facilities. These villages get benefited by setting up of these projects since project proponent will invest in transportation and communication facilities etc., as a part of the project's construction.

c) Project proponent will mobilise investment to the region to an extent of about Rs.556.20 millions (US $ 13.90 millions) which otherwise would not have happened in the absence of the project activities. This is a significant investment in a remote area often characterized by landslides due to heavy rains during the monsoon season.

d) These project activities result in extending the electric supply system to the remote villages. Generation from small power station and feeding the power into local 33 kV sub-station will greatly improve the much needed assured quality power in the far-flung and isolated areas thereby opening up the economy and giving a boost to food and tourism industry which will cater jobs for local people.

e) The project will result in reduction of local air pollutant emissions (NO_x, SO_2, particulates, etc.) as well as greenhouse gases, by displacing thermal power generation. In addition, it will respect regulations on residual water flow and thereby avoid negative impacts on the fauna and flora in the Luni Khad.

f) The project will result in utilisation of environmentally safe and sound technologies in small scale hydroelectric power sector. Further the project demonstrates harnessing hydro potential in small rivulets and encourages setting up such new projects in future.

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g) Since, the projects feed the generated power to the nearest HPSEB substation at Dehan village, energy availability and quality of the power improves significantly under the service area of the substation.

In view of the above, the proposed project activities strongly contribute to the sustainable development.

A.3. Project participants:

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Name of the party involved ((Host) indicates a host party)	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved wished to be considered as project participant (Yes/No)
India (Host)	**Private Entity:** Sri Sai Krishna Hydro Energies (P) Limited	No

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

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A.4.1. Location of the small-scale 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: Himachal Pradesh

A.4.1.3. City/Town/Community etc:

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District: Kangra
Tehsil: Baijnath

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

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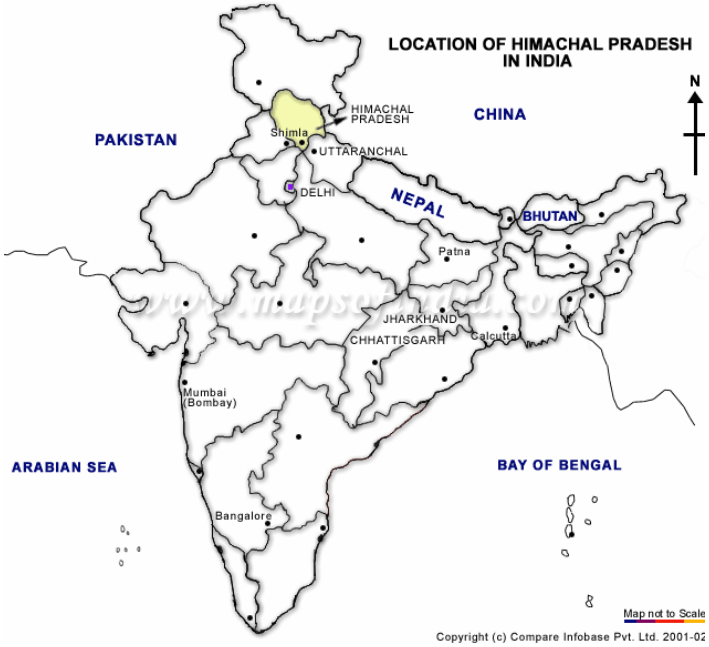
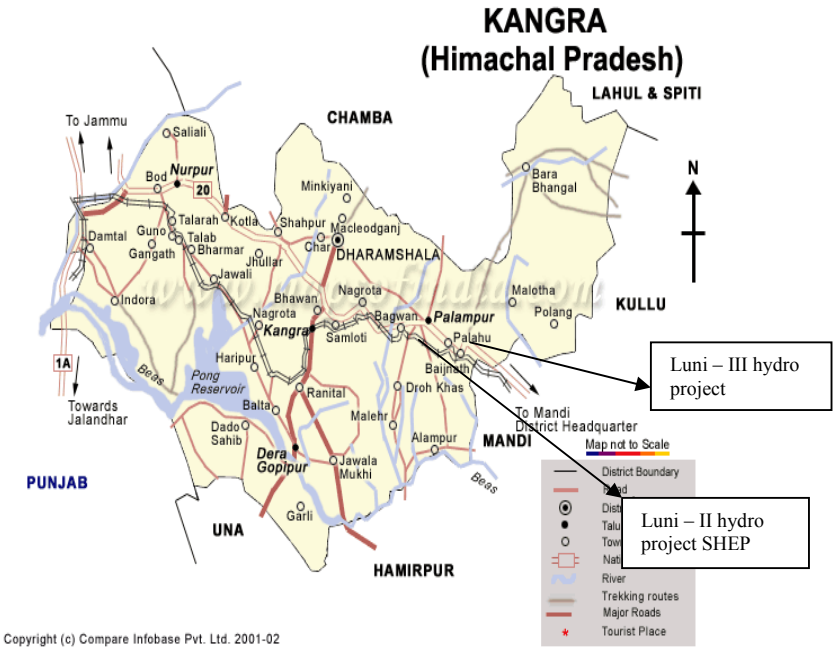
The proposed Luni – II small hydro project is a downstream development of proposed Luni-III small hydro project on Luni khad, a tributary of river Binwa in Kangra District, Himachal Pradesh. The location can be approached through Baijnath - Deol road. Deol village is at a distance of 8 kms from Baijnath town. The project site is located at a distance of 18 kms from Baijnath, which is also the nearest railhead, on Pathankot – Palampur - Baijnath National Highway. The nearest airport is at Gagal (Kangra) located at a distance of 56 kms. The geographical co-ordinates of Luni III are 76º45' to 76º47' East (Longitude) and 32º11' to 32º12' North (latitude) and that for Luni II are 76º41' to 77º47' East (Longitude) and 32º5' to 32º10' North (latitude).



