# CLEAN DEVELOPMENT MECHANISM
# SIMPLIFIED PROJECT DESIGN DOCUMENT
# FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
# Version 02

## CONTENTS

**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.<br>• 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>. |

## SECTION A. General description of the small-scale project activity

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

>>
10 MW bundled Upper Khauli & Drinidhar small hydroelectric projects, Himachal Pradesh, India

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

>>
The bundled project activity comprises of two run of the river hydro electric schemes with capacities of 5 MWs each which will utilise surplus hydro potential available in Khauli Khad & Brahl Khad, both tributaries of river Beas in Himachal Pradesh state of Northern India and to export the generated electricity to the Himachal Pradesh State Electricity Board (HPSEB), a state owned power utility. The details for each of these projects are described below.

**5 MW Upper Khauli hydroelectric scheme:**

The scheme is located on the up stream of the proposed hydroelectric plant of Himachal Pradesh State Electricity Board who have a 12 MW grid connected power plant near Salli village which is expected to be commissioned in three to four months. There is no up stream project for the proposed Upper Khauli hydroelectric project. The catchments area is snow bound. The terrain is Himalayan mountain range and no irrigation is possible in the area. Net head available for the project is 400 meters and the design discharge is 1.50 cumecs. Energy generation is expected at 27.34 Gwh. The project design consists of two pelton wheel turbines of 2500 kws each with synchrnous generators.

**5 MW Drinidhar hydroelectric project:**

This scheme is on Brahl khad which is a tributary of Beas river. The catchment area for the project is 47.50 Sq.km. Net head available is 255 meters and design discharge is 2.58 cumecs. Energy generated by the hydroelectric scheme is expected at 27.87 Gwh. The project employs two pelton wheel turbines of 2500 kwh each.

The power is generated at 6.6 kv and will be stepped up to 33kv before interfacing with the grid system.

The implementation of the project activity is expected to have several positive impacts for sustainable development. Some of the socio economic benefits expected due to implementation of the small hydro projects are:

- The bundled project activity is proposed in rural areas, where mostly tribals are living who are engaged in seasonal agricultural activities. These areas are lacking proper medical facilities and dependable power supply. By setting up of the small hydro projects 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. The construction of the project activity extends for a period of 24 – 30 months employment is created for the local

unemployed youth during the construction period. Further during project operation, permanent employment is created for about 60 persons.

- Since the proposed project gives employment, it reduces the migration of rural peoples to urban areas.
- The proposed project will provide employment opportunity to both genders of population, which will improve the gender equity among the peoples.
- With rising hydropower generation and improving efficiencies in distribution of electricity, the bundled project activity offer energy at stable prices for industrial development of the State.
- The project would 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 results in a positive impact on balance of payments due to reduced dependence on imported coal and other fossil fuels..
- The project is 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 bundled 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 in to the stream to maintain local flora and fauna, if any.
- The project will results in utilization of environmentally safe and sound technology in small hydroelectric projects. Further the project demonstrates the harnessing the hydro potential and setting up new projects in unused watercourses.

**A.3. Project participants:**

**>>**

| Name of the party involved ((Host) indicates a host party) | Private and/or public entity (ies) project participants | Whether party involved wishes to be considered as project participant |
|---|---|---|
| India (Host) | **Private Entity:** Vamshi Industrial Power Limited | No. |

**A.4. Technical description of the small-scale 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 two projects will utilise height drops of 400 mtrs (Upper Khauli) and 255 mtrs (Drindhar) respectively. The components involved in each of the hydro electric schemes consists of construction of a raised drop type trench weir across the stream at elevations, intake chamber, desilting chamber, D-shape tunnel, 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. The annual export to the regional grid is 50.79 GWh from both the hydroelectric projects.

Brief technical parameters of both the projects under the CDM project activity are furnished below

| Parameter | Upper Khauli | Drinidhar |
|---|---|---|
| | | |
| ***Hydrology*** | | |
| Catchment area at diversion site | 16.75 sq. km | 47.50 sq. km |
| Design Discharge | 1.50 cumecs | 2.58 cumecs |
| Gross head | 429.12 m | 267.06 m |
| Net rated head | 400 m | 255 m |
| | | |
| ***Plant Equipment*** | | |
| Type of hydro turbine | Pelton Wheel | Pelton Wheel |
| Type of generator | Synchronous | Synchronous |
| No. of generating units | 2 | 2 |
| Capacity of each generating units | 2500 KW | 2500 KW |
| Generation voltage | 6.6 KV | 6.6 KV |
| Grid interfacing voltage | 33 KV | 33 KV |
| Frequency | 50Htz | 50Htz |
| | | |
| ***Energy*** | | |
| Gross energy generation | 27.34 MU | 27.86 MU |
| Annual export to the grid | 25.15 MU | 25.63 MU |

