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

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. • 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:

>>
3MW Iruttukanam Small Hydro Electric Project by M/s Viyyat Power Pvt Ltd
Version - 01
Date: 2nd May 2007

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

>>
The main objective of the Iruttukanam small hydroelectric project is to produce clean electrical energy in a sustainable manner, optimizing the utilization of a renewable resource, water. In the context of the current power and energy shortage, and the ever-increasing demand for electricity, the implementation of the proposed project with an installed capacity of 3MW, contributes to help meeting the power and energy demand in the state of Kerala.

3MW Iruttukanam Hydro Electric project is conceived by Viyyat Power Private Limited (VPPL) as a run of the river project proposing utilization of the flow of the river Western Kallar, a tributary of Muthirapuzha, flowing in the Idukki district of Kerala.

The project components consist of diversion veir, power tunel, surcharge shaft, penstock, powerhouse & tailrace and power evacuation system. The proposed over-ground power house site is on the right bank of the Western Kallar River. It is proposed to install 2 nos. of 1.5MW Francis (Horizontal) type reaction turbine. The tail race channel will convey the discharge from the power house into the Western Kallar River and is designed to carry the peak discharge required for the ultimate installation proposed in the power house. The switchyard is proposed to be located on the rightbank of the Western Kallar river.

The scheme presents no environmental or rehabilitation problems. The project is economically viable and technically feasible only after considering the adequate returns and revenues from its registration under the Clean Development Mechanism (CDM).

Contribution of project activity to sustainable development:

The Designated National Authority for the CDM in India, which is the Ministry of Environment & Forests, has stipulated the following indicators for sustainable development in the interim approval guidelines for Indian CDM projects. Each of the indicators has been studied in the context of the project activity to ensure that the project contributes to sustainable development.

Social well – being:

- The proposed project activity leads to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility. This includes improvement of electricity quality, frequency and availability as the electricity is fed into a deficit grid.
- The construction work, i.e., place during the civil works, will generate employment for the local population. There will also be various kinds of mechanical work on the site, generating

employment opportunities on a regular and permanent basis. The transportation of various project components to the final site during constructoin will also create work opportunities and an improvement in the population's income.

Economic well – being:

- With the proposed project activity employment opportunities will eventually increase in the local area, uplifting thereby the economic conditions of the local population. The project creates indirect employment opportunities for skilled and unskilled workers during construction, which otherwise would not happen in the absence of the project. In addition, the project also creates direct permanent employment for operation of the project.
- By promoting the decentralization of economic power, the project contributes in bringing economic sustainability around the plant site.
- The project activity also leads to the diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well – being:

- The hydroelectric project has no negative environmental impacts because it relies on existing river releases and it does not involve any tree cutting or any submersion etc. Furthermore, adequate provisions are made for the plantation and building of greeneries, making the area more environment-friendly.
- The project utilizes hydro energy for generating electricity which otherwise would have been generated through alternate fuels based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions. Being a renewable resource, using hydel energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.
- As hydel power projects produce no end products in the form of solid waste (ash etc.), the project contributes in bringing environmental sustainability.
- Being a renewable resource, using hydel energy to generate electricity contributes to resource conservation.

Technological well – being:

The project activity utilizes an efficient horizontal Francis type reaction turbine with a capacity of 1.5MW in 2 nos. The project can generate 11.92MU of energy per annum, which demonstrates the hydel power based renewable energy generation. The generated electricity can be fed to 66kV Transmission line available at a distance of 2.5 km from the power house site. It is proposed to step up to 66kV and connect to the grid with loop-in-loop-out system as advised by Kerala State Electricity Board (KSEB)

Thus the project is in accordance with interim approval criteria suggested for sustainable development by the DNA in India i.e. Ministry of Environment & Forest, Government of India for CDM projects.

A.3. Project participants:

>>

Name of Party involved (*)	Private and/or public entity(ies)	Kindly indicate if

((Host) indicates a host Party)	project participants (*) (as applicable)	the Party involved wishes to be considered as project participant (Yes/No)
Ministry of Environment and Forest, Government of India (Host Country)	Viyyat Power Private Limited (Private Entity, Project participant)	No

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

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.:

>>

Kerala State

A.4.1.3. City/Town/Community etc:

