Voluntary Carbon Standard
Project Description Template

19 November 2007

[Date of VCS PD – 24th December 2009]

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1 Description of Project:

1.1 Project title

"Teesta – V Hydro Power project in Sikkim by NHPC Limited, India"

1.2 Type/Category of the project

The project activity falls under the following types/categories of the Clean Development Mechanism under the Kyoto Protocol:

- Sectoral Scope – Energy Industries (Renewable Energy)
- "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002/Version 10, Sectoral Scope: 1, EB 47[1]

- The specified project is not a part of a grouped project

1.3 Estimated amount of emission reductions over the crediting period including project size:

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2008*-2009	2044442
2009-2010	2044442
2010-2011	2044442
2011-2012	2044442
2012-2013	2044442
2013-2014	2044442
2014-2015	2044442
2015-2016	2044442
2016-2017	2044442
2017-2018	2044442
Total estimated reduction (tonnes of CO_2 e)	20444420
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	2044442

*1st April – 31st March every year

Since the project results in more than 1,000,000 tonnes CO2 equivalent emissions reductions per year, it is a mega project.

1.4 A brief description of the project:

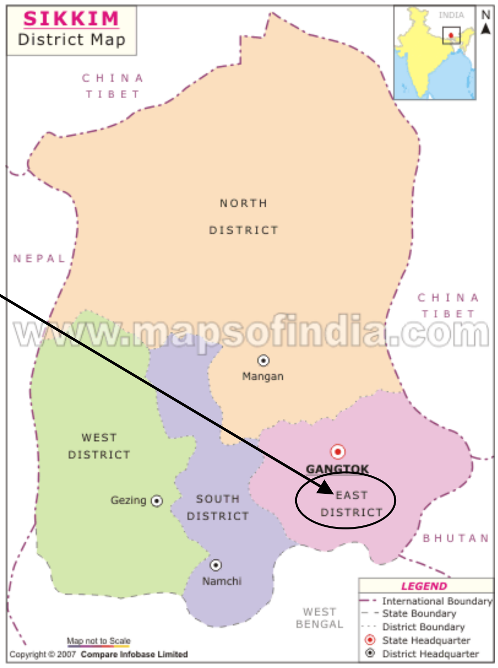
[1] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_323M30IDF1IH6AG3GRCJ4PKR9CKM7P

The implementing agency for the project is National Hydroelectric Power Corporation Limited (henceforth referred as NHPC) which is a Government of India enterprise.

The Teesta HE project - Stage V is a run of the river scheme and will be producing 2572.67 MU of energy that will be absorbed into the Eastern region, connected to the NEWNE grid. Stage V of the Teesta river project has installed a capacity of 510 MW (3×170 MW turbines). The power house is located near Singtam (about 4 km upstream of the confluence of Rongnichu with Teesta). The dependable discharge available throughout the year has been assessed as 60 cumecs and gross head available is 216.73 m; installed capacity of 510 MW. The project consists of concrete gravity dam across river Teesta with a 15 km long head race tunnel and an underground power housing three generating units of 170 MW capacity each. The energy generation at 90% dependable year and 95% machine availability is 2572.67 million kWh.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The project is located in East district of Sikkim state on the major river system in Teesta in Sikkim. The power house site is located at 88º27´30” E and 27º15´00” N. The project site is accessible from Bagdogra Airport and is situated at a distance of 140 km from the airport (power house site being 110 km away). The nearest railway points are New Jalpaiguri and Siliguri. The location of the proposed project activity is given in the following maps:



1.6 Duration of the project activity/crediting period:

- Project Start date: 1st March 2008 which is the start date of commercial operation of the plant
- Crediting Period start date[2]: 1st April 2008
- Credit Period: 10 years renewable crediting period

1.7 Conditions prior to project initiation:

Sikkim is a thinly populated state with the population concentrated around the state capital Gangtok. The economy is mainly agriculture based with very little technological advancement of industrial base. The energy requirement and peak demand of the Eastern region during 1999-2000 without Teesta HE Project V was 59638 Million kWh and 10357 MW respectively and for 2007-2008 shall be 103567 Million kWh and 17893 MW respectively; clearly stating the power demand[3]. The project is a renewable energy project and supplies power to the NEWNE grid, without the project the above said conditions will prevail.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The project activity is a run-of-the-river hydro project which will supply power through NEWNE Grid. The power generated by the project activity displaces the power that would have otherwise been generated by the grid. The purpose of the project activity is to generate electricity using renewable hydro energy and to use to meet the energy demands of the region. In the absence of the project activity, equivalent power would have been generated based on the fossil fuel plants dominating the NEWNE grid, resulting in Green House Gas emissions into the atmosphere.