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

**>>**

**A.4.1.1. Host Party(ies):**

**>>**

India

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

**>>**

Himachal Pradesh

**A.4.1.3. City/Town/Community etc:**

**>>**

**District:** Kangra & Chamba

**Tehsil:** Shahpur (T) (for Upper Khauli) & Sihunta (S.T) (for Drinidhar)

**Village:** Salli (Upper Khauli), Bhiora (Drinidhar)

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity (ies):**

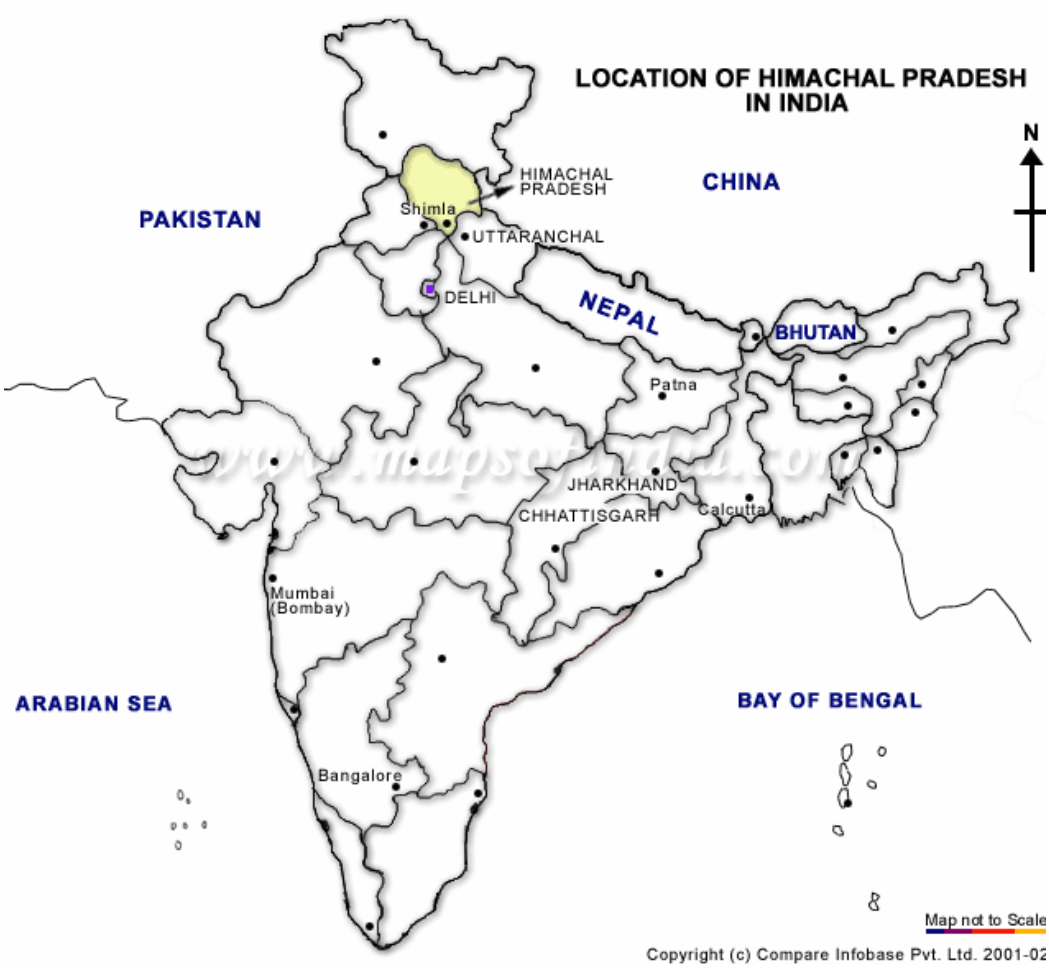
**>>**

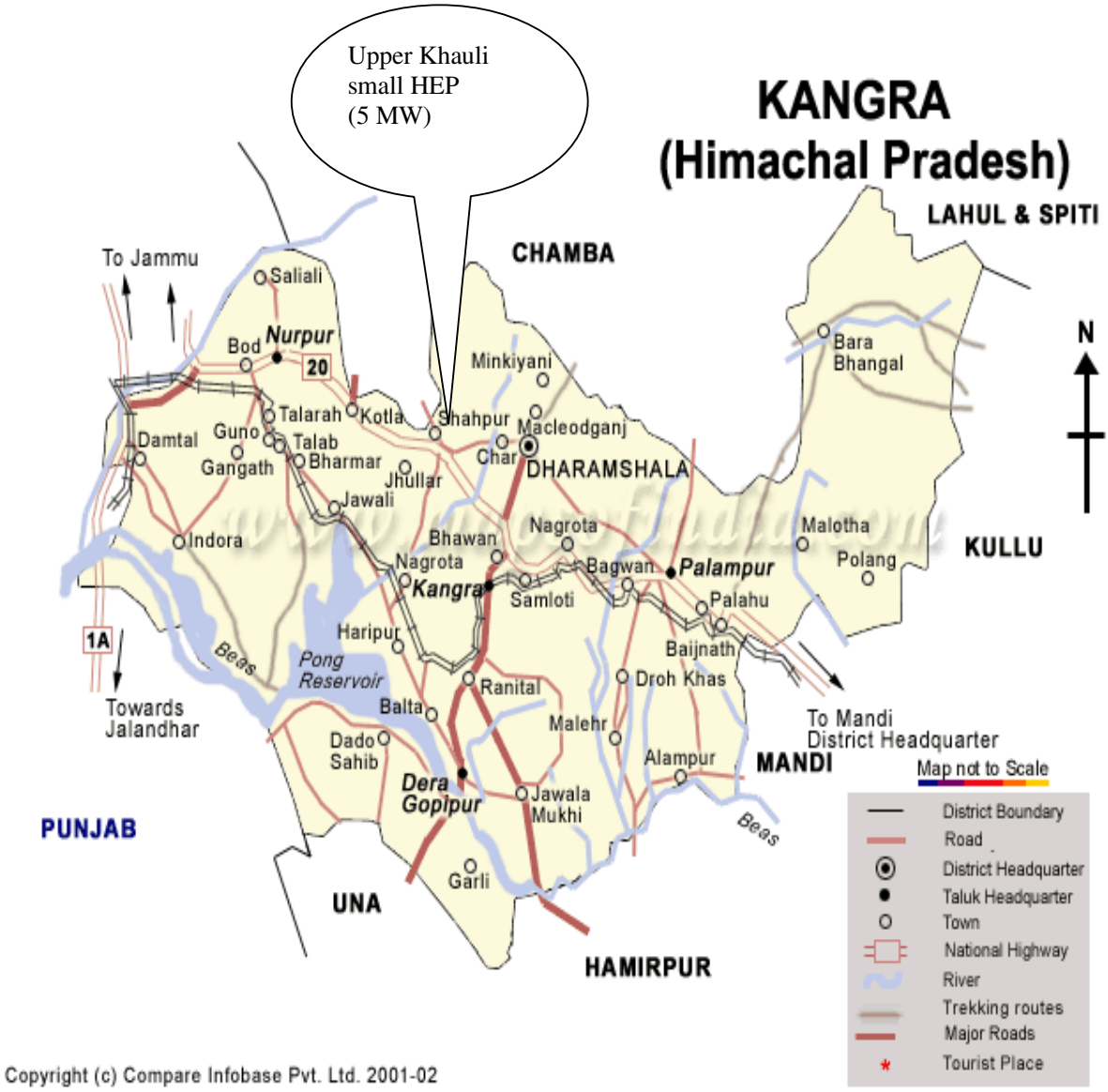
The CDM project activity is a bundle of two small hydroelectric projects, of which one plant is located on upstream of the Khauli Khad, the other at the down stream of Brahl Khad in the Kangra and also in the adjacent Chamba District of Himachal Pradesh.