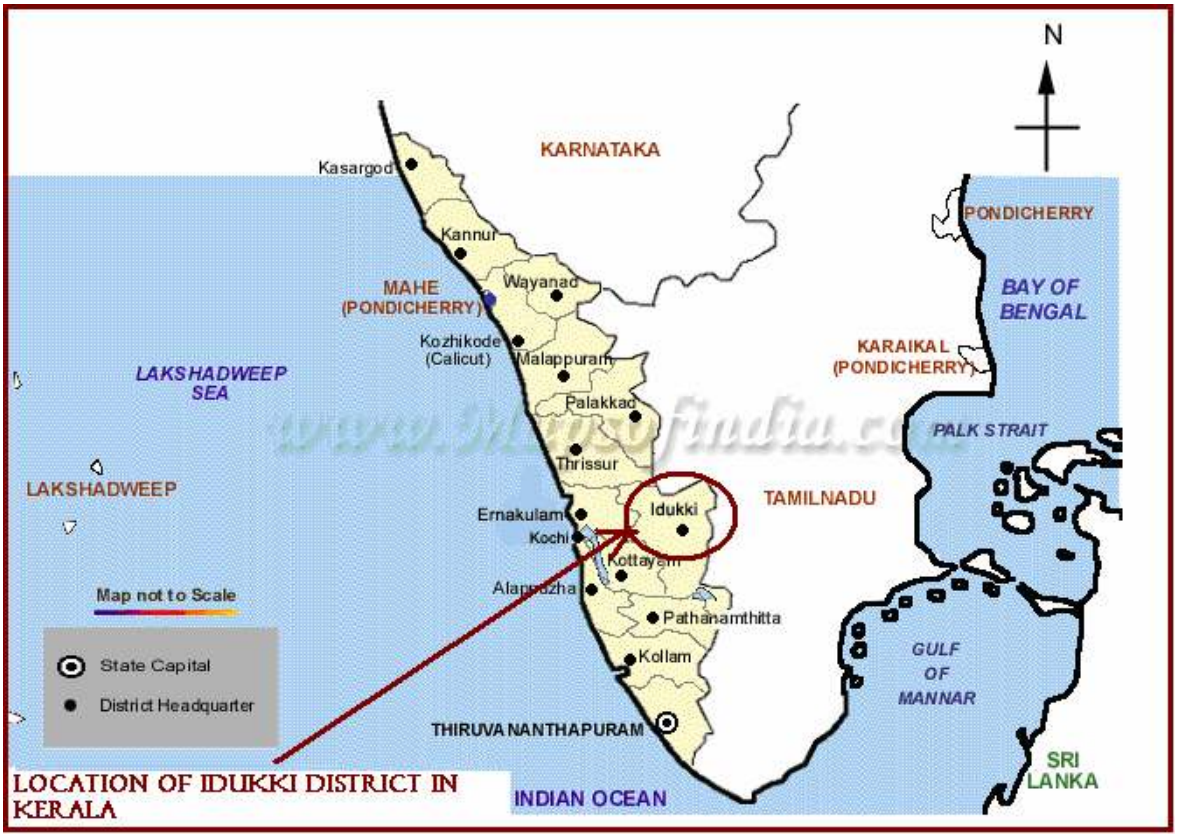
>>

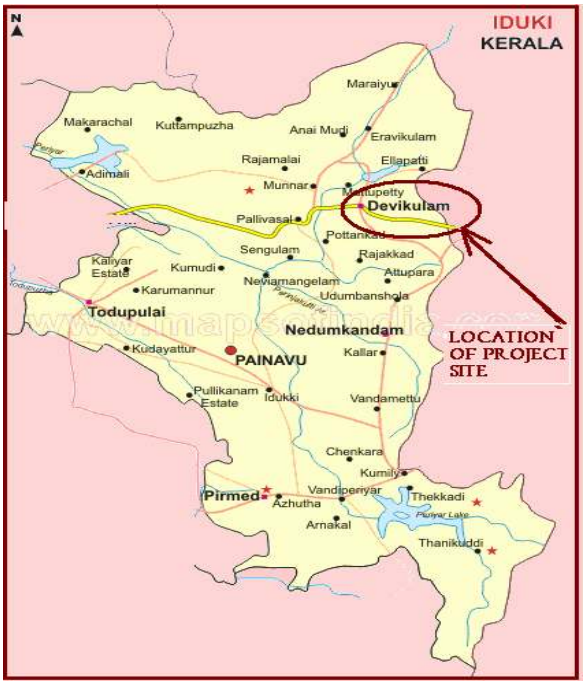
District: Idukki
Taluka: Devikulam
Village: Kunjithanni and Anaviratti in Vellathuval Grama Panchayat.

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

>>

The river site near the village of Kunjithanni and Anaviratti is approachable from the place Aluva (on Aluva – Munnar Road at Iruttukanam village). The project site is near to Adimali town 8km towards Munnar. The project site is situated at 10º0’26" (N) latitude and 71º 01’ 30 " (E) longitude in the region of Kerala


N
KARNATAKA
Kasargod
Kannur
Wayanad
MAHE (PONDICHERRY)
Kozhikode (Calicut)
Malappuram
Palakkad
Thrissur
Ernakulam
Kochi
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
THIRUVANANTHAPURAM
LAKSHADWEEP SEA
LAKSHADWEEP
TAMILNADU
PONDICHERRY
BAY OF BENGAL
KARAIKAL (PONDICHERRY)
PALK STRAIT
GULF OF MANNAR
SRI LANKA
INDIAN OCEAN
Map not to Scale
State Capital
District Headquarter
LOCATION OF IDUKKI DISTRICT IN KERALA


N
IDUKI
KERALA
Maraiyur
Makarachal
Kuttampuzha
Anai Mudi
Eravikulam
Rajamalai
Elapatti
Adimali
Munnar
Devikulam
Pallivasal
Pottankad
Sengulam
Rajakkad
Kaliyar Estate
Kumudi
Neriamangelam
Attupara
Karumannur
Udumbanshola
Todupulai
Nedumkandam
LOCATION OF PROJECT SITE
Kudayattur
PAINAVU
Kallar
Pullikanam Estate
Idukki
Vandamettu
Chenkara
Kumily
Pirmed
Azhutha
Vandiperiyar
Thekkadi
Arnakal
Thanikuddi

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

>>

Type I: Renewable Energy Projects
Category-D: Grid Connected renewable electricity generation

The project activity is a Hydro Power Plant. The installed capacity of the turbine is only 3 MW (2 x 1.5), which is less than the limit of 15 MW for renewable energy project activities to qualify under Type I project activities.

As per the provisions of indicative simple baseline and monitoring methodologies for small scale CDM project activities (Version 10: 23/12/2006), Type I.D. "comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit". With above considerations, the Type I.D. is the most appropriate category for the project under discussion.

Technology description

3MW Iruttukanam Small H.E Scheme is proposed in Westerm Kallar river, a tributary of Muthirapuzha river in Periyar Basin. Western Kallar river originates from the Kallar hills and flows towards south. Water from upper Pooyamkutty catchment discharges into this river at its upper reaches. The Scheme is located at Iruttukanam 8 kms from Adimali in Devikulam Taluk of Idukki District.

The main components of the project comprise the following.

- A gravity type small concrete weir across the western Kallar river, having a length of 25.3m with an un-gated central spillway of 2 spans of 8.0 m each.
- A reservoir intake with gates and trash rack.
- A water conducting system consisting of 'D' shaped tunnel of 2.50 m finished diameter and 767 m long.
- A surge tank 5.0m diameter in RCC.
- A single line open penstock 250 m long of diameter 1.25 m, branching off into two, each having a diameter of 900 mm.
- A surface power house of size 35 m x 14 m, capable of housing 2Nos. of 1.5 MW Francis turbine generating units.
- A small tail race channel to lead the discharge from machine, back into the main river
- A switchyard near the power house.

The project comprises of horizontal synchronous generator, coupled to a horizontal Francis type reaction turbine with a capacity of 1.5MW in 2 nos. The project can generate 11.92MU of energy per annum and the net energy for sale can be 11.85MU per annum. The generated electricity can be fed to 66kV Transmission line available at a distance of 2.5 km from the power house site. It is proposed to step up to 66kV and connect to the grid with loop-in-loop-out system or as may be advised by KSEB.

Technical details

Hydrology data:
Free catchment area 21.45 Sq.Km
Average annual runoff 104.3 Mm^3
Design flood at Diversion site 97.3 cumecs
Design head = 110.00 m

Power Data:

Total Gros generation	11.92GWh
Total Sale energy	11.85GWh
Generation voltage	3.3kV
Transmission voltage	66kV

Plant Equipment:

Hydro Turbine	Horizontal Francis type
No. of generating units	Two
Capacity	1.5MW
Frequency	50 Hz

Technology transfer

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

Demonstration for being with in 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 head available has been estimated as 110.00meters. Based on the head available and discharge the optimum capacity of the power plant has been envisaged at 3MW. By keeping the above considerations, the project proponent declares that the project will be within the limits of small scale through out the crediting period.