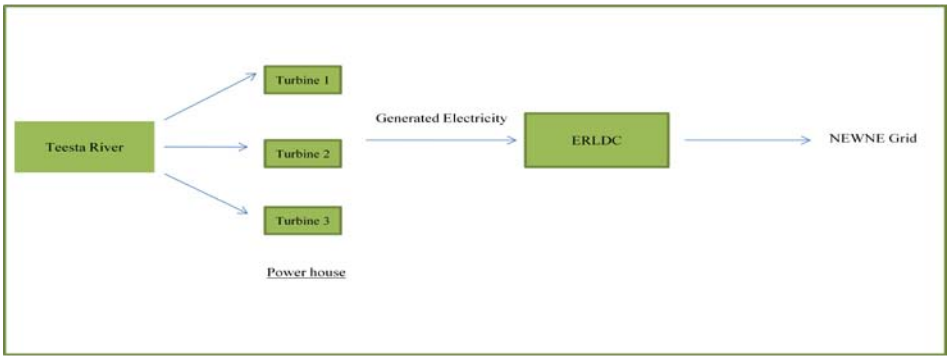
By utilizing the flow of the river, the project activity is;

- Utilizing the untapped mechanical energy resource, this was otherwise being wasted.
- Contributing to the power requirements of state of Sikkim thereby positively contributing to economic growth of the state.
- Conserving the environment and its natural resources (like coal etc.) through use of renewable energy
- Also reducing the need for transportation of the fuels
- Protecting the environment from degradation due to deforestation (on using wood based fuels) or pollution (due to use of fossil fuels for energy or the transportation of fuels).
- Reducing Green House Gas (GHG) emissions.

<u>Project Boundary</u>

[2] Commercial Operation Date of Unit-II

[3] Source: NHPC



1.9 Project technologies, products, services and the expected level of activity:

The Teesta HE project Stage V is a run of the river scheme and will be producing 2572.67 million kWh of energy that will be absorbed into the Eastern region, part of the NEWNE grid. The project consists of 96.45 m high concrete gravity dam across river Teesta with a 15 km long head race tunnel and an underground power housing three generating units of 170 MW capacity each. The annual energy generation is 2572.67 million kWh in 90% dependable year.

The project will provide the state with a clean source of energy which can be utilized not only for meeting the energy demand, but also reducing dependency on fossil fuel or wood but also provide a source of revenue and development opportunities in the state. The project technical specifications[4] are given below:

<u>**Technical specifications of the project activity**</u>

Parameter	Value
Hydrology	
Catchment Area	4307 sq. km
Design Discharge	9500 cumecs
Diversion Tunnels	
No.	2
Lengths	410 m and 550 m
Head Race Tunnel (HRT)	
No.	1
Diameter and Height	25 m and 92 m
Design Discharge	292.37 cumec
Tail Race Tunnel (HRT)	
Type	D – Shaped
Length and Width	135m and 6m
Penstock	
Type	Vertical Pressure Shaft
No.	3
Design Discharge	97.45 cumecs (each)
Power House (Francis)	
Type	Underground
Design Discharge – 3 units	292.37 cumces
Installed Capacity	510 MW
Gross Head	216.73 m
Net Head	197.57 m

[4] Techno- Economic Approval, Central Electricity Authority, GoI

1.10 Compliance with relevant local laws and regulations related to the project:

The project activity is not mandated by any local or national laws. The project proponent has obtained all required approvals as given below.

Approval Name	Approval date	Law under which applicable
Ministry of Environment and Forest, GoI	14th May 1999	Forest (Conservation) Act, 1980
Environmental Clearance	19th May 1999	Environmental Impact Assessment Notification, 1994
Techno-economic Clearance	26th February 1999	Electricity (Supply) Act, 1948
Power Purchase Agreement	9th September 2002	Electricity (Supply) Act, 1948
Sikkim State Pollution Control Board Consent	7th January 2009	Water (Prevention & Control of Pollution) Act, 1974 & Air (Prevention & Control of Pollution) Act, 1981

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

The project under review is subjected to various hydrological, geological, infrastructural and operational constraints as elaborated below. The existing hydro projects in Sikkim have continuously been affected by these barriers and the Teesta Stage V may also be subjected to similar constraints. This may lead to serious implications leading to reduced power generation and hence closure of plant. Thus, it would result in increased dependability on grid power which is leading to increased GHG emissions. Following are the barriers that may substantially affect the project's GHG emissions reductions:

Hydrological Barriers

The project site is exposed to various hydrological risks such as poor water availability during winters, high sediment in rivers during monsoons, flash floods etc. The risks are highlighted below, with a brief history of these events in the region.