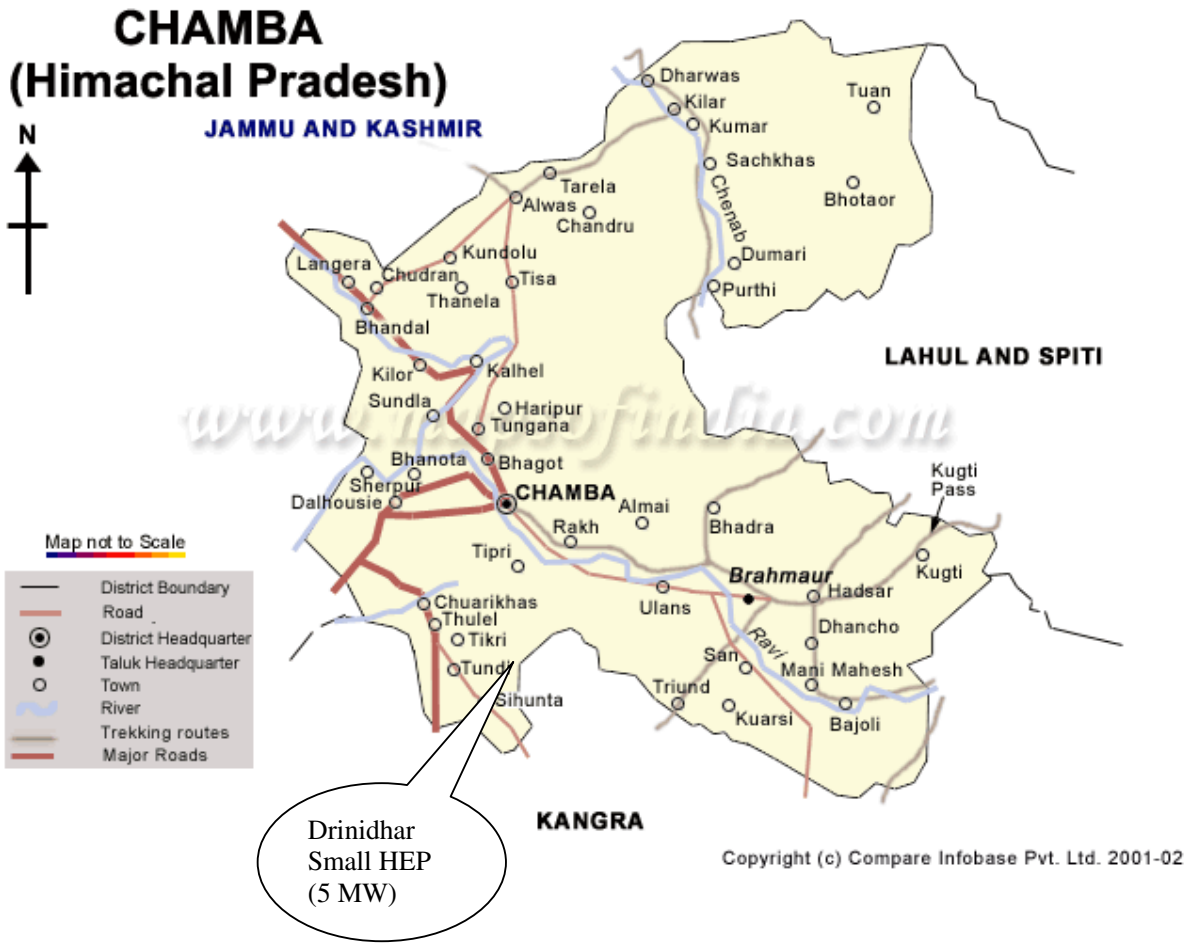
The Upper Khauli Small Hydroelectric project is a run-of-the river development scheme for power generation on Khauli Khad, a tributary of Beas River. The project is located near village Salli, in Kangra District of Himachal Pradesh. Salli village is at 21 km distance from Shahpur town, on Pathankot – Manali National Highway – 20, which is connected to Shimla, Pathankot, Chandigarh and is linked to the nearest railhead at Kalka by a 220 km long road. A motorable road exists from Shahpur village and an approach road can be constructed from this road to the powerhouse site for about 5 km. The Geographical location of the project site is between longitude $77^{o}$- 42'- 44'' E & $77^{o}$-1'-10'' E and latitude $31^{o}$- 23'-57'' N & $31^{o}$- 23'-17'' N.

The Drinidhar Small Hydel Power project is proposed as a run-of-the river scheme on Brahl Khad, a tributary of Beas River, which runs through two adjacent districts Chamba & Kangra of Himachal Pradesh. The powerhouse is located in the Village Bhiora, Sihunta (S. T) Tehsil, Chamba district, which is at a distance of 42 km from Kangra and 244 Km from Shimla, the state Head Quarters by road. The nearest railway station is at Pathankot at a distance of 71 km. The Geographical location of project is between longitude $76^{0}$-8' – 35'' E & $76^{0}$ -11'-30'' E and latitude $32^{0}$-16'-20'' N & $32^{0}$-19'-15'' N.