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

>> The total emission reductions by the project activity over the fixed crediting period (10 years) are expected to be as under:

Years	Annual estimation of emission reductions in tonnes of CO2 e
2008	10,191
2009	10,191
2010	10,191
2011	10,191
2012	10,191
2013	10,191
2014	10,191
2015	10,191
2016	10,191
2017	10,191
Total estimated reductions for the crediting period	**1,01,910**
Total number of crediting years	**10y-0m**
Annual average over the crediting period of estimated reductions (tones of CO2 e)	10,191

In the above table, the year 2008 corresponds to the period starting from 01.10.2008 to 31.09.2009. Similar interpretation shall apply for remaining years. The crediting period will start from the date of registration of the project with CDM EB.

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

>>

No public funding, as part of project financing from the parties included in Annex I of the convention, is involved in the project activity.

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

According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, the VPPL small-scale renewable energy project is not part of a larger emission-reduction project. This affirmation is based on the fact that the project participants have not registered or operated any other project in the region surrounding the project boundary.

The project activity is not a debundled component of a large project activity, as the project proponents have not registered or applied to register any other small-scale project activity:

- in the same category, and
- with the same project participants;
- within the previous 2 years;
- whose project boundary is within 1 km of the project boundary of the proposed small scale project activity.

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:

>>

Main Category: Type I - Renewable Energy Projects
Sub Category: I.D. - Grid connected renewable electricity generation

The reference has been taken from the list of the small-scale CDM project activity categories contained in 'Indicative simple baseline and monitoring methodologies for small-scale CDM project activities-Version 10, 23/12/2006'

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

>>

As per Appendix B of Indicative Simplified Monitoring and Baseline Methodologies, 'renewable energy generating units that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit' come under Category I.D.

The project activity involves generation of power by harnessing hydro potential which is a form of renewable energy and exporting this power to the Southern Regional grid. The power generated by the project activity helps in displacing electricity that would have been supplied by the thermal power plants connected to the grid. Thus, the project activity meets the applicability conditions of the Baseline Methodology of AMS I.D.

As the capacity of hydel power generation through the project activity is 2 x 1.5MW, which is less than stipulated 15 MW, the project activity falls under the small scale CDM project activity as per AppendixB of the simplified modalities and procedures for small –scale CDM project activities of UNFCCC.

The Methodology is applied in the context of the project activity as follows:

I. Baseline Emissions: The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient measured in kg CO2 equivalent/kWh. Two methods are provided for category I.D for estimating the emission coefficient in a transparent and conservative manner. They are:
a. The average of 'approximate operating margin' and the 'build margin', or
b. The weighted average emissions in kg CO2/kWh of the current generation mix. Since the project activity affects both current and future generation mix of the grid, the project proponent decides to use Option a. - the average of 'approximate operating margin' and the 'build margin', for estimating the emission coefficient of the electricity distribution system. Details of baseline calculations are provided in Section B.4. of the PDD.

II. Project Boundary: The project boundary encompasses the physical, geographical site of the renewable generation source. The details are provided in Section B.3. of the PDD.

III. Additionality: The additionality aspects for the project activity have been discussed in accordance with Attachment A to Appendix B in Section B.5. of the PDD.

IV. Monitoring: The detailed Monitoring plan for the project activity is provided in Section B.7.2 of the PDD.

V. Emission Reductions: Since there are no project emissions or leakage associated with the project activity, the Emission Reductions are equivalent to the baseline emissions avoided for that particular year. The detailed emission reduction calculations are provided in Section B.5 of the PDD.

B.3. Description of the project boundary:

>>

As mentioned under Type I.D. of 'the simplified modalities and procedures for small-scale CDM project activities', the project boundary encompasses the physical and geographical site of the renewable energy source.

The physical project boundary essentially covers the diversion veir, power tunel, surcharge shaft, penstock, powerhouse & tailrace and and the transmission system till the evacuation point. No emissions have been envisaged within the project boundary.

B.4. Description of baseline and its development:

>>

According to paragraph 9 of the small scale methodology AMS I.D, the baseline of the project activity is the kWh generated by the project activity multiplied by the emission factor of the regional grid in which it displaces the electricity.

The emission factor of the grid, according to the outlines of the methodology, is calculated in a transparent and conservative manner as a combined margin which is calculated as the average of the operating margin and the build margin. The detailed calculations of the operating and build margins have been provided in CEA CO2 Baseline Database, Version 1.1, dated 21 December 2006[1]. Please refer to Annex 3 for baseline details. The baseline emissions are calculated according to the equation as provided in section B.6.1.

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:

>>

Justification for application of simplified methodologies to the project activity

The installed capacity of the project is 3 MW, which is less than the limiting capacity of 15 MW and is thus eligible to use small-scale simplified methodologies. 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 for additionality of the project

[1] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

The construction of the project activity is expected to start in April 2007 and is expecting to be commissioned by 01/10/2008. The crediting period will start after the project is registered. CDM revenue was considered from the early stages of the project's development, and it is an integral part of the financial package of the project.

The description and explanation on why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances is given below:

The All India aggregate installed capacity of electric power generating stations under various utilities as on 31.03.2006[2] was 124287.17 MW comprising 32325.77 MW of hydro, 82410.54 MW of thermal, 3360.00 MW of nuclear and 6190.86 MW Renewable Energy Sources (RES). The percentage share of hydro, thermal, nuclear and RES stood at 26.01%, 66.31%, 2.70%, and 4.98% respectively of the total installed capacity. It is evident that the power generation is heavily dependent on the thermal generation.

There are five regional grids: Northern, Western, Southern, Eastern and North-Eastern. Different states are connected to one of the five regional grids. The CDM project is located in the Southern Grid. The Southern Region of India comprises of four states and two Union Territories (UT), Karnataka, Tamil Nadu, **Kerala**, Andhra Pradesh, NLC and Pondicherry.

The total installed capacity in the southern regional grid is 36447.52MW as on 31.03.2006[3]. The installed capacity in MW of thermal, hydro, nuclear and RES in the southern grid was 20366.32, 10967.71, 880 and 4233.49MW respectively. The major source of power generation in the grid is thermal which constitutes approximately 55.87% of the total installed capacity. It is evident that the power generation is heavily dependant on the thermal generation.

The estimated hydro potential in the country is 1, 50,000 MW[4] (corresponding to 84,044 MW at 60% load Factor). As on 31.03.2006, the hydro-electric schemes in operation account for only 19.08% and those under execution are 5.61% of the total potential. Thus, the bulk of the potential (75.32%) remains yet to be developed, while 14,393 MW[5] hydro capacity is planned to be added in 10th Five Year Plan (2002-2007).