Map 1: Location of Himachal Pradesh state in India



Map 2: Location of the project sites in Kangra District of HP

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

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According to the Appendix B to the simplified modalities and procedures for small-scale CDM project activities the proposed project activities falls under the following type and category.

Project Type: Type I – Renewable Energy Projects
Category I.D: Grid connected renewable electricity generation.

The project activity utilizes renewable hydro potential for power generation and exports the generated power to the grid. Accordingly, the applicable methodology for the project activity shall be AMS I.D/ Version 13, EB 36, which includes hydro electric generation for a grid system.

Technical details of the project activities

The technology employed for power generation in a hydroelectric plant is converting the potential energy available in the water flows into mechanical energy using hydro turbines and then electrical energy using alternators. The generated power will be transformed to match the nearest grid substation for proper interconnection and smooth evacuation of power.

The project employs the use of hydel energy for the purpose of electricity generation. Since, the technology employed by the project proponent does not result in GHG emissions, the project does not

cause any negative effects on the environment. Hence, the technology used for the project activities do not pose any threat to the environment when compared to the fossil fuel-fired power plants.

The total capacities of the turbine generators are 10 MW, which generates electricity at 3.3 kV level and evacuated at 33 kV level. It is anticipated that the plants can operate at a Plant Load Factor (PLF) of 50 %. The annual export to the regional grid is 40.30 GWh from both the hydroelectric projects, after accounting for auxiliary consumption of 3.5 GWh (8%) from the gross electricity generation of 43.8 GWh.

Table 1: Technical specifications of the some of the important items of plant and machinery

Parameter	Luni – III	Luni - II
Hydrology		
Design Discharge	1.32 cumecs	1.98 cumecs
Gross head	448.13 m	302.00 m
Net rated head	441.11 m	292.75 m
Plant Equipment		
Type of Hydro turbine	Pelton Wheel	Pelton Wheel
Type of generator	Synchronous, Brushless	Synchronous, Brushless
No. of generating units	2	2
Capacity of each generating units	2.5 MW	2.5 MW
Generation voltage	3.3 kV	3.3 kV
Grid interfacing voltage	33 kV	33 kV
Frequency	50 Hz	50 Hz
HPSEB substation	132/33 kV at Dehan	132/33 kV at Dehan
Energy		
Gross energy generation	21.9 GWh	21.9 GWh
Auxiliary Consumption (8%)	1.75 GWh	1.75 GWh
Annual export to the grid	20.15 GWh	20.15 GWh

Technology Transfer

No technology transfer from other countries is involved in the project.

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

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The crediting period chosen for the proposed project activity is 10 years. Estimation of total emission reductions as well as annual estimates for the chosen crediting period is furnished below.

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2008	32,658
2009	32,658
2010	32,658

2011	32,658
2012	32,658
2013	32,658
2014	32,658
2015	32,658
2016	32,658
2017	32,658
Total estimated reductions (tonnes of CO_2 e)	**326,580**
Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO_2 e)	**32,658**

In the above table, the year 2008 corresponds to the period starting from 01.09.2008 to 31.10.2009 Similar interpretation shall apply for remaining years.

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

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The project activities do not involve any public funding from Annex 1 countries.

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

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In accordance with Appendix C[1] of the Simplified Modalities and Procedures for Small-Scale CDM project activities "DETERMINING THE OCCURANCE OF DEBUNDLING", it can be confirmed that these project activities are not a debundled component of a larger CDM project.

The proposed project activity is bundling of two small scale hydro electric power projects namely Luni - III & Luni - II, located on the same river at different locations. Both projects would be developed with separate infrastructure and with an installed capacity of 5 MW each. Even if the proposed projects are taken independently or combinely, would not exceed the limit for the small scale CDM project activities.

Hence, it may be concluded that the proposed project activities are not the debundled components of a single large scale project activity.

No other CDM activity has been undertaken by the same project participant within the previous 2 years, which is in the same project category and technology/measure, whose boundary is within 1 km of the project boundaries of these project activities at the closest point.

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: **AMS I.D, Grid connected renewable electricity generation Ver 13, EB 36**

[1] http://cdm.unfccc.int/EB/Meetings/007/eb7ra07.pdf

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

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The capacity of the bundled CDM project is 10 MW. This is below the 15 MW limit[2] of output-capacity for small-scale projects and therefore the project qualifies as a small-scale CDM project. Hence, AMS.I.D 'Grid connected renewable electricity generation' is applied for the proposed small scale project activity.

Since, the capacity of the proposed bundled CDM project is only 10 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 these two projects demonstrate that the project activities will remain under the limits of SSC through out the crediting period. To determine the capacity of the power plant, two important inputs are required namely the head available and discharge of water in the stream. The hydrology studies carried out have established the envisaged capacities of the plants. The net heads available have been estimated as 441.11 m (Luni – III) and 292.75 m (Luni – II). Based on the head available and discharge, the optimum capacities of the power plants have been envisaged at 5 MW each. There is no possibility of exceeding the limits of small-scale CDM project activities during the crediting period and the project activities will remain as small scale project activities through out the crediting period.

B.3. Description of the project boundary:

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In accordance with AMS I.D, the project boundaries encompass the physical, geographical site of the renewable generation source.

The project boundaries therefore include the physical boundaries around the catchment areas, weirs, desilting tank, headrace tunnel, fore bay, penstock, powerhouse, tailrace and the transmission system till the evacuation point at the Dehan sub-station. The power generated from these projects is metered at the Dehan sub-station and accurately quantifiable.

In addition, the project boundaries also include the connected electricity system, i.e. the Northern grid, for the purpose of determining the baseline emission factor for displaced grid electricity. The Northern grid covers the following states: 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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The project activity applied the approved small scale methodology AMS I.D. The application of the methodology is described below:

The project activities are located in the state of Himachal Pradesh which is a part of Northern regional grid system. The boundary for determining the baseline emission factor is the Northern Region of India as defined by Central Electricity Authority (CEA).