The location maps of the project are furnished below:


LOCATION OF HIMACHAL PRADESH IN INDIA
N
HIMACHAL PRADESH
CHINA
PAKISTAN
Shimla
UTTARANCHAL
DELHI
NEPAL
BHUTAN
Patna
JHARKHAND
CHHATTISGARH
Calcutta
Mumbai (Bombay)
ARABIAN SEA
BAY OF BENGAL
Bangalore
Map not to Scale
Copyright (c) Compare Infobase Pvt. Ltd. 2001-02


Upper Khauli
small HEP
(5 MW)
KANGRA
(Himachal Pradesh)
LAHUL & SPITI
CHAMBA
KULLU
MANDI
PUNJAB
UNA
HAMIRPUR
To Jammu
Towards
Jalandhar
To Mandi
District Headquarter
Saliali
Nurpur
Bod
20
Talarah
Kotla
Shahpur
Minkiyani
Macleodganj
Damtal
Guno
Talab
Gangath
Bharmar
Jhullar
Jawali
Char
DHARAMSHALA
Bara
Bhangal
Indora
Bhawan
Nagrota
Kangra
Samloti
Bagwan
Palampur
Palahu
Malotha
Polang
Haripur
Pong
Reservoir
Beas
1A
Ranital
Droh Khas
Baijnath
Balta
Malehr
Dado
Sahib
Dera
Gopipur
Jawala
Mukhi
Alampur
Garli
N
Map not to Scale
District Boundary
Road
District Headquarter
Taluk Headquarter
Town
National Highway
River
Trekking routes
Major Roads
Tourist Place
Copyright (c) Compare Infobase Pvt. Ltd. 2001-02




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

**>>**

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

***Project type : Type I - Renewable Energy Projects***
***Category : I.D - Renewable Electricity Generation for a grid.***

Since, the capacity of the proposed CDM project is only 10 MW, which is well below the qualifying capacity of 15 MW, the project activity is a small scale CDM project activity and UNFCCC indicative simplified modalities and procedures can be applied.

The technology or 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.

No technology transfer is involved in the project activity.

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 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 for the streams have revealed that the capacity of power generation cannot exceed 10 MW. Further, the power generation capacity of the project activity is limited by the installed capacity of the generators installed in the plants. Hence, the project participants affirm that the capacity of the project would remain as 10MW and would be within the limits of small scale through out the crediting period.

**A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:**

**>>**

The proposed project activity generates electricity-using hydro potential and exports the generated power to the regional grid system. Hence, the generation by the proposed project activity is non-GHG source and it is expected that the proportion of fossil fuel based generation in the grid will be reduced by the project activity leading to lesser carbon intensity in the grid.

Emissions reductions due to the project activity mainly depend on the energy fed to the state grid and the content of fossil fuel based generation in the grid system.

The proposed project activity displaces northern regional grid electricity, which is fed by both fossil and non-fossil fuel based generation sources. As per the latest records of power generation, the share of thermal power coming from coal, lignite and gas are around 74%. The connected grid system i.e northern regional grid is dominated by fossil based power generation, which is evident from the share of fossil fuel based power accounting to 74% of the total grid electricity. Further, the significant energy shortage exists to an extent of around 11.51% in the northern region such that huge financial resources need to be mobilised. Due to the prevailing resource potential, the reliance will be only on the coal based power plants. This is evident from the fact that large capacity additions are not possible through hydro, nuclear, wind, biomass and natural gas. Because of this increasing dependence on coal based power projects, the carbon intensity of the connected grid electricity system increases in the near future.

On the other hand, the renewable energy sector in India is advancing at a very slow pace, even though the Govt. of India encourages development of renewable energy projects in India. In the year 2000, Govt. of India has set a target of 10000 MW additions by 2012 from renewable energy sources. Under the present market conditions and unfavourable market environment in the power sector, achieving this target is highly unlikely.

In view of the above discussion as demonstrated in section B.3, it can be concluded that the project activity would not have occurred without the CDM and that the project activity generates emission reductions in addition to that of the baseline.

The project activity is expected to generate around 50.79 GWh per year for the grid system and depending on the grid electricity emission factor, the anticipated emission reductions would be around 426,600 during 10 years of crediting period.

**A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:**

**>>**

The bundled project activity will export 50.79 GWh/annum to the Northern Regional grid after auxiliary consumptions from the installed capacity of 10 MW. The average estimated amount of emission reductions is 42,660 $tCO_2$ eq. per annum and it is calculated as 426,600 $tCO_2$ eq. for the whole 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 | 42,660 |
| 2 | 2009 | 42, 660 |
| 3 | 2010 | 42, 660 |
| 4 | 2011 | 42, 660 |
| 5 | 2012 | 42, 660 |
| 6 | 2013 | 42, 660 |
| 7 | 2014 | 42, 660 |
| 8 | 2015 | 42, 660 |
| 9 | 2016 | 42, 660 |
| 10 | 2017 | 42, 660 |
| **Total Emission reductions** (tonnes of $CO_2$ eq) | | 426, 600 |
| **Total Number of crediting years** | | 10 |
| **Annual average over the crediting period of estimated reductions** (tones of $CO_2$ eq) | | 42, 600 |

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

**>>**

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 larger project activity:**

**>>**

The proposed small-scale project activity is neither debundled one of a larger project activity nor bundled to form a larger project activity (> 15 MW). The proposed small-scale CDM project activity of 10 MW capacities is a bundled component of two small project activities of 5 MW each (4 x 2.5 MW) and the PDD is developed for this capacity.