Additionality:
According to Attachment A to Annex B of the simplified modalities and procedures for CDM small-scale project activities evidence to why the proposed project is additional is offered under the following categories of barriers:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

The barriers faced by the project activity are further discussed below:

[2] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf
[3] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf
[4] CEA Annual Report 2006 (Pg 53)
[5] http://planningcommission.nic.in/plans/planrel/fiveyr/10th/volume2/v2_ch8_2.pdf

Investment Barrier

High capital cost
These financial risks fall stronger on small-scale projects, which in any case are subject to greater technological and hydrological risks, and have a higher installed cost per MWh of electricity generated.

The project proponent required investing around Rs. 150.3 millions, an investment of Rs.50.1 millions per MW which is high compared to investments required for conventional power plants. Even though the operating cost is low for hydropower projects, getting finances for the project to the extent specified above is difficult due to the risks associated with hydropower projects such as low plant load factor, irregular monsoons, uncertainty with regard to the availability of water flows etc.

Lack of Infrastructure
The project location is underdeveloped, hence no infrastructure such as roads, electricity, communication, transportation and proper civic amenities etc. are available. The project proponent had to develop these facilities before implementation of the project. This adds to the project cost and makes a burden for private investor in the hydroelectric sector

The project activity is a run of river hydro power project, without any storage of water. So the plant load factor (PLF) is totally dependant on the rainfall in the region. The project activity is located in rural set-up without sufficient infrastructure like roads, communication and transportation facilities. The sites for the project are located in hilly terrain. The possibility of flash floods and cloud burst that can totally wipe the project components cannot be ruled out in this region. Thus the project proponent is bearing a considerable investment risk by investing in the project activity

Evacuation of power
The power generated from the project is proposed to evacuate to the grid of 3.3 KV / 66 KV transformer having dual tapping placed outdoors, which is at a distance of 2.5 km from the project site. For this, the promoters have envisaged a cost of Rs. 70lakhs for the construction of Transmission line & Evacuation of power. This additional expense of Rs. 70lakhs (approx. 4.65% of the total project cost) has a great impact on the economical viability of the project. Monitoring and maintenance of transmission system in the hilly terrain is difficult and tedious due to absence of road linkages. This aspect makes a barrier for conceiving the small-scale hydroelectric project.

Material and manpower movement
As the project site is located in hilly terrain, material and manpower movement is quite difficult. Transportation of necessary materials such as cement, steel, construction equipment, plant and machinery, involves higher over heads. Sudden repair or break down in unit could not be rectified at ease due to lack of availability of skilled persons in inaccessible area. The difficult terrain, working conditions, and poor infrastructure make it extremely difficult to set in place, repair and maintenance net works and this adversely affects reliability and performance of installed services.

Low return on Investment
An IRR analysis has been prepared for the project activity to ascertain the project IRR, its attractiveness and the effect of GHG income based on the following assumptions:

1. Capital Cost of the project : Rs. 150.3 millions
2. Means of Finance

- Equity	: Rs. 45.1 millions
- Term Loan	: Rs. 105.2 millions
3. Gross Energy Generation	: 11.92 GWh
4. Aux, transmission, transformation outages etc.	: 0.07 Gwh
5. Net power export to grid	: 11.85 GWh
6. Tariff per kwh	: Rs. 2.70 (fixed)
7. Operation and Maint cost	: 2% cost of project with a yearly escalation of 5%
8. Interest on term loan	: 12%
9. MAT	: 8.415

Based on above assumptions the IRR is working out to 11.35% without CDM revenue and the same will improves to 14.50% with CDM revenues. A Benchmark return has also worked out considering a return on equity of 16% which is working out to 15.23%. As could be seen from the above, CDM revenues are significant of the project activity.

Scenario	IRR (%)
10% decrease in power generation	9.11
10% increase in tariff	13.59

The above analysis indicates that the IRR is below the benchmark return in all the scenarios, and the significance of CDM revenues for the project activity.

Institutional barrier:
The project faces institutional barrier during the implementation of the project, mainly with respect to the determination of the tariff for electricity exported.

The VPPL project so developed would consider the power purchase tariff through transparent and competitive bidding process and adopt the lowest tariff of all determined through transparent process of bidding in accordance with the guidelines of Kerala State Electricity Board. As a result, the power purchase tariff would be the lowest when compared to the other states of the region. Low power purchase tariff is a major investment barrier. This indicates no guarantee that the project receives the same tariff in future for the power fed to grid. This makes a significant barrier for the private sector investments in the power sector in the Kerala state.

Project development delays
The government procedures related to power purchase agreements and various licenses and clearances to be obtained is a long and time consuming process. The policies change from time to time, changing power purchase price during accord of sanction as per process of bidding and the present prices along with the annual rate of escalation. The uncertain and inconsistent policies of the state government in this regard indicate an uncertain power purchase price. This makes a barrier for investments to continue in the project.

Due to the government's lack of experience with the development of power projects by the IPP subject to lengthy delay until the government established processes for the negotiation of power purchase agreements, further delayed the project, as they required renegotiation of key project agreements, during which time the project was placed on hold. As a result of this no further development of the project was

possible for over 15 months (Date of application for formal approval from KSERC i.e., 10th September 2005 till final approval i.e., on 15th December 2006).

One of the main reasons for the investor's reluctance to develop government identified small hydro project is that the bidding process involved for power purchase tariff is highly time consuming. In addition, there is often an inordinate delay in obtaining government clearances once the bidding process is complete.

Technological barrier

The lack of available experience and the lack of confidence in the technology involved by IPP built hydroelectric projects make small-scale hydroelectric plants difficult to establish. VPPL is an inexperienced small-scale entrepreneur in hydropower, which subsequently lacks trained manpower for such a project. This has cause additional perceived risks to investor lending to the project, and has pushed VPPL to call for technical expertise and thus maintain an additional cost.

Since the project activity is located in a difficult terrain, investigation of the plant was all the more difficult, construction of water conductor system posed challenges. Transportation of construction material and machinery to the project site was also difficult due to the terrain.

Barrier due to prevailing practice

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

The total installed capacity of power projects in India is 124287.17 MW as on 31.03.2006[6] was against this small hydro projects in operation in India is 1748.98 MW[7] as on 31/12/2005, giving an idea of the contribution of small hydro projects in the total power generation at 1.40%, which is negligible.

In the Southern region, the total installed capacity of power plants is 36,447.52MW against small hydro installations of 642 MW indicating that small hydro projects account only to a negligible 1.76% of total generation in the Southern region. Out of the total installations of small hydro in Southern region, the contribution of Kerala is to an extent of 84.62MW[8] and this account for 0.23% of total capacity of power plants in Southern region.