- **Poor Water Availability:** The proposed project activity is a hydropower generation, which is run-of-the-river type with limited pondage facilities for the lean periods, which last for three to four months in a year. Thus, power generation from project activity depends directly on the water available in the streams or indirectly on the amount of rainfall the region receives. The project site is characterized by severe winters during which the water freezes (and is sparsely available) in the streams. Due to this hydro generation in state drops down to less than 50% of the installed capacity[5] . Thus, it is expected that the availability of water will affect the power generation and hence the GHG emission reduction potential of the project.

- **Sedimentation:** During the monsoon season, rivers in Sikkim are characterised by high silt content this generally results in overloading of silt traps at the hydro project sites. The deposition of silt is associated with the problem of frequent shut-downs, mechanical failures, reduced efficiency, resulting in the loss of output of the plant. Heavy silt deposits also lead to frequent wear and tear of the equipment and thus require additional finance and efforts for the plant's operation and maintenance. Similar factors were found to be responsible for the shutting down of the Teesta Stage

[5] http://www.sikkimpower.org/files/annual%20report0607.pdf Pg3 Paragraph 2

V hydro power project in Sikkim for around 44 days due to heavy siltation[6]. The project activity may further be affected by similar technical problems as the frequent landslides along Teesta river supply huge amount of sediments into the river channels[7] .

- **Flash floods:** Every year flash floods are known to cause havocs at hydro power sites in Sikkim. Heavy rains may cause floods and landslides in the Teesta River[8]. Every year, three or more high floods passes through the river and thus results in change in cross section several times during the monsoon season[9] . It results in huge loss to property and reduced power generation which consequently leads to shut down of plants. This can result in considerable time and cost overruns for the project activity. Apart from the damage during the construction phase, these incidences may also result in significant impact during operational phase of project.

<u>Geological Barriers</u>

The hydropower projects involve huge amount of construction processes which are located in the geologically sensitive region. This is due to the fact that such regions lead to hindrances which are unexpected in nature and beyond human control. These, lead to delay in construction along with financial problems etc. causing the implementation of such projects difficult.

The project activity site falls under seismically active zone IV. The table given below gives a brief history of earthquakes that have occurred in Sikkim very recently.

Table.1.3: Recent Earthquakes in Sikkim[10]

Major Earthquake	Date of Occurrence	Magnitude (in Richter Scale)
Singyang	20th May,2007	5.0
Nambu	18th May, 2007	4.6
Mana	14th February, 2006	6.3

Further, a study conducted by the Centre for Inter-disciplinary Studies of Mountain & Hill Environment, University of Delhi, on the Teesta river basin showed that the region is characterised by unstable slopes, glacial moraines and thick moraines providing weak substrates; and thus are prone to recurrent landslides. This indicates that this locale represents a fragile ecosystem[11]. Thus, the possibility of geology changes as result of earthquakes, landslides etc. cannot be ruled out in this area considering its fragility. This may impose severe obstructions in the functioning of tunnel and powerhouse. Thus, the geological factors, which are beyond the control of the project proponent, may have a major stake on the power generation capacity of the project.

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[6] http://www.eastrpc.org/MOM%20of%2010th%20CCM%20on%2025.06.09.pdf, page 12

[7] http://www.sikenvis.nic.in/CCSOTB/Executive%20Summary%20&%20Recommendations.pdf Pg 201, Paragraph 1

[8] http://www.sikenvis.nic.in/CCSOTB/VolIV_Water%20Environment.pdf Page 49

[9] http://www.sikenvis.nic.in/CCSOTB/Vol-IV_Water%20Environment.pdf Page 378

[10] http://asc-india.org/seismi/seis-sikkim.htm

[11] http://www.sikenvis.nic.in/CCSOTB/Executive%20Summary%20&%20Recommendations.pdf, Pg 198-202

Thus it is envisaged that poor water availability, silt deposition on turbines and geological surprises may affect the generation of power from the project, thus affecting the GHG reduction potential of the project.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The hydropower project has been installed with the aim of harnessing the under-developed hydro potential of the state. The electricity generated from the project activity meets the power demand of the State (Sikkim). Hence, it contributes greatly toward filling the gap of demand and supply in the North Eastern region. Thus, it is evident that project proponent has initiated this project with an aim to supply electricity to the grid, and not primarily for creating GHG emissions primarily for the purpose of its subsequent removal.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project has not created any other form of environmental credit. An undertaking for the same is provided by the project promoter.