The project proponents hereby confirm that the proposed project activity is not a debundled component of another larger project activity.

## SECTION B. Application of a baseline methodology:

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

>>
Project Title: Type 1 – Renewable Energy Project
Reference: I. D. Renewable Electricity Generation for a Grid

### B.2 Project category applicable to the small-scale project activity:

>>
The project category is renewable energy generation for a grid system which is fed by both fossil fuels fired generating plants and non-fossil fuel based generation plants. Hence the applicable baseline as per clause 29 of Appendix B, indicative simplified baseline and monitoring methodologies is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in $kgCO_2/kWh$) calculated in a transparent and conservative manner.

Under clause 29 of Appendix B, two methods of calculating the emission co-efficient are given. Under clause 29(a) emission coefficient is calculated as the average of the approximate operating margin and build margin. Under the second method i.e. 29(b), the emission factor is the weighted average emissions of the current generating mix. Grid system and the baseline methodology for the proposed activity are described below.

*Grid System*

The state of Himachal Pradesh falls under Northern regional grid and the project proponent has considered regional grid as the appropriate electricity system for the project activity.

*Emission Co-efficient*

Out of the two methodologies specified in the indicative simplified baseline and monitoring methodologies, the second method viz. 29(b), the weighted average emissions (in kgCO2e/kWh), is chosen for the proposed project activity due to the following reasons.

The proposed project activity will displace grid electricity, which is fed by both fossil, and non-fossil fuel based generation sources. Keeping in view of the electricity scenario, the entire Northern Region Electricity Grid ((NREB) system with its expansion plans, generation and investment trends are considered for identifying the baseline scenario.

The grid system chosen for the proposed activity is presently under deficit situation. As per NREB Annual Report 2005-06, the grid system is facing 11.51% energy shortage and about 12.68% peak deficit. Further, as per the 16$^{th}$ electric Power Survey by Central Electricity Authority, the growth in the energy requirement is around 6.9% till 2017. Present planned capacity addition will not be sufficient to meet the energy demand and it is most likely that all power generating plants will be in operation during the crediting period. An analysis of the past data indicates that the planned capacity would never be achieved in the power sector in the country.

Non-fossil fuel energy sources such as hydro, biomass, wind and nuclear are very limited such that the energy development compared to the demand is very low. Ministry of Non-conventional Energy Sources has targeted an addition of 10% of the total installed capacity of the year 2001 i.e. 10,000 MW through renewable energy sources by the year 2012. Northern Region is expected to add about 2784[1] MW approximately. But, it is unlikely to achieve this target due to limited renewable energy sources. Substantial nuclear capacity addition is not possible during the crediting period. Only two nuclear projects are under construction in the northern region with a total capacity of 440 MW[2], which are expected to commission during 2007. Hence carbon intensity of the grid cannot be reduced from the non-fossil fuel based power generation.

Although the fossil fuel based generation mix in the grid system is likely to increase during the crediting period, choice of weighted average emissions of the current generation mix (Option 29.b of simplified baseline methodologies) as the baseline for the proposed project activity makes the estimation of emission reductions conservative over the choice of average of operating and combined margin (Option 29.a of simplified baseline methodologies).

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

**>>**

*Justification of application of simplified methodologies to the project activity*

The capacity of the project is only 10 MW, which is less than the qualifying capacity of 15 MW to use simplified methodologies. Hence, the project satisfies the decision 17/CP.7, paragraph 6 (c) of the simplified modalities and procedure of SSC project activity.

Further, the project activity is generation of electricity for a grid system using hydro potential. Hence, the type and category of the project activity matches with I.D. as specified in Appendix B of the indicative simplified baseline and monitoring methodologies for small-scale CDM project activities.

*Justification of additionality of the project*

UNFCCC simplified modalities seek to establish additionality of the project activity 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 identified the following barriers for the proposed project activity.

[1] Total installed capacity in India in the year 2001 is about 100,000 MW. 10% of it is targeted for addition by the year 2012 through renewable energy sources. As per the Annual Report of 2001-02 of Ministry of Power, the installed capacity of Northern Region is 27,843 MW in the year 2001 and 10% of the installed capacity amounts to 2,784 MW which is expected to be added through renewable energy sources.

[2] Nuclear Power Corporation of India Ltd., Rajasthan Atomic Power Station in Rajasthan. Units 5 & 6 of capacity 2 x 220 MW are expected to be commissioned during 2007.

***Investment Barriers:***

Upper Khauli SHP

There is no access to the project site unless an approach road is built. The approach road is to be laid in a hilly terrain for a length of 800 meters. Further there is no way of approaching forebay, water conductor system and weir site due to the terrain difficulties. It is planned to construct a rope way to reach the forebay and from forebay to the other component of the project, mules are being used for movement of material for construction.

The project requires construction of tunnel for the water conductor system. It is proposed to construct the tunnel with D-shape. Being a small project, the tunnel has to be of built manually. A manual path is required to be developed in the first phase, a platform is to be made for storage of civil material and then commence the construction. Therefore considerable amount and time is required to be spent for the construction of the critical components of the project.

Drinidhar SHP

The project proponent is required to construct road up to a length of 3.5 Kms and another length of 7 kms to get access to the powerhouse. A D-shape tunnel is being built as water conductor system. The construction of tunnel is expected to bring several difficulties as the strata have a very poor rock formation. Extra precautions and protection measures are required to be considered during construction of the tunnel. Further the tunnel due to its size has to be of manual construction.

The location is such that it receives un interrupted rainfall with high density during the entire rainy season affecting the construction work.

Being small hydro projects of capacity of 5 MWs, it is difficult to create necessary infrastructure for smooth construction with constraints on resources unlike a large hydro projects.

The project location is underdeveloped, hence no infrastructure such as roads, electricity, communication, transportation and proper civic amenities etc. are available. Due to lack of basic facilities, it is difficult to attract skilled manpower for the operation of the projects.