In Kerala state, only 14 out of the 198[9] possible hydroelectric sites identified by the MNES have been developed. This indicates that there is still a large scope to develop small hydroelectric power plants within the state of Kerala.

First IPP in the state of Kerala

[6] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf
[7] http://www.mnes.nic.in/annualreport/2005_2006_English/CH9/1.html
[8] http://www.mnes.nic.in/annualreport/2005_2006_English/CH9/2.html
[9] http://www.mnes.nic.in/annualreport/2005_2006_English/CH9/1.html

The project is the first small scale hydro power plant developed by Independent Power Producer (VPPL) in the state of kerala. Added to that VPPL's hydro power plant is the first in the state of Kerala to seek registration under the CDM. This shows that investing in small hydropower plants is not a common prevailing practice in the state.

Other Barriers

Hydrology Risks

The water availability for power generation in Irrutukanam Hydro Scheme is based on the water available in Western Kallar river. In view of this rainfall data has not been considered for Hydrological study purpose. In this context Iruttukanam site is one of the identified locations in Kerala with a potential of 3MW, KSEB had established a gauging weir and readings are being observed since 1973, in connection with upper Kallar Diversion for Sengulam Argumentation Project.

Based on the KSEB preliminary investigations, it is found that the Western Kallar river, which is a tributary to Muthirapuzha river has a catchment of 46.50 Sq. km. upto the proposed weir site. It is proposed to divert flow from a catchment of 28.50 Sq.KM of upper Kallar in Pooyamkutty basin upto Western Kallar for use in the proposed Sengulam Augmentation (SA) Scheme. The diversion for SA scheme is at a point intercepting 25.05 sq. km of western Kallar also. Thus, flow from 25.05 Sq.KM of Western Kallar, along with the above upper Kallar diversion will be diverted for S.A. Scheme, leaving only flow from the downstream free catchment of 21.45 Sq.KM for Iruttukanam project, which gives only 28.6% of flow being now measured at Iruttukanam, which is a high hydrology risk.

The water availability for power generation is based on the rainfall and monsoon. In view of this rainfall data has not been considered for Hydrological study purpose. From the total gauge data of Iruttukanam gauging weir, quantity of water diverted to Sengulam reservoir by S.A. Scheme is reduced to get the water available for the present scheme, daily flow data was collected from November 1984 to December 2003 for detailed study. The flow generally varies from 0 to 33.33 cumecs. Daily Discharge Data at Irruttukanam Weir for the Year 2003 is given below:

Date	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1.1	0.392	0.156	0.3384	5.6188	0.339	5.741	16.7578	14.862	3.798	7.8523	2.831
2	1.0781	0.392	0.1513	0.291	2.6131	0.337	4.3201	14.6	12.0019	7.5569	9.2121	0
3	1.0128	0.3804	0.141	0.2513	1.9424	0.326	5.7916	12.1731	10.4854	8.7518	9.6288	0
4	0.975	0.355	0.141	0.2601	1.4025	0.302	9.1985	10.4854	9.6288	11.0695	8.6606	0
5	0.9478	0.3403	0.141	0.2853	1.036	0.2963	14.0821	8.613	8.865	16.3331	8.211	0
6	0.891	0.3313	0.1328	0.217	0.741	0.284	16.4183	7.2338	8.6606	41.8571	7.955	0
7	0.891	0.319	0.131	0.2026	0.5687	0.2786	13.6618	6.6488	7.955	63.7971	7.392	0
8	0.8728	0.3136	0.1275	0.171	0.4649	0.267	10.9628	5.9476	7.392	43.1037	7.392	0
9	0.833	0.3105	0.12	0.171	1.3704	0.2613	6.9966	6.6275	7.392	32.718	7.2338	0
10	0.833	0.3105	0.1265	0.1131	1.9546	0.249	5.741	8.9834	7.2338	28.8928	6.886	0
11	0.8236	0.2995	0.1503	0.2181	0.9065	0.239	5.6732	11.301	6.886	26.4584	6.886	0
12	0.803	0.284	0.1663	0.3384	0.609	0.2326	6.142	10.7223	6.886	21.9417	6.6488	0
13	0.803	0.2786	0.156	0.302	0.5288	0.3191	6.6023	8.6606	6.7278	17.2325	6.127	0
14	0.7905	0.267	0.1438	0.2735	0.693	0.4949	7.3328	7.955	6.38	15.7175	5.9476	0
15	0.763	0.256	0.141	0.2513	0.9983	0.7411	8.0357	7.8523	6.3009	16.147	5.553	0
16	0.7505	0.232	0.1378	0.217	0.7655	0.8173	12.586	9.8603	6.127	12.586	5.553	0
17	0.7108	0.2273	0.131	0.2073	0.5687	1.8909	24.1208	9.8603	6.127	12.4691	5.1946	0
18	0.684	0.217	0.1275	0.186	0.4586	2.6975	32.5075	8.865	5.9476	13.17	4.9332	0
19	0.6378	0.217	0.7857	0.1719	0.392	3.9265	22.6704	8.6606	5.553	11.5367	4.892	0

20	0.605	0.204	1.9861	0.141	0.3804	14.8365	16.554	7.955	5.553	10.2075	4.892	0
21	0.5868	0.1963	1.4988	0.2479	0.3384	26.1107	13.8709	10.1515	5.4839	11.7214	4.717	0
22	0.547	0.186	1.142	0.6581	0.291	33.3315	12.0019	22.7751	5.332	11.5346	4.432	0
23	0.5407	0.186	1.0206	0.7436	0.2513	24.4567	14.979	45.5962	5.1945	10.4854	4.432	0
24	0.527	0.1813	0.9067	0.7048	0.1777	14.3776	1.2181	38.9806	4.892	9.0733	4.3004	0
25	0.521	0.171	0.8346	0.4586	0.1803	10.6118	18.3593	29.1951	4.892	8.865	4.011	0
26	0.502	0.171	0.7411	0.3804	0.267	12.4665	15.3404	22.5657	4.892	8.866	3.9444	0
27	0.489	0.171	0.5868	0.3384	0.2832	9.6779	17.4468	18.9693	4.7482	8.211	3.673	0
28	0.4727	0.1663	0.5288	0.4305	0.3418	6.3641	17.8165	12.4665	4.432	7.9555	3.398	0
29	0.4568		0.4768	0.9029	0.3408	7.457	14.8988	11.8851	4.432	1.3788	3.2798	0
30	0.43		0.4318	3.5353	0.355	7.2728	14.1562	19.0943	4.2338	10.1382	2.9809	0
31	0.4181		0.3804		0.3493		13.7977	22.7111		8.4046		0

The dependability factors for these projects such as variation in 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.