[2] In accordance with the simplified modalities and procedures for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3): http://cdm.unfccc.int/Reference/Documents/AnnexII/English/annexII.pdf

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The baseline emissions are calculated based on the net energy provided to the grid (in GWh /year) by renewable generating units, and an emission factor for the displaced grid electricity (in tCO_2 /GWh).

The Emission factor for northern region is taken from CEA published Grid Emission Factors for Indian grid systems, which are made publicly available on CEA website. The Emission factors are calculated according to the guidelines of CDM UNFCCC website.

Key Parameter	Value	Data Source	Website
EF	Baseline emission factor for the Northern region grid	CEA published baseline emission factor for Northern region grid (CM)	www.cea.nic.in
EGy	Net power export to the grid per annum	From Plant and HPSEB Records. Ex-post determination.	------

The baseline emission factor has been considered from the "**CO_2 Baseline Database**" published by CEA[3]. The emission factor published by CEA for the latest year 2006-07 is 810.46 tCO_2/GWh based on combined margin approach.

Actual emission reductions from each of the two projects will be calculated ex post based on the actual amount of electricity exported during each year of the crediting period.

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:

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UNFCCC simplified modalities and procedures seek to establish additionality of the small scale project activities as per Attachment A to Appendix B, which listed various barriers, out of which, at least one barrier shall be identified due to which the project would not have occurred any way.

Project participants have undertaken the following analysis in support of additionality.

I. Investment Barrier
II. Technological Barrier
III. Barrier due to Prevailing practise
IV. Other Barriers

I. Investment Barrier:

The projected investment in the project activities are about Rs. 556.20 millions. This works out to Rs. 55.62 millions/MW. Its high specific investment cost, in combination with its small absolute size, is a key barrier, which prevents the project activities from being implemented by large power sector stakeholders such as National Hydropower Corporation (NHPC) and State Electricity Boards. These public stakeholders have a clear preference for least-cost generation options, i.e. large-scale hydro and especially thermal units.

Low Return on Investment:

[3] CO_2 Baseline Database, http://www.cea.nic.in/planning/c%20and%20e/Govertment%20of%20India%20website.htm

The project faces investment barrier due to low return on investment. IRR analysis is prepared and the project IRR is compared with Bench mark to demonstrate additionality of the project activity.

The project internal rate of return (IRR) worked out for a period of 20 years is working out to 10.97 %, which is less than the Benchmark Return of 15.23%. The soft copy of investment analysis along with assumptions supporting the preparation of cashflow statements is furnished to the DOE for verification.

The relevant benchmark value has been determined according to tool for demonstration and assessment of additionaility (version.5) Clause (a) of sub-step 2b – option III which states that " 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 officially publicly available financial data.

Following figures have been considered for arriving at the relevant Benchmark.

Government Bond rate [4] = 7.73 %

December **Reserve Bank of India Bulletin** **2006**

No. 27 C : MONTH-END YIELD TO MATURITY OF SGL TRANSACTIONS IN CENTRAL GOVERNMENT DATED SECURITIES FOR VARIOUS RESIDUAL MATURITIES

(Per cent)

Term to Maturity (in years)	2005		2006									
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.
1	2	3	4	5	6	7	8	9	10	11	12	13
20	7.4440	7.4058	—	7.5694	7.7261	7.7902	8.0768	—	8.6829	8.2499	8.0578	7.9912

er

a) The Equity Premium in India by *Rajnish Mehra*, University of California, Santa Barbara and National Bureau of Economic Research[5], and
b) A First Cut Estimate of the Equity Risk Premium in India by *Prof. Jayant R. Verma and Samir K. Barua*, Indian Institute of Management, Ahmedabad[6]
c) Cost of Capital for Central Sector Utilities by Crisil Advisory Services[7]

While Prof. Rajnish Mehra has estimated the equity risk premium at 9.7% based on Sensex and 11.3% based on BSE 100, Prof J.R. Verma and Barua have estimated the equity risk premium at about 8.75% on geometric mean basis and 12.50% on an arithmetic mean basis with reference to Sensex. According to the Crisil study "Some researchers like Prof. Aswath Damodaran have categorized the countries on the basis of economic fundamentals like variance in the economy, political risk, structure of the market, etc., and predicted a market risk premium to be used for countries in each category. For a developing country such as India, a value of 7.5% has been predicted".

[4] http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/74675.pdf

[5] http://www.academicwebpages.com/preview/mehra/pdf/Equity%20Premium%20in%20India.pdf

[6] http://www.iimahd.ernet.in/~jrvarma/papers/WP2006-06-04.pdf

[7] http://cercind.gov.in/rep1304.pdf. (2.2 a; page 29)

Among the above three sources the PP has considered a conservative estimate of 7.5% as risk premium for the project activity.

Therefore the benchmark is estimated at 15.23% (7.73 % + 7.5 % = 15.23 %).

As explained earlier the project IRR is 10.97% which is lower compared to benchmark of 15.23%. The same improves to 14.07% considering CDM revenue. Therefore the project activity is not feasible without considering CDM revenue.

A sensitivity analysis has been carried out with respect to parameters having more than 20% impact such as project cost and revenue. The results are as under:

Parameters	+ 10%	Base Case	- 10 %
Project Cost	9.58%	10.97%	12.60%
Revenue	12.91%	10.97%	8.87%

Further the sensitivity analysis has also been carried out to determine the scenarios in which the project activity would pass the benchmark, or yields more favourable return nearer to the Benchmark. If the project cost decreases by 23.11 % or when the revenues increases by 22.89 % the IRR improves to 15.23 %. However there are no possibilities of both the scenarios happening. The revenue is based on tariff fixed in the power purchase agreement and therefore the chance of the same going up does not happen. Similarly due to the increase in the cost of civil works as well as plant and machinery, the project cost is likely to go up and will not come down.

Therefore the project is not economically the most attractive proposition without CDM revenues, and it is against the above background that CDM benefits assume importance for taking up the project activity with CDM benefits.