The above barriers with regard to the construction of hydro electric plants in hilly terrain prevent any new investment in the region. The project promoters had to develop these facilities before implementation of the project.

Hence, the project activity involved investment barriers.

***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. 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.

The share of electricity from small hydroelectric projects in India's total installed capacity is very small. According to the latest statistics published by the Ministry of Non-conventional Energy Sources (MNES) the total installed capacity of small hydroelectric projects is only at 2333 MW[3] including projects under construction where as the India's total installed capacity is around 124287 MW [4] as on 3rd April, 2006.

In view of the above, the proposed project activity is additional and not the same as the baseline scenario.

Other Barriers

The various other barriers related to the proposed project are:

***Geological risks:***
The project site is located close to the epicenter of Kangra earthquake occurred in the year 1905 and it falls under seismically active zone. 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.

***Hydrological risks:***
Project activity is proposed on two small streams which are tributaries 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 streams. 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. The actual gauge data is available only for short period and cannot be relied for construction of hydroelectric projects. 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.

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 activities.

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

**>>**
The project boundary specified in the Appendix B of simplified modalities and procedures is that encompasses the physical, geographical site of the renewable generation sources.

For the proposed project activity under construction the project boundary considered is that encompasses that the diversion structure, water conductor system, penstock, powerhouse, power evacuation system and tail race.

[3] Ministry of Non-conventional Energy Sources www.mnes.nic.in
[4] Ministry of Power, Government of India www.powermin.nic.in/generation/generation_state_wise.htm

The two hydro electric plants have their individual project boundaries. The special extent of the project activity covers all plants connected to Northern Region Grid system.

**B.5. Details of the baseline and its development:**

**>>**

The baseline for the project activity is constructed according to 29.b. i.e. weighted average emissions of the current generation mix (in $kgCO_2e/kWh$), 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: 24/05/2006

Name of the person / entity determining the baseline:
**Zenith Corporate Services (P) Limited**

Contact information of the above entity furnished below:

| | |
|---|---|
| Organization: | ZENITH CORPORATE SERVICES (P) LTD. |
| Street/P.O. Box, Building: | 10-5-6/B, MYHOME PLAZA, MASABTANK, |
| City: | HYDERABAD |
| State/Region: | ANDHRA PRADESH |
| Postfix/ZIP: | 500028 |
| Country: | INDIA |
| Telephone: | +91 40 2337 6630, 2337 6631 |
| FAX: | +91 40 2332 2517 |
| E-Mail: | zenithenergy@sancharnet.in |
| URL: | www.zenithenergy.com |
| Represented by: | |
| Title: | DIRECTOR |
| Salutation: | MR. |
| Last Name: | REDDY |
| Middle Name: | MOHAN |
| First Name: | ATTIPALLI |

The above entity is not a project participant.

## SECTION C. Duration of the project activity / Crediting period:

**C.1. Duration of the small-scale project activity:**

**>>**

**C.1.1. Starting date of the small-scale project activity:**

**>>**

01/04/2006

**C.1.2. Expected operational lifetime of the small-scale project activity:**

**>>**

30 years

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

**>>**

**C.2.1. Renewable crediting period:**

**>>**

Not chosen

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

**>>**

Not applicable

**C.2.1.2. Length of the first crediting period:**

**>>**

Not applicable

**C.2.2. Fixed crediting period:**

**>>**

**C.2.2.1. Starting date:**

**>>**

01/01/2008

**C.2.2.2. Length:**

**>>**

10y-0m

**SECTION D. Application of a monitoring methodology and plan:**

>>

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

**>>**

The name of the methodology applied for the project activity is ***"Metering the Electricity Generated".***

This is in accordance with Appendix B of simplified modalities and procedures for small-scale CDM project activities. The reference to the proposed monitoring methodology is Clause 31 of Appendix B of simplified modalities and procedures for small-scale CDM project activities.

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

**>>**

The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7. As the power plant is of 10 MW capacity, reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

| D.3 Data to be monitored: |
|---|

>>

This monitoring plan requires monitoring of one parameter that is the power exported to the Himachal Pradesh State Electricity Board (HPSEB) grid system. 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 E. Emission reductions generated by the project will be monitored at regular intervals and will be reported to the Board of Directors. 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.

The following data is to be monitored to ascertain project emissions and emissions reductions

| ID number *(Please use numbers to ease cross-referencing to D.3)* | Data variable | Data unit | Measured (m), calculated (c) or estimated (e) | Recording Frequency | Proportion of data to be monitored | How will the data be archived? (Electronic/ paper) | For how long is archived data to be kept | Comment |
|---|---|---|---|---|---|---|---|---|
| D.3.1 | Power exported by each project in the bundle | MWh | m | Monthly | Full (100%during the month) | Paper (Only sales records can be verified) | 2 years after crediting period | The data will be recorded at the grid substation, which is under the control of HPSEB. The energy measured using calibrated meters and recorded at HPSEB substation will be monitored. Records of measurement will be used for verification of emission reductions. Sales bills/receipts may be compared as an alternative proof of the power exported to the grid. |
| D.3.2. | Emission Factor | $tCO_2/MWh$ | c | Yearly | 100% | Paper | Minimum of two years after last issuance of CERs | Emission factor will be calculated for the Northern region grid using the data published by the Central Electricity Authority. |

**D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:**

**>>**

| Data | Uncertainty level of data (High/Medium/Low) | Explain QA/QC procedures planned for these data, or why such procedures are not necessary |
|---|---|---|
| D.3.1 | Low | The data will be recorded at the grid substation, which is under the control of HPSEB. The energy measured using calibrated meters and recorded at HPSEB substation will be monitored. Records of measurement will be used for verification of emission reductions. Sales bills/receipts may be compared as an alternative proof of the power exported to the grid. |
| D.3.2. | Low | This data item is a calculated value based on Central Electricity Authority database and the quality control is not in the control of project participants. Hence, no quality control procedures are envisaged for this data item. |

**D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:**

**>>**

The management structure proposed for monitoring of emissions and reductions due to the project activity mainly comprises a GHG audit team / committee. The committee will be appointed as soon as the project implementation is nearing completion and will be authorized to perform various functions such as measuring, recording, storage of measured data and reporting to the project participants. The outcomes of the committee, in the form of GHG audit reports, are being monitored monthly and annually. The committee comprised representatives of the project participant and other experts as decided from time to time. It was proposed that whenever required external independent GHG auditors would be deputed for the monitoring activities.