Flash floods

Flash flood is the phenomenon of rainstorm. Rainstorm of high intensity can flood the catchment of the stream and cause the maximum flow in the stream. The occurrence of flash flood floods and cloud burst that can totally wipe the project components cannot be ruled out in this region. Flash flood have the effect of damaging the water conducting system, power house and other structures which could cause maximum damage to the power plant disturbing the power generation.

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

Impact of CDM revenues

The approval and registration of the project as a CDM activity would enable the project proponents to access additional revenues by selling certified emission reductions. It is estimated that the project would generate approximately 10,191 CERs per year. All the barriers described earlier are of perceived risks associated with the project activity. The additional revenue from the sale of CERs would only alleviate risk factors and act as a provision in the event of any unexpected breakdowns. For instance, additional revenue could compensate financial losses arising out of lack of water resources for power generation or reductions in the power purchase price by KSEB etc.

Therefore, the proposed renewable energy project is additional as it overcomes the above barriers, taking up the risk associated to the project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

Baseline Emissions: According to the methodology the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient measured in kg CO2 equivalent/kWh. Two methods are provided for category I.D for estimating the emission coefficient in a transparent and conservative manner as follows:

a. A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. The CM will be calculated as average of the OM and the BM.

b. The weighted average emissions in kg CO2/kWh of the current generation mix.

Since the project activity affects both current and future generation mix of the grid, the project proponent opts to use Option a. - the average of 'operating margin' and the 'build margin', for estimating the emission coefficient of the electricity distribution system.

Emission Factor of the Grid (EFy)
Electricity baseline emission factor of Southern regional grid (EF*y*) has been calculated by the Central Electric Authority (CEA) of India (Central Electric Authority: CO2 Baseline Database, version 1.1 dated 21st December 2006) as per the guidelines of ACM0002/Ver 06. The same emission factor for the grid has been used for calculation of emission reductions. For details please refer to Annex 3 of this project document.

Baseline emissions are calculated as the KWh produced by the renewable generating unit multiplied by an emission coefficient for the Southern region grid

BE = EGy * CEFgrid

where EGy is the net quantity of electricity exported to the grid by the project in year y, and CEF grid is the carbon grid emissions factor of the Southern region grid.

Project Emissions:

There are no anthropogenic emissions by sources of GHGs in the project boundary as a result of the project activity.

Leakage:

As prescribed in Appendix B of the Simplified Modalities and Procedure for small-scale CDM project activities, for Category I.D, leakage estimation is only required if there has been any transportation of either any equipment or fuel. As there is no transportation of neither fuel nor equipment, therefore no leakage is envisaged.

Emission Reductions: The emission reductions of the project activity are calculated as the difference between the baseline emissions and the project emissions.

$ERy = BEy - PEy$
where,
ERy = emission reductions for the project activity in tonnes of CO2 e
BEy = Baseline emissions in tonnes of CO2 e
PEy = Project emissions in tonnes of CO2 e = 0

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

(Copy this table for each data and parameter)

Data / Parameter:	CEFgrid
Data unit:	tCO_2e/GWh
Description:	Baseline Emission Factor
Source of data used:	Central Electricity Authority Baseline database
Value applied:	860
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline emission factor has been considered from the "**CO2 Baseline Database**" published by CEA on 21st December 2006. The emission factor published by CEA for the latest 3years is 0.86tCO2/MWh based on combined margin approach. Baseline Database Version 1.1 dated 21st December 2006
Any comment:	This data item is required for estimating the baseline emissions and emission reductions.

B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline emissions:

Baseline emissions or CERs generated by the project are then estimated as follows:

Baseline emissions = Baseline Emission coefficient x Power generated from the project
(tCO_2) (tCO_2/GWh) (GWh/year)

Project Emissions:

The emissions from the project activity are zero.

Leakage:

As prescribed in Appendix B of the Simplified Modalities and Procedure for small-scale CDM project activities, for Category I.D, leakage estimation is only required if there has been any transportation of either any equipment or fuel. As there is no transportation of neither fuel nor equipment, therefore no leakage is envisaged.

The following formula is used to determine emission reductions:

CO_2 emission reduction due to project activity = Baseline emission – Project Activity emission

The emission reductions due to the project activity are 10,191tCO_2e/year.

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

>>

Year	Estimation of project emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emissions reductions (tCO_2e)

2008	0	10,191	0	10,191
2009	0	10,191	0	10,191
2010	0	10,191	0	10,191
2011	0	10,191	0	10,191
2012	0	10,191	0	10,191
2013	0	10,191	0	10,191
2014	0	10,191	0	10,191
2015	0	10,191	0	10,191
2016	0	10,191	0	10,191
2017	0	10,191	0	10,191

In the above table, the year 2008 corresponds to the period starting from 01.10.2008 to 31.09.2009. Similar interpretation shall apply for remaining years. The crediting period will start from the date of registration of the project with CDM EB.

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	EGtotal
Data unit:	KWh
Description:	Total electricity generated
Source of data to be used:	Plant Records
Value of data	$11.92 * 10^6$
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. Measured at supply and receiving end. The data is used to estimate the amount of emission reductions from the project activity.
QA/QC procedures to be applied:	This data item will be recorded at the project sites which are under the control of project proponent. The energy generated and consumed are measured using calibrated meters and recorded by project proponent. Records of measurements will be used for calculating net export to grid.
Any comment:	The data will be archived for 2 years + the crediting period.

Data / Parameter:	EGaux
Data unit:	KWh
Description:	Auxiliary consumption.
Source of data to be used:	Plant Records
Value of data	$0.07 * 10^6$
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. Measured at supply and receiving end. The data is used to estimate the amount of emission reductions from the project activity.

QA/QC procedures to be applied:	This data item will be recorded at the project sites which are under the control of project proponent. The energy generated and consumed are measured using calibrated meters and recorded by project proponent. Records of measurements will be used for calculating net export to grid.
Any comment:	The data will be archived for 2 years + crediting period.

Data / Parameter:	EGy
Data unit:	KWh
Description:	Net saleable energy.
Source of data to be used:	Plant Records
Value of data	$11.85 * 10^6$
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. Measured at supply and receiving end. The data is used to estimate the amount of emission reductions from the project activity.
QA/QC procedures to be applied:	This data item will be recorded at the project sites which are under the control of project proponent. The energy generated and consumed are measured using calibrated meters and recorded by project proponent. Records of measurements will be used for calculating net export to grid.
Any comment:	The data will be archived for 2 years + crediting period.