II. Technological Barrier:

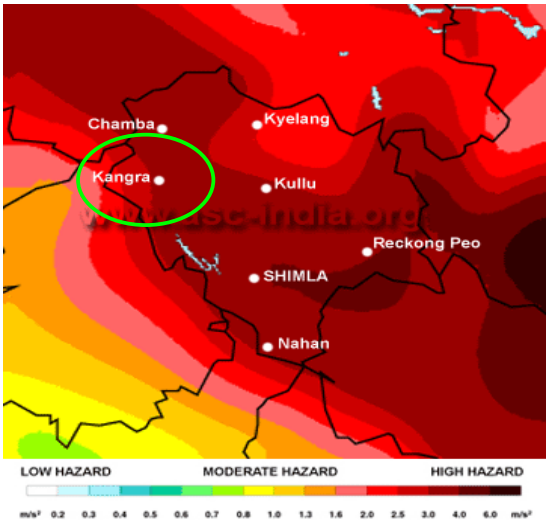
Geological Risks:

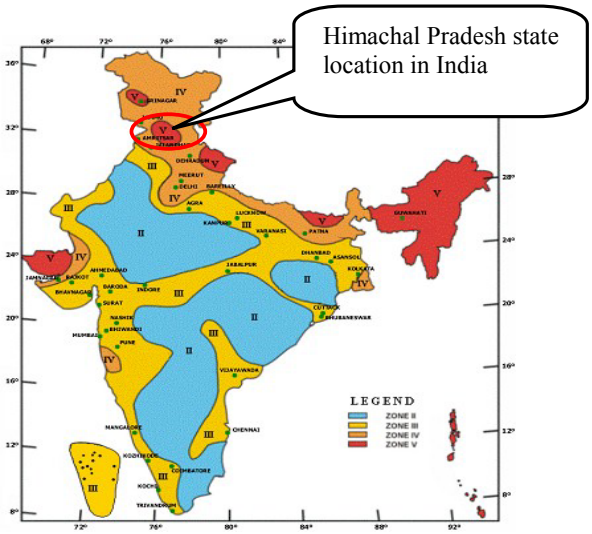
Himachal Pradesh is exposed to various geological risks. Frequent natural disasters of various intensity and their impact on society and land are one of such problems which has been hampering the development of the state. Earthquakes, landslides, cloudbursts, flashfloods, avalanches.. etc, have caused tremendous loss to the state. On the basis of the damage caused by the disasters and their wide spread nature, Himachal Pradesh can be called as one of the most unstable and disaster prone states of India[8]. Of the geological risk affecting the project activity, the most important are;

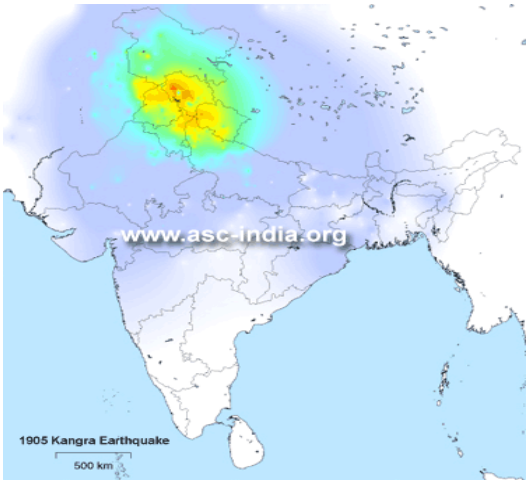
- Earthquakes
- Flash Floods
- Landslides

[8] Further evidence on the geological risks can be found from a Report prepared by Planning Commission, Government of India in "Himachal Pradesh Development Report" (http://www.planningcommission.gov.in/plans/stateplan/sdr_hp/sdr_hpch3.pdf).

- *Earthquakes:* The project areas lie in highly seismic belt and within seismic zone V of the seismic zoning map of India. The project sites are located in Kangra valley, which lie in the epicenter tract of devastating Kangra earthquake of 1905. The magnitude of this earthquake was recorded as 8 on Richter's scale. The area is prone to repeated earthquake of rarely high intensities as indicated by recurrence of Dharamshala earthquake of 1978. The magnitude of this earthquake was 5 on Richter's scale and epicenter lies in the vicinity of Dharamshala. From seismic zoning map of India (IS 1893-1975), it is seen that project areas lie in seismic zone where earthquake of intensity greater than IX mm scale are expected. As such project proponent will have to consider these issues while implementation of the project, which leads to higher investment and risk to the project investment.







1905 Kangra Earthquake

- *Flash Floods:* In Himachal Pradesh state, the flood is due to various reasons which include cloudburst in the catchment areas, intense and prolonged rainfall, the downstream blocking of river channels by landslides or avalanches or the sudden breach or burst of artificial/ natural lakes.

  The rivers in Himachal Pradesh have a history of flash floods, which normally occur during rainy season (June - September). Another form of flooding in this hilly state is flash flooding which is principally associated with hydrologically small regions. The duration of this phenomenon is short but can cause extensive damage. The state of Himachal Pradesh has experienced a large number of incidences of floods since its inception in 1971. Though the state has also faced severe flood disasters in 1975 and 1988 but the last decade (1997-2005) has proved one of the worst decades as both the magnitude and frequency of floods have gone up. There were several incidences of floods/flashfloods during 1997-2005 and of which about five were really gigantic. These disastrous events have brought heavy toll to the state as the loss was estimated in several thousand millions of rupees and also killed several hundreds of people besides large number of cattle heads[9].

- *Land Slides*: In the rainy season, heavy rain fall is common[10], 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 lost revenues if plant operation is affected.