1.14 Project rejected under other GHG programs (if applicable):

The project has not been rejected under any other GHG programs. An undertaking for the same is provided by the project promoter.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

The project promoter is ensuring operation and maintenance of all the equipments for their efficient functioning. The entire data specific to the monitoring of the project shall be recorded and the data shall be made available to the DOE during the validation and verification process by the project proponent.

Contact Information:

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www.emergent-ventures.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical,

economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

Legislative:
The project participants obtained all clearances from stakeholders hence no legal risks are anticipated.

Socio-economic well being:

- Project activity has generated direct and indirect employment for skilled and unskilled manpower during construction phase as well as during operational stage and thus helped in controlling migration from the region and alleviation of poverty.

- The project activity's contribution of power supply towards the NEWNE grid is helping in the upliftment of the social life of the people by ensuring a sustainable and reliable source of power for the region.

- The Project activity has improved the infrastructural facilities like water availability, road, and medical facilities etc in the region.

Environmental well being:

- The project activity generates clean and green power thus causing negligible emissions of green house gases. By building and operating the Teesta project Stage V, much pollution is avoided. In the absence of the project activity, equivalent power would have been generated based on the fossil fuels resulting in more Green House Gas emissions into the atmosphere.
- The project activity has reduced the dependence on fossil fuels for power generation thus conserving the natural reserves. The project has lead to green house gas emission reduction and hence contributed in mitigating climate change.

Technological well being:

- The project activity has increased awareness and interest among the private players to make investments in similar **areas.** The technology employed in the project activity is safe and sound.

1.17 List of commercially sensitive information (if applicable):

No information is deemed to be commercially sensitive.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

The VCS methodology applied to the project activity is:

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Reference: Approved consolidated baseline methodology ACM0002/Version 10, Sectoral Scope: 1, EB 47[12]

[12]http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_323M30IDF1IH6AG3GRCJ4PKR9CKM7P

Title: Tool to calculate the emission factor for an electricity system
Reference: Version 02, EB 50

Title: Tool for the demonstration and assessment of additionality
Reference: Version 05.2, EB 39

The project primarily displaces power from the NEWNE grid. Hence, the baseline calculation is carried out as per approved large scale CDM methodology ACM0002 and the emission factor as per "Tool to calculate emission factor for an electricity system", EB 50 Annex 14.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

Applicability criteria	Project activity
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is a grid connected hydro electric power project. It is a Greenfield project activity.
The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is the installation of a new run of the river hydro power plant with an installed capacity of 510 MW.
In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	This is a Greenfield project activity and does not involve any capacity additions, retrofits or replacements.
In case of hydro power plants: - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density	- Not applicable. This is a Greenfield project. - Not applicable. This is a Greenfield project. The power density of the project is 752.7

of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2. - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	W/m^2 which is greater than 4 W/m^2. - The project activity is constructed as a run-of-the-river hydropower project with limited pondage.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

GHG Sources

The major anthropogenic (man-made) sources of GHG i.e. CO_2 by burning of fossil fuels like coal, petroleum, natural gas for industrial, commercial, transportation, residential and other uses. The spatial extent of the project boundary includes the project site and all power plants connected physically to the baseline grid. In the calculation of project emissions/removals, only CO_2 emissions from fossil fuel combustion at the project plant are considered.

Sinks of GHGs

Sinks refer to 'storehouses' of the gases - places where they can be sequestered. The project activity is generation of electricity by using the harnessable resource (water) and exporting the same to the grid which is overwhelmed by fossil fuel sources and though the project is not a direct sink but contributes as a sink (CO_2 removals) for GHG by the displacement of power in the grid from connected power plants.

Source		Gas	Included	Justification/ Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. (NEWNE Grid)	CO2	Yes	Main emission source.
		CH4	No	Minor emission source.
		N2O	No	Minor emission source.
Project Activity	For hydro power plants, emissions of CH4 from the reservoir.	CO2	No	Minor emission source.
		CH4	No	The project activity is a run-of-river hydro power with limited pondage and hence no emissions.
		N2O	No	Minor emission source.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

As per the approved consolidated methodology ACM0002, version 10, since the project activity involves the installation of a new grid-connected hydro power plant, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

The project activity uses the "BASELINE METHODOLOGY PROCEDURE" as described in the tool.