B.7.2 Description of the monitoring plan:

>>

The project activity is a grid-connected hydropower project, where the grid's geography and system boundaries are explicit, the characteristics are readily available, and the installed capacity will be less than 15MW. On this basis the conditions for applying AMS-1.D are met.

The methodology requires the project-monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by the emission factor for regional grid forms the baseline for the project activity.

GHG SOURCES

Direct on-site emissions: There would be no direct on-site emissions after the implementation of the project activity since it is a mini hydroelectric project without any storage of water.

Direct off-site emissions: There would be no direct off-site emissions after the implementation of the project activity since it does not involve any transportation of fuel.

Indirect on-site emissions: The indirect on-site GHG sources are the consumption of energy and the emission of GHGs involved in the project's construction. Considering the project's lifetime and the emissions to be avoided over that period, emissions from the above-mentioned source is too small and hence neglected. No other indirect on-site emissions are anticipated from the project activity.

Indirect off-site emissions: No indirect off-site emissions are anticipated for the project activity

PARAMETERS AFFECTING EMISSION REDUCTIONS

Total Power generated by the project: The total power generated by the power project is measured to the best accuracy, and is recorded and monitored on a continuous basis. The parameter would substantiate the smooth operation of the power plant.

Net Power exported to the grid: The project revenue is based on the net units of power exported as measured by the Main metering system installed at the interconnection point and/or the Check metering system installed at the grid sub-station of KSEB. The monitoring and verification system would mainly comprise of these meters as far as power export is concerned.

Key Project Parameters affecting Emission Reductions

Total Power generated by the project: The power exported by VPPL would be monitored to the best accuracy and as per the table given in section B.7.

Auxiliary consumption: The auxiliary consumption by VPPL would be monitored to the best accuracy.

Net Power exported to the grid: The project revenue is based on the net units exported by VPPL.

The general principles for monitoring above parameters are based on the general monitoring principles, which are:

- Frequency
- Reliability
- Registration and reporting

Frequency

Monthly joint meter reading of main meters installed at the interconnection point are taken and signed by authorised officials of VPPL and KSEB on the first day of each month. Hourly data recording by the shift in-charge of VPPL will be there at generation end.

Reliability

The amount of emission reductions is proportional to the net energy generation from the project activity. The reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result.

The project proponent ensures accuracy of the measurement system as follows:

- The shift in-charge is responsible for the hourly data recording and the plant manager would ensure that the data is properly archived.
- All the shift in-charges would undergo an exhaustive training programme, including plant operations, data monitoring, report generation etc.

VPPL keeps requisite sets of metering equipment, duly tested/calibrated, as spares, for replacement as and when required. Main or Check meter would be replaced by spare sets of meters with mutual consent of the parties when a faulty meter is required to be removed. The Main and Check meter would be jointly inspected and sealed on behalf of the parties and shall not be interfered with, by either party except in presence of the other party.

The Main and Check meter is test-checked for accuracy every six months. If any meter were found to be beyond permissible limits of error, it would be calibrated or replaced with spare tested calibrated meter, as may be necessary. All the tests on the Main and Check meters would be conducted in KSEB's laboratory in presence of the authorized staff of both the parties.

Registration and reporting

KSEB and VPPL jointly read the metering system and keep the complete and accurate records for proper administration. Hourly data recording by the shift in-charge is there. Daily, weekly and monthly reports stating the generation are prepared by the shift in-charge and verified by the plant manager. In addition to the records maintained by VPPL, KSEB also monitors the actual power exported to the grid.

Verification

The performance of the project would lead to CO_2 emission reductions. In other words, the more the electricity exports to the grid, the more the emission reductions. There are two aspects to the Verification

1. Verification of the Monitoring System, which includes:
    - Verification of various measurement and monitoring methods
    - Verification of instrument calibration methods
    - Verification of measurement accuracy
2. Verification of Data collected which includes
    - Total generation of power and power export to grid.

To measure the delivery and import of energy by VPPL, one main meter is maintained at the interconnection point and one check meter is maintained at the grid substation of KSEB. Main meter reading would form the basis of billing and emission reduction calculations, as long as the meter is found to be within prescribed limits of error during half yearly check.

The Project Developer will have a designated engineer on site that will be responsible for monitoring the emission reductions of the project activity. No leakage is expected.

- The proven and qualified monitoring equipment (electricity meter) will be installed in place. The systems will allow automated and continuous recording and reporting of data. These readings will be checked for any anomalies before being filed for future reference.
- The data will be monitored and recorded by qualified technicians according to the monitoring plan. Electricity records will be double checked with the Maharashtra state electricity board records.
- The data will be electronically archived. Receipts of electricity sales will be obtained.

For the commissioning and maintenance of the plant the organization chart will be as under:

a) Plant Manager	1
b) Shift Engineers (Mech)	3
c) Shift Engineers (Elec)	3
d) Shift Operators (Mech)	4
e) Shift Operators (Elec)	4
f) Gen. Asst. Admn / Cash & Accounts	1

In addition to the above permanent staff, the routine cleaning job, security (watch of ward) job, trash removal work etc. could be arranged on contract basis.

Preventive maintenance as per manuals shall be done by the regular staff as a routine procedure including changing of spares like bearings, gaskets, runner blades etc which are subjected to more wear and tear. They shall also attend to routine electrical maintenance.

Proper management process and routine procedures will be put in place to ensure the quality of reports required by verification audits. The daily and monthly reports stating the generation and net power export will be prepared by the engineer and verified by the plant engineer who will maintain the records. Records of joint meter reading will be maintained at site.

As and when required, people are sent to short-term training courses on the operation and the maintenance of the power plant. Similarly, in-house training is also provided on when needed. The chief engineer is responsible for identifying the training needs and maintaining the undergone training records.

Adequate fire fighting and safety equipment are installed as per the guidelines of the Directorate of Factories. The plant engineer is responsible for the upkeep of the safety and fire fighting equipment and maintains necessary records.

Calibration of the main meters recording the power exported is done by KSEB every year and necessary records are maintained by both KSEB and VPPL. The plant engineer maintains records of the same. In order to ensure that the project emissions are being regularly monitored and to ensure that the monitoring system functions, the chief engineer would carry out an audit every six months and maintain necessary records of the same. All necessary corrective and preventive actions based on the audit findings will be carried out.

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

>>

Date of completion and application of baseline and monitoring methodology: 08/02/2007
Name of responsible person/entity: Viyyat Power Private Limited and their consultant.

Detailed contact Address of the project participant is given in Annex 1.