The power purchase agreements to be signed by the project participants with HPSEB has clauses on quality assurance and quality control measures to be employed by the project participants and include installation of main meters supported by check meters, calibration requirements for energy meters, procedures for recording the energy values, emergency preparedness etc.

**D.6. Name of person/entity determining the monitoring methodology:**

**>>**

The contact information of the entity, which has determined the monitoring methodology, is given below.

| | |
|---|---|
| Organization: | ZENITH CORPORATE SERVICES (P) LTD. |
| Street/P.O. Box, Building: | 10-5-6/B, MYHOME PLAZA, MASABTANK, |
| City: | HYDERABAD |
| State/Region: | ANDHRA PRADESH |
| Postfix/ZIP: | 500028 |
| Country: | INDIA |

| | |
|---|---|
| Telephone: | +91 40 2337 6630, 2337 6631 |
| FAX: | +91 40 2332 2517 |
| E-Mail: | zenithenergy@sancharnet.in |
| URL: | www.zenithenergy.com |
| Represented by: | |
| Title: | DIRECTOR |
| Salutation: | MR. |
| Last Name: | REDDY |
| Middle Name: | MOHAN |
| First Name: | ATTIPALLI |

The above entity is not a project participant for the project activity.

## SECTION E.: Estimation of GHG emissions by sources:

### E.1. Formulae used:

>>

### E.1.1 Selected formulae as provided in appendix B:

>>

Appendix B of the simplified modalities and procedures for small-scale CDM project activities does not provide specific formulae for the baseline for project Category I.D.

### E.1.2 Description of formulae when not provided in appendix B:

>>

### E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

The proposed project activity is run-of-the river hydroelectric project. No anthropogenic emissions by sources of greenhouse gases within the project boundary will be identified. Hence, no formulae are applicable.

### E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>

No leakage is applicable for the project activity, hence no formulae are applicable.

### E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>>

The sum of E.1.2.1 and E.1.2.2 is Zero.

**E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:**

**>>**

As explained in Section B.2, the baseline for the project activity is kWh produced by the hydroelectric project multiplied by an emission co-efficient calculated in a transparent and conservative manner as the weighted average emissions (in kgCO2/kWh) of the current generation mix.

For the proposed project activity the current generation mix is taken for the Northern Region grid system. Central Electricity Authority publishes the annual energy generation from all power generating stations in the grid system.

Formula used for calculation of the baseline is given below.

**Step 1: Estimation of emissions from each fuel source**

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

| **Emissions ($tCO_2$)** | = | **Actual Generation (GWh)** | X | **CEF for fuel (tC/TJ)** | X | **Net Heat Rate (TJ/ GWh)** | X | **Conversion factor (44/12)** |
|---|---|---|---|---|---|---|---|---|

In the above calculation, actual generation is obtained from CEA publications. Carbon Emission Factors (CEF) for fuels is taken from IPCC default values. Since collecting heat rates for all plants connected to the grid system is difficult, only heat rates as specified by the Central Electricity Authority are considered for calculation of baseline emissions. This is reasonable for a small-scale project activity whose generation is negligibly small compared to the total grid generation.

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

**Step 2: Total Baseline emissions**

Total baseline emissions are estimated by summation of emissions from all fossil fuel sources.

**Step 3: Estimation of baseline or Emission Coefficient**

Baseline emission factor is estimated as the weighted average of all existing generation sources using the following formula.

| **Baseline emission Factor ($tCO_2$/GWh)** | = | **Baseline emissions ($tCO_2$)** | / | **Total net energy in the system (GWh)** |
|---|---|---|---|---|

Using the above formula baseline / emission coefficient is estimated as 839.88 tCO2 /GWh.

**Step 4: Estimation of baseline emissions**

Baseline emissions or emissions avoided by the project activity are estimated using the following formula.

| **Baseline Emissions From or avoided emissions ($tCO_2$)** | = | **Emission co-efficient (From Step 3) ($tCO_2$ /GWh)** | X | **Actual generation project activity (GWh)** |
|---|---|---|---|---|

The resulting baseline emissions during the crediting period are tabulated below.

**Table E.1. Baseline emissions during the entire crediting period.**

| Year | Emission Co-efficient ($tCO_2$/GWh) | Anticipated generation, (GWh) | Baseline emissions, ($tCO_2$) |
|---|---|---|---|
| 2008 | 839.88 | 50.79 | 42, 660 |
| 2009 | 839.88 | 50.79 | 42, 660 |
| 2010 | 839.88 | 50.79 | 42, 660 |
| 2011 | 839.88 | 50.79 | 42, 660 |
| 2012 | 839.88 | 50.79 | 42, 660 |
| 2013 | 839.88 | 50.79 | 42,660 |
| 2014 | 839.88 | 50.79 | 42, 660 |
| 2015 | 839.88 | 50.79 | 42, 660 |
| 2016 | 839.88 | 50.79 | 42, 660 |
| 2017 | 839.88 | 50.79 | 42, 660 |
| **Total Emission Reductions** | | | **426, 600** |

**E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:**

**>>**

Difference between E.1.2.4 and E.1.2.3, which represent emission reductions of the project activity are given in the table given below.