  The project activity has also experienced landslide during the construction stage. A severe landslide in the year 2007 has extensively damaged the infrastructure of the project. The damage of the infrastructure includes power house access road, parapet wall of the project, supporting soil besides the switchyard, desilting tank and water conducting system. One of the construction workers (local villager) at the project site died during the landslide, due to which the project faced difficulty in the project progress, since, the villagers were not willing to work at the site due to

[9] Floods and Flash Floods in Himachal Pradesh : A Geographical Analysis Dr. D. D.Sharma, Himachal Pradesh University, Shimla , www.nidm.net/idmc/Proceedings/Flood/B2-%206.pdf

[10] http://www.tribuneindia.com/2007/20070301/himachal.htm#1

the impact of the incident for long time. This hindered the progress of construction and overrun of time and additional costs. The renovation works at the site attracted additional efforts as well as high expenditure to the project participant. Inspite of the past history of landslides in the region, the project participant took investment decision to proceed for project implementation only by considering the CDM revenues. This incidence of landslides presents a significant risk and barrier for the project as envisaged.

III. Prevailing practice:

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

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 in general, 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; and
- The few small-scale hydro plants existing in the project region (state of Himachal Pradesh) are different from the proposed projects with respect to capacity.

Each of these three indicators is analyzed in more detail below:

In order to demonstrate that the proposed project activity i.e. generation of electricity through two small hydro projects of 5 MW each, is not a common practice- use the fact that 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 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 was 126,089 MW[11] as on 30th June 2006. Against this, small hydro projects in operation in India was 1748 MW[12] as on the same date, giving an idea of the contribution of small hydro projects in the total power generation at 1.38 %. This percentage is only related to the installed capacities. It is a well known fact that plant load factor of the small hydro projects is always less, some times as low as below 30%, compared to approx. 70 – 90% for thermal power plants.

In the Northern region, the total installed capacity of power plants is 33,957.1 MW[13] against small hydro installations of 525.72 MW[14]. This corresponds to a share 1.55% for small hydro.

[11] Page No: 3, CEA Report as on 30th June 2006. www.cea.nic.in/planning/POWER SCENARIO AT A GLANCE/ index.htm

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

[13] Page No: 7, CEA Report as on 30th June 2006. www.cea.nic.in/planning/POWER SCENARIO AT A GLANCE/ index.htm

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

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Another interesting fact is that the installed capacity of hydro projects, basically large projects in India is 32,326 MW[15] against an installed capacity of small hydro projects to an extent of 1748 MW[16] accounting for about 5% of the total hydro capacity.

b) Tapping of Potential for Small Hydro

In Himachal Pradesh, the total hydro potential has been estimated at 20,400 MW, and the potential for small hydro projects (below 25 MW) at less approx. 750 MW[17]. However, the total installed capacity of small hydro power plants today is only 112.2 MW. Out of this 89.5 MW. was constructed by the state power generator HPSEB over several years. The remaining are being, established under the HIMURJA program, partly as CDM activities (Table 4). This means that the existing potential for small hydro in the state has been tapped to an extent of only 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 3. 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 activities. Today the focus of HPSEB is clearly on large-scale hydro projects. Schemes which are under execution by HPSEB are to an extent of 2720.50 MW out of which all the projects are large hydro projects (99%) (www.hpseb.com/hydro_potential.htm). Hence implementation of small-scale projects such as the proposed projects cannot be considered a common practice of HPSEB.

Table 3: 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**

[15] www.cea.nic.in/planning/POWER SCENARIO AT A GLANCE/ index.htm

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

[17] www.hpseb.com/hydro_ potential.htm

	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 the state nodal agency has facilitated implementation of small hydro projects with private participation. The list is furnished below in the Table 4. As could be seen from the list the projects which are comparable with the project activity in terms of capacity are already registered under CDM. The few existing projects are not necessarily comparable with projects in the size range of 5 – 25 MW, because they involve a 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 4 List of hydropower projects under HIMURJA[18]

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

S. No	Name of the Project	Capacity
1	Raskat	0.8 MW
2	Titang	0.9 MW
3	Dehar* [19]	5 MW
4	Maujhi* [20]	4.5 MW
5	Ching	1 MW
6	Manal*[21]	3 MW
7	Aleo* [22]	3 MW
8	Manjhal	1 MW
9	Baragran[#23]	3 MW
10	Salag	0.15 MW
	Total	**22.35 MW**

(Note: * Project activities which are registered with CDM Executive Board
Project under request for registration)

IV. Other Barriers:

Lack of Hydrological Data

- There is no rain gauge station in the catchment of Luni – III and Luni – II hydroelectric projects. Rainfall data of nearby precipitation stations at Dharamshala/Palampur has been considered.

- Further there is no snow gauge data available in the Luni Khad valley. The data available in respect of rainfall/snowfall is too less to give any quantitative information regarding rain or snow that occurs over different part of the catchment.

- Discharges of Luni Khad have not been measured in the past and discharge data is available for two lean seasons i.e. from November 2002 to May 2004.

- Long term flow series for Luni Khad has been developed from the long term data available from Neogal Khad which has different catchment characteristics compared to Luni Khad catchment. In absence of the longer duration data in the nearby catchment, the flows at Neogale Khad are taken to derive long term flow series for Neogal Khad for estimating power potential for project activity. Since longer flow series is obtained for the project activity from gauge station of dissimilar catchment characteristics there is every possibility for higher or lower actual discharges at the project location during project operation period.

The dependability factors for these projects such as various flows, mean rainfall are simulated from data which are not reliable and incomplete, where major risk is involved for investment as the nearby catchments characteristics such as run-off, absorption etc., are not available at the project planning stage.

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

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

[21] Reference No. 0330, 21 July 2006, http://cdm.unfccc.int/Projects/registered.html

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

[23] Reference No: 1253, Request for registration, http://cdm.unfccc.int/Projects/request_reg.html

Lack of Infrastructure:

The project location is underdeveloped; hence, infrastructure such as roads, electricity, communication, transportation and proper civic amenities are not available. The project promoters are required to develop these facilities investing substantial sum of money before implementation of the projects. Steel required will be brought from steel stockyard at Chandigarh, which is about 325 kms from the project sites. Cement required for project construction has to be procured from Barmana and Darlaghat, which are about 120 to 150 kms from the project sites. This results in a substantial impact on the cost of these materials.