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:

>>
01/04/2007

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

>>
30y-0m

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:

>>
01/10/2008 (or starting date of the registration)

C.2.2.2. Length:

>>
10y-0m

SECTION D. Environmental impacts

>>

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

>>

The total project cost is less than the prescribed cost for small-scale project US$21.74 million; hence in accordance with the Ministry of Environment and Forests, Government of India, Environmental Impact Assessment is not required for the proposed project.

Small-scale run-off hydropower project has a 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.

Proposed project will not result in resettlement and rehabilitation in project site, as it is not under human habitation area. The scheme does not involve any impounding of water and hence no submergence or rehabilitation activity is needed. The project shall not affect the aquatic life available in this stream, which at present is insignificant.

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 region of the state.

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

The project activity does not have any negative impacts on the socio-economic environment of the region. Indeed, there are no displacements of local populations, no disturbances in the local eco-systems, no deforestation etc., involved.

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:

>>

There are no environmental impacts considered and the project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India.

SECTION E. Stakeholders' comments

>>

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

>>

Requirement of Stakeholder comments

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

Before implementing any project, project investors / developers need to identify the stakeholders, prepare necessary documents, approach the identified stakeholders directly and obtain required clearances / approvals. The stakeholders after review of documents and profile, getting satisfied with the project design or they feel that the project is sustainable and helpful in terms of local environment / social / economical environments, they will issue clearances / approvals for the implementation of the project.

However, the project participant assembled the local populace at plant premises of Devikulam Taluka, Idukki District on 3rd March 2006 and informed about the project, asked for their comments.

The members enquired about control measures taken by the company to prevent emissions and benefits they get on implementation of the project. The company's representative explained the members that, since project is hydro project, there won't be any emissions of poisonous gas. All the members welcomed the establishment of the project since the project renewable energy project and it creates opportunities for employment.

Identification of Stakeholders

The project participants, as required for setting up the project, have identified the following stakeholders.

Local populace

Local populace, represented by the Vellathuval Gram Panchayat, where the project is getting implemented, will issue No-Objection Certificate (NOC) for setting up of the project under the jurisdiction of the village.

Power department

Power department will issue the No-Objection Certificate (NOC) for setting up of the project.

These stakeholders are to be approached during the project implementation stage, however, will in no way obstruct the implementation of the project as long as the designs are according to the stipulated regulations.

The project participants prepared necessary documentation before implementation of the project activity and approached the above stakeholders individually. No negative comments have been received by the project participants, which is evident from the following clearances and approvals.

Village Panchayat

Local populace, represented by the Village Panchayat, the elected administrative body of the village where the project is getting implemented, issued NOC (No-Objection Certificate) has been approached and expecting the positive comment.

Power Department
The Power Department of Kerala has issued No Objection Certificate (NOC) for construction of the project.

E.2. Summary of the comments received:

>>
The village panchayat /local elected body of representatives administering the local area are a true representative of the local population in a democracy like India. Hence, their consent / permission to set up the project are necessary.

The local population comprises of the population in and around the project area. As the project will provide good direct and indirect employment opportunities to the local population, this one is a beneficiary of the project and therefore encourages it. Moreover, the local population will also benefit, as an indirect consumer, of the power that is supplied to the grid. The power sold to the grid is expected to improve the stability in the local electricity network. Furthermore, the project will not require displacements of the local population.

The public hearing was conducted on 03/03/2006 with a view to have public participation. The company representative headed the chair expressed his intention of calling for meeting and his interest towards setting up a Greenfield hydro project. His statement also follows possible employment generation for the local populace. The local members expressed their enthusiasm on coming up of the hydroelectric unit in their village.

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

It can thus be said that the project activity will not cause any adverse social impacts on the local population and will rather help improvising the population's quality of life.

All the above mentioned clearances are on place and will be produced to the validation team at the time of validation.

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

>>
Project is expecting no comments from the above mentioned stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Viyyat Power Private Limited
Street/P.O.Box:	Kariyavattom,
Building:	Viyyat-Kausthubham,
City:	Trivandrum
State/Region:	Kerala
Postfix/ZIP:	695 581
Country:	India
Telephone:	+91 -471-2418562
FAX:	+91 -471-2418562
E-Mail:	pdnair@rediffmail.com
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Nair
Middle Name:	
First Name:	P.D.
Department:	
Mobile:	+91-0-9447007534
Direct FAX:	
Direct tel:	
Personal E-Mail:	pdnair@rediffmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project

Annex 3

BASELINE INFORMATION

For the project activity the baseline scenario involves electricity consumption which entails GHG emissions. As per the simplified methodology AMS I D, for grid power generation as baseline scenario the Emission Factor for the displaced electricity system is calculated as per ACM0002 baseline methodology. The project proponent proceeds to determine the Emission Factor for the electricity system it imports power from.

A) Choice of the grid that will be affected by the project activity

The regional grid presently considered for estimating the baseline emission coefficient for the proposed project is operated and managed by Southern Region Electricity Board (SREB) comprises of the states namely Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, and Pondicherry. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. SREB facilitates the share of power generated by the central generating stations**.**

Southern regional grid has a total generating capacity of 35818.93MW as on 31.12.2005, of which Private and Central stations has a generating capacity of 5212.45 MW and 9270MW respectively and the balance is being generated by power stations at state level. Thus around 25.8% of the generation capacity is coming from the central generating stations and 74.11% generation capacity from the state and private. As all the Power generated by all the central generation units is being fed to the grid (Southern Grid), which is accessible to the states forming part of the Southern grid. Considering state grid for baseline determination is not appropriate and therefore Southern regional grid is considered as the appropriate grid system for the project activity.

Furthermore as per ACM0002 (Version 6), "In large countries with layered dispatch systems (e.g. state/provincial/regional/national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity."

Taking into consideration both the points mentioned above (i.e. the relevant grid displaced by the project activity and the guidelines for selection of the appropriate grid in large countries with layered dispatch systems like India as given in ACM0002), the Southern Regional Grid has been considered as the most representative system boundary (i.e. project electricity system) where an equivalent amount of electricity would be replaced by the implementation of the proposed project activity. The carbon intensity of the Southern Regional Grid would be determined to arrive at the baseline emission factor for baseline emission calculations for the project activity's crediting period.

B) Determination of the Carbon Intensity of the chosen Grid

Complete analysis of the system boundary's electricity generation mix has been carried out for calculating the emission factor of Southern Regional Grid by Central Electric Authority (CEA) of India in its CO2 Baseline Database Version 1.1 dated 21st December 2006. The project proponent has used this analysis for computation of the grid emission factor. For more information please refer to

http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm. The combined margin grid emission factor computed from the above analysis is thus 0.86tCO2/MWh for the Southern Regional Grid.

Annex 4

MONITORING INFORMATION

Please refer to the section B.7.2 for monitoring information

- - - - -