Identification of the baseline scenario

As per the methodology If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Since the project activity is the installation of a new grid-connected hydroelectric power plant hence the baseline scenario is the same as described above. In the following section Combined Margin for the grid has been calculated as per "Tool to calculate the emission factor for an electricity system"

Step 1. Identify the relevant electricity systems: India's power & electricity operations are organized into two power regions, i.e. NEWNE and South. Power generation projects have traditionally been planned and implemented on the basis of the projected demand in the region and also the availability of fuel. These regional grids have independent load dispatch centres that manage the flow of power in their jurisdiction.

The NEWNE grid is managed by the Northern, Eastern, Western and North Eastern Regional Load Dispatch Centres. These Centres under the NEWNE grid have their own power generating stations as shown in the table below. The project activity is in the state of Sikkim which is connected to NEWNE Grid. Thus the NEWNE grid has been considered for estimating the grid emission factor.

NEWNE Grid Classification			
Northern	Eastern	Western	North-Eastern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh
Delhi	Jharkhand	Gujarat	Assam
Haryana	Orissa	Daman & Diu	Manipur
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya
Jammu and Kashmir	**Sikkim (state of project activity)**	Madhya Pradesh	Mizoram
Punjab	Andaman- Nicobar	Maharashtra	Nagaland
Rajasthan		Goa	Tripura
Uttar Pradesh			
Uttarakhand			

Out of the effective generation capacity of the NEWNE grid 20.60% is the share of must run in the case of hydro/nuclear[13].

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

PP chooses option 1 to include only grid power plants.

[13] http://www.cea.nic.in/

Step 3. Select a method to determine the operating margin (OM)
Calculation of operating margin is based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

As per the tool any of the four methods can be used however, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

As observed in the CEA database, Version 4, less than 20% is provided by the low cost/ must-run power sources (hydro, biomass and nuclear power), hence project proponent has chosen to calculate Simple OM.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

• Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

• Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year *y* is usually only available later than six months after the end of year *y*, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year *y*, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Project proponent has chosen to apply ex-ante option.

Step 4. Calculate the operating margin emission factor according to the selected method

(a) Simple OM
The full generation weighted average for the most recent years has been considered from the Central Electricity Authority data[14].

Operating Margin

Year	tCO_2/MWh	Net Imports(GWh)
2005-06	1.02	4852.69
2006-07	1.01	5126.47
2007-08	1.00	8192.62
Average OM	1.008	

In this PDD *ex-ante* vintage has been fixed and will not be changed during the crediting period.

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

Step 5. Identify the group of power units to be included in the build margin

The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently; or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Step 6: Calculate the build margin emission factor

Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The data has been taken from "CDM - Carbon Dioxide baseline database[15]" published by Central Electricity authority of India.

Build Margin

Year	tCO_2/MWh
2007-08	0.597

Step 7. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

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

Where:

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

Where:
Weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$)

$EF_{grid\ OM,\ y}$ and $EF_{grid\ BM,\ y}$ is calculated as described in Steps 1 and 2 above and are expressed in tCO2/MWh.

The weighted average applied by the project participants are fixed for the entire crediting period.

Combined Margin/ Grid Emission Factor

Year	tCO_2/MWh
Average OM	1.008

[15] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf

Build Margin, BM	0.597
Combined Margin, CM	**0.803**

Thus the grid emission factor for the project activity is 0.803 tCO_2/ MWh and is fixed for the present crediting period.

The project activity is generation of electricity for a grid system which is also served by other fossil and non-fossil fuel based generating units. Hence, the applicable baseline methodology for the proposed project activity is the baseline in kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh).

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The Additionality of the project activity is determined based on "**Tool for the demonstration and assessment of additionality**". This document provides for a step-wise approach to demonstrate and assess additionality.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

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

This step asks for identification of other realistic and credible alternative scenario(s) that deliver outputs and services (e.g. electricity) with comparable quality, properties and application areas.

India is a power deficit country and at present the power demand in the regional grids surpasses availability. India is a growing economy and the increasing demand will need to be catered to, as also bridging the current gap. This power demand can be met with a number of power generating options in the country depending on the availability of sources including thermal and large hydropower projects. But, thermal power plants are going to be the mainstay of all such plans to sustain the growth rate it has set for herself. The facts supporting this scenario are low capital intensive nature of thermal power plant investments, less time required for their implementation, certainty of input (fuel) supplies, absence of seasonal impacts on power production and low unit cost of power generation.

There are only two alternatives to the project activity, viz.,

1. *The proposed project activity not undertaken as a