As the locations are 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 and transport facilities. The evacuation of the power generated by the projects to the grid is a major concern.

Power evacuation problems:

The power generated has to be transmitted through 8.5 km long 33 k.v line in the hilly terrain where the transmission line may be subjected to problems on account of heavy rainfall, gale, landslides and earthquakes. The availability of line will be badly suffered especially during monsoon season. Power evacuation problems will arise during the rainy season resulting in to loss of power generation every year. Therefore project faces power evacuation problems.

Hence, the proposed projects are 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 this additional revenue will lighten the said risks to a certain extent.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The project activities generate electricity using hydro potential and export 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 activities 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 activities do not modify or retrofit an existing electricity generation facility, the electricity in the baseline scenario would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in the grid system.

The baseline emissions are calculated based on the net electricity exported to the grid (in GWh/year), and an emission factor for the displaced grid electricity (in tCO2 /GWh).

$BE_y = EG_y * EF_y$

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where,

EG_y = the net electricity exported to the grid system during the year *y*
EF_y = the emission factor of the grid to which the project exports electricity

Central Electricity Authority (CEA) (which is an official source of Ministry of Power, Government of India) have worked out baseline emission factors for various grids in India and made them publicly available i.e "**CO_2 Baseline Database**" at

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

The emission factor of the grid for the ex ante approach is calculated in the following way:

According to the METHODOLOGICAL TOOL, 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. Identify the relevant electric power system.
Step 2. Select on operating margin (OM) method.
Step 3. Calculate the operating margin emission factor according to the selected method.
Step 4. Identify the cohort of power units to be included in the build margin (BM).
Step 5. Calculate the build margin emission factor.
Step 6 Calculate the combined margin (CM) emission factor.

Step 1 – Identify the relevant electric power system

Central Electricity Authority , a statutory organisation of Government of India, the host country has published a delineation of the project electricity system and connected electricity systems. For identification of relevant electric power system of the project activity the data published by CEA of India is used and the project activity falls under southern regional grid.

Step 2 – Select an operating margin (OM) method

The approved methodological tool recommends the use of one of the following for the calculation of the operating margin emission factor ($EF_{grid,OM,y}$):

a) Simple OM, or
b) Simple adjusted OM; or
c) Dispatch data analysis OM; or
d) Average OM.

The methodological tool 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 unlikely to be so during the crediting period.

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In view of this it is proposed to apply other choices as suggested in the METHODOLOGICAL TOOL. Since the power supplied by low cost must run power plants[24] to the Northern grid during 2006-07 is clearly below 50%, it has been decided to apply the **Simple OM method.**

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.

Step 3 – Calculate the operating margin emission factor according to the selected method.

a) Simple OM

In the Simple OM method, the emission factor is calculated as generation weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. simple OM can be calculated using any of the three available methods. Option A has been selected where the data on fuel consumption and net electricity generation of each power plant/ unit is available. The CEA baseline is derived using the following formulae to calculate simple OM

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_{m} EG_{my}} \quad (1)$$

Where:

$EF_{grid,OM,simple,y}$ is simple operating margin CO2 emission factor in year y (tCO2/MWh)

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

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

$EFco_{2,I,y}$ is CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)

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

m is all power plants / units serving the grid in year *y* except low-cost / must-run power plants / units

i is all fossil fuel types combusted in power plant /unit m in year y

y is either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante)

The CEA data published on Baseline emission factor for different regions in Indian electricity system are provided in Annex 3.

Table 1: Operating Margin[25]

Most recent three years	2004/05	2005/06	2006/07

[24] Defined as Hydro, geothermal, wind, low cost biomass, nuclear and solar generation plants in the METHODOLOGICAL TOOL

[20] CEA published CO2 data base, http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Operating Margin* (OM) in t CO_2 / GWh	980.1	999.2	998.46
Average of 3 years	**992.58**		

* including imports

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

Step 4 – Identify the cohort of power units to be included in the build margin

METHODOLOGICAL TOOL 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 Northern 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.

Step 5 – Calculate the build margin emission factor

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

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

Where:

$EF_{grid,BM,y}$ –Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ –Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ –CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m –Power units included in the build margin

y –Most recent historical year for which power generation data is available

Build Margin emission factor[4] is determined as below:

Build Margin (BM)	**628.34**	tCO_2 / GWh

Step 6 – 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% for the first crediting period. As noted above, the resulting Combined Margin is fixed ex ante for the duration of the crediting period:

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

Where:

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

As the proposed project activity is Hydro, the weighting of operating margin emission factor and weighting of build margin emission factor is considered as 0.5 and 0.5 respectively and calculated combined margin as under:

Combined Margin (CM) Simple average of OM and BM	**810.46**	tCO_2 / GWh

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. However, as the projects are equipped with diesel generator of capacity 62.5 kVA to meet the emergency requirements of power house etc., emissions out of usage of fossil fuel (diesel) will be accounted as project emissions based on the following equation.

$$PE_y = FF_{i,y} \cdot COEF_i$$

Where

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

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

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

The CO_2 emission coefficient COEFi fuel *i (*tCO_2 / mass or volume unit of the fuel), is obtained as

$$COEFi = NCVi \cdot EF_{CO2,i} \cdot OXIDi$$

Where

NCVi the net calorific value (energy content) per mass or volume unit of a fuel *i*(43 TJ/Gg as per IPCC2006 default values)
OXIDi the oxidation factor of the fuel (1 as per IPCC 2006 default Values),
$EF_{CO2,i}$ the CO_2 emission factor per unit of energy of the fuel *i(*74.1 tCO_2/TJ as per IPCC 2006 default values).