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Baseline emissions, **E.1.2.4**, $tCO_2$ | 42, 660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 |
| Project emissions, **E.1.2.3**, $tCO_2$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference between **E.1.2.4 and E.1.2.3,** $tCO_2$ | 42, 660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 | 42,660 |

**E.2 Table providing values obtained when applying formulae above:**

**>>**

| Year | Period | Annual estimation of emission reductions ($tCO_2$ eq.) |
|---|---|---|
| 1 | 2008 | 42,660 |
| 2 | 2009 | 42,660 |
| 3 | 2010 | 42,660 |
| 4 | 2011 | 42,660 |
| 5 | 2012 | 42,660 |
| 6 | 2013 | 42,660 |
| 7 | 2014 | 42,660 |
| 8 | 2015 | 42,660 |
| 9 | 2016 | 42,660 |
| 10 | 2017 | 42,660 |
| **Total Emission reductions** (tonnes of $CO_2$ eq) | | 426,600 |
| **Total Number of crediting years** | | 10 |
| **Annual average over the crediting period of estimated reductions** (tones of $CO_2$ eq) | | 42,660 |

**SECTION F.: Environmental impacts:**

**F.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 $ 12.50 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 project shall notify to the Himachal Pradesh State Pollution Control Board (HPPCB) for necessary evaluation and approval.

Project participants conducted environmental studies and found that the proposed project is not likely to have any significant negative socio-economic, environmental effects on local populace during execution or after commissioning or during the entire operational lifetime. The highlights of the study are as follows:

- The project is run of the river scheme, which does not involve any impounding of water, and also there is no habitation on the banks, 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. So, the project doesn't have its influence on the microclimate of the region and reduce global warming impacts.

- The danger of erosion and disturbance to hill slopes is minimized as the land required for the proposed project is barren and very small area of cultivable land which does not involve felling up of any trees.
- The catchment areas upto the weir sites is only averagely 32 square kilometres and comprises mainly of gneisses, which are by and large quite compact and do not pose problem of possible potential slides in general. The catchments in the higher reaches of khad and nalla are not approachable. It is proposed to provide engineering measures such as contour drainage, easing of critical slopes etc. wherever required around the project area. Afforestation is proposed in the catchment and provision of funds has been kept for this purpose.
- The constructions of this project neither alters nor contributes to raising of water level in the stream thereby, does not support any aquatic life. Hence the scheme shall not endanger the species of local flora and fauna, if any.
- The construction of roads and project components will not involve felling of neither any tree nor lead to deposition of excavated material in the khad to affect environment adversely.
- Since the local labour will be deployed, only skilled and specialists would be brought from outside and thus a small colony shall only be needed.
- The construction labour and project staff will be educated in terms of environmental concerns and relevant anti poaching laws in consultation with Forest Department. Apart from this, Notice Boards shall be placed at appropriate places warning people against poaching in the area.

With all the above it is clear that the project conserves local resources, reduce pressure on the local environment to a great extent, provide improved health and other environmental benefits and also meet local renewable energy portfolio standards and environmental policies.

## SECTION G. Stakeholders' comments:

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

>>

A project proponent who desires to set up hydro project in Himachal Pradesh is required to take the following steps for obtaining public comments before starting of the project work.

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 90 days before issuing license. Based on the feedback the Government of Himachal Pradesh will decide whether the project to be sanctioned or withheld.

Similarly, Electricity Regulatory Commission of Himachal Pradesh (ERCHP) also 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.

The project also requires the No Objection Certificate (NOC) from the local village panchayat, which is the elected statuary body of the local populace. NOC will be given after getting comments from the local public.

The main stakeholders for the project are the local people residing around the project area and the Government of Himachal Pradesh. Apart from them the various stakeholders involved in the project are:

Himachal Pradesh Government Energy Development Agency (HIMURJA), a state nodal agency to initiate, implement, and monitor all the techno-economic viability of the small hydroelectric project activities.

Himachal Pradesh State Electricity Board (HPSEB), accords techno-economic clearance to the project, purchases power from the project.

Himachal Pradesh Pollution Control Board (HPPCB), a regulatory body to monitor environmental impacts and environmental management of industries, accords clearances for setting up of industries in the state after ensuring adherence to the statutory regulations. Also gives consent to start the operation of the project if it satisfies with the environmental management and pollution control measures

Irrigation Department of Himachal Pradesh, accords clearance for utilizing water resources in Himachal Pradesh state

Revenue Department of Himachal Pradesh, gives consent to establish the project and registers the project in revenue records of the Himachal Pradesh state.

Forest Department of Himachal Pradesh provides permission for utilizing forestland for construction of the project.

Local Village Panchayat accords permission for setting up of the project under the jurisdiction of the village.

*Stakeholders' involvements*

Power Purchase Agreement (PPA) is to be executed with Himachal Pradesh State Electricity Board (HPSEB) and firm power purchase price is to be ascertained.

The project has obtained Environment and Forest Clearance from Ministry of Environment & Forest, Govt. of India and State Government of Himachal Pradesh.

The project proponent has obtained clearance from Himachal Pradesh State Pollution Control Board (HPPCB).

The company has obtained required clearance from HIMURJA for setting up the project in Himachal Pradesh using hydro potential available at the proposed site.

*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. The project proponent is yet to execute power purchase agreement with HPSEB.

**G.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.

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

**>>**

No comments received; hence no report is applicable.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization | M/s Vamshi Industrial Power Limited |
| Street / Post Box | Kasturibhai Gandhi Marg |
| Building | Upper Ground Floor, Antriksh Bhawan |
| City | New Delhi |
| State / Region | Delhi |
| Postcode / Zip | 110001 |
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| Telephone | +91 – 11 – 23311991, 23311992 |
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| Title | General Manager |
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| Last Name | Roy |
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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

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