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Where available, local values of NCVi and $EF_{CO2,i}$ should be used. If no such values are available, Country-specific values are preferable to IPCC world-wide default values.

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:	810.46 (2006-07) Average of 3 year OM and BM
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:	

Data / Parameter:	$COEF_i$
Data unit:	*kg CO_2/TJ*
Description:	CO_2 emission factor of fuel type i
Source of data used:	IPCC 2006 default values
Value applied:	Diesel : 74000
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC values have been used for diesel since no country specific data is available.
Any comment:	The project activity may combust only one type of fossil fuel i.e, diesel during the project operation to meet the emergency power requirement of the project. Hence only emission factor of diesel is provided in the parameter

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B.6.3 Ex-ante calculation of emission reductions:

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Baseline emissions

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

BE_y = 40.30 GWh * 810.46 tCO_2/GWh

BE_y = 32,658 tCO_2

Project emissions

The project emissions due to the combustion of diesel are considered as zero for estimation of ex-ante calculations of emission reductions. The corresponding emissions from the combustion of diesel for operation of DG set during emergency situation are considered negligible. 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 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 * 74000 kg CO_2/TJ

$PEFF_y$ = 0 tCO_2

Leakage

No leakage is applicable

Emission reductions

ER_y = BE_y - PE_y - L_y

ER_y = 32,658 - 0 - 0

ER_y = 32,658 tCO_2 ($ER_y = BE_y$)

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

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

Year	Estimation of Project activity Emissions (tCO_2 e)	Estimation of baseline Emissions (tCO_2 e)	Estimation of Leakage (tCO_2 e)	Estimation of overall emission Reductions (tCO_2 e)
2008	0	32,658	0	32,658
2009	0	32,658	0	32,658
2010	0	32,658	0	32,658

2011	0	32,658	0	32,658
2012	0	32,658	0	32,658
2013	0	32,658	0	32,658
2014	0	32,658	0	32,658
2015	0	32,658	0	32,658
2016	0	32,658	0	32,658
2017	0	32,658	0	32,658
Total (tonnes of CO_2e)	**0**	**326,580**	**0**	**326,580**

In the above table, the year 2008 corresponds to the period starting from 01.09.2008 to 31.10.2009. Similar interpretation shall apply for remaining years for the purpose of this projection.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{gross,y}$
Data unit:	GWh
Description:	Total electricity generated by the project during the year *y*
Source of data to be used:	On-site measurements
Value of data	43.80 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 industry standards.
Any comment:	--

Data / Parameter:	$EG_{Auxiliary,y}$
Data unit:	GWh
Description:	Auxiliary electricity consumption of the project during the year *y*
Source of data to be used:	On-site measurements
Value of data	3.50 GWh (8%)
Description of measurement methods and procedures to be applied:	Measured monthly using calibrated meters and aggregated annually or the difference between the gross energy generation and the net electricity export to the grid system can be arrived as auxiliary consumption of the project activity.
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. If the data is calculated as the difference between gross and net power export, no QA/ QC procedures are applicable, since, the both parameters are already underwent the QA/QC procedures.
Any comment:	--

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	40.30 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 industry standards. Sales records to the grid and other records are used to ensure consistency.
Any comment:	Electric power sold to the grid will be measured by main meter and check meter by HPSEB as specified in the PPA and records maintained. To be cross-checked with monthly invoices or receipts of payments.

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:	--

Data / Parameter:	$F_{i,y}$
Data unit:	*Tonnes/kilo liters*
Description:	Quantity of fossil fuel type *i* combusted in the project plant during year *y*
Source of data to be used:	On-site measurements
Value of data	0 (assumed value for ex-ante calculation of emission reductions)
Description of measurement methods and procedures to be applied:	The total number of operating hours of DG set and the corresponding quantity of diesel consumed for the purpose will be recorded in the log book maintained at the DG set room. The operating hours and the quantity of diesel consumption will be recorded.
QA/QC procedures to be applied:	The weigh bridge meter will under go calibration/maintenance subject to appropriate industrial standards. The data recorded can be cross checked against the fuel purchase receipts.
Any comment:	--

B.7.2 Description of the monitoring plan:

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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 Himachal Pradesh in India. The monitoring plan, which will be implemented by the project proponent describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

Project Management

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 for the purpose. The identified person will be the in charge of GHG monitoring activities and necessary reports will be submitted to the management or it's Committee for review.

Monitoring Requirements

The monitoring plan includes monitoring of energy parameters such as Gross energy, Auxiliary consumption, energy export to the HPSEB grid system, energy import to the project activity from grid and also consumption of diesel for DG set operation. Emission reductions resulted from the project activities will be calculated using the energy fed in accordance with the calculations illustrated in Section B.6.3 of the PDD. Emission reductions generated by the projects shall be monitored at regular intervals. The crediting period chosen for the CDM project activity is 10 years.

Monitoring equipment comprises of energy meters, which will monitor the energy fed by the plants to HPSEB grid system by the proposed projects. In accordance with the PPA, project proponents have to install two energy meters one is main meter and the other is check meter for each of the two projects. Project proponent will calibrate both the meters according to the procedures laid down by PPA. Project proponent will appoint a Designated Operational Entity (DOE) for verification of emission reductions and leakages resulted by the project activities at regular intervals. As per simplified modalities and procedures for small-scale CDM project activities, the same DOE who validated the project can undergo verification of emission reductions and leakage generated by the projects.

Methodology adopted for determining base line emission factor is the **combined margin emissions** of the generating mix in the Northern 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 Northern 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 & 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.

Leakage Monitoring

The proposed bundled 10 MW Luni hydroelectric projects are 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 proposed activities.

Data Recording and Storage

The net energy fed to the grid system by the project activities will be recorded by project proponents using either of the two meters (main meter and check meter) in the presence of the representative of HPSEB in a document whose format is acceptable to HPSEB. Representatives of both the project proponent and HPSEB will sign the document which will contain all details such as the equipment data, calibration status, previous reading, current reading, export, import, net billable units, date and time of recording etc. This document will be used as a basic document for monitoring and verification of the net energy exported to the grid. HPSEB will pay to project proponents based on this document.

The above document will be preserved for verification of emission reductions from the projects, in safe storage. Supporting documents such as receipts of payments released by HPSEB will also be preserved in safe storage for later verification by an independent third party. The period of storage will be 2 years after the end of crediting period or till the last issuance of CERs for the project activities whichever occurs later.

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

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Date of completion of the baseline: 19/06/2008

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

Contact information of the above entity furnished below:

Organization:	Zenith Energy Services (P) Limited
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The above entity is not a project participant.

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:

>>
03/03/2006 (Agreement with M/s MCS Construction Pvt Ltd. For civil works)

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

>>
20 years

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

>>

C.2.1. Renewable crediting period

>>

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

>>
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:

>>
01/09/2008

C.2.2.2. Length:

>>
10 y – 0 m

SECTION D. Environmental impacts

>>

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 & Forests (MoEF), Government of India, Environmental Impact Assessment (EIA) studies need not to be carried out for the projects less than US $ 21.74 millions. Since the total cost of the proposed bundled projects are only US $ 13.90 millions, it 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.

Small-scale run-off the river hydroelectric projects has low impact on river flow volumes and all water diverted to the powerhouse is returned to main stream. Compared to thermal and nuclear establishment hazards, small hydropower hazard is almost zero. Project proponent has already obtained No Objection Certificate (NOC) from Irrigation and Public Health Department of Himachal Pradesh, Deol Gram Panchayat, 'Consent for Establishment' from Himachal Pradesh State Environment Protection & Pollution Control Board (EPPCB) and the remaining necessary permission/clearance will be obtained prior to the implementation of the projects.

Proposed projects will not result in resettlement and rehabilitation in project sites, as they are not under human habitation area. The scheme does not involve any impounding of water and hence no submergence or rehabilitation activities are involved. The projects shall not affect the aquatic life available in this stream.

Beneficial impacts are envisaged on socio-economic conditions, as there will be rural and urban electrification. The industrial development may also take place, which will trigger the economic growth in the backward region of the state.

Soil conservation methods are also taken into account prior to implementation of the projects, so the proposed projects will not result in damage to soil profile in the construction phase. From the above discussions, it is evident that the proposed projects are not likely to have any significant adverse environmental impacts during execution or after commissioning.

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:

>>

No significant environmental impacts considered due to implementation of project activities by the host party, Hence, no references or procedures are specified here.

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.

CDM – Executive Board

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 implemented or not.

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 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.	Accords techno-economic clearance to the project, purchases power from the project by executing Power Purchase Agreement to determine the tariff and other terms.

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 the state of Himachal Pradesh
Ministry of Environment & Forests, Govt. of India	Government is partly responsible for overseeing utilization of forest land.	Grants permission for utilizing forestland for the 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

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

Village Panchayat
Local populace, represented by the Deol Gram Panchayat, the elected administrative body of the village Deol where the projects are getting implemented, issued NOC (No-Objection Certificate) for both projects on 4th August 2005.

Irrigation Department
The Irrigation and Public Health Department of Himachal Pradesh has issued No Objection Certificate (NOC) for constructions of the projects vide **EE/IPHDP/WA/N.O.C./2005-5327-28** dated 12th July 2005.

HPSEB
Himachal Pradesh State Electricity Board (HPSEB) accords Techno-Economic Clearance for the projects vide letter No. **HPSEB/CE (P)/CC-Luni-III/2004-1496-1505** dated 17th August 2005 for Luni-III SHP

CDM – Executive Board

and vide letter No. **HPSEB/CE (P)/CC-Luni-II/2004-1476-85** dated 17th August 2005 for Luni-II SHP..

EPPCB

Himachal Pradesh State Environment Protection & Pollution Control Board (EPPCB) has issued 'Consent for Establishment' vide Consent No. **EPPCB/Luni-III SHEP – Kangra/2006/3454-59** dated 24th February 2006 and Consent No. **EPPCB/Luni-II SHEP – Kangra/2005/3460-65** dated 24th February 2006 for 5 MW Luni – III small hydroelectric project and 5 MW Luni – II small hydroelectric project respectively.

The 'Consent to Establish' granted by Himachal Pradesh State Environment Protection & Pollution Control Board (PCB) was renewed vide letter No. **NO/PCB/EE (J)/838-/07-3052-53** dated 16th March, 2007 for 5 MW Luni-III small hydro-electric project and **NO/PCB/EE (J)/838-/07-3050-51** dated 16th March, 2007 for 5 MW Luni-II small hydro-electric project. Copies of approvals are furnished for verification

Stakeholders' Comments

All stakeholders have issued their approvals/consents/licenses for setting up the projects and no comments were received on the projects.

E.2. Summary of the comments received:

>>

No comments were received on the projects.

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

>>

No comments were received and hence action reports are not applicable.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sri Sai Krishna Hydro Energies Private Limited
Street/P.O.Box:	Plot No: 226, Road No: 78, Jubilee Hills,
Building:	Phase- III
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 033
Country:	India
Telephone:	+91- 40- 2354 6500, 2354 6600
FAX:	+91- 40- 2354 7700
E-Mail:	asthapower@rediffmail.com
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Keshav
First Name:	M
Department:	
Mobile:	
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Direct tel:	+91- 40- 2354 6500, 2354 6600
Personal E-Mail:	asthapower@rediffmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

This project uses grid emission factor calculations officially published by the Central Electricity Authority (CEA) of India, following the approaches and rules defined in METHODOLOGICAL TOOL. For details and further information on data please see CEA CO_2 data base from the following web link: http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

➔ "CDM Carbon Dioxide Baseline Database, Version 3 (December 2007)"

Annex 4

MONITORING INFORMATION

Monitoring information is provided in section B.7.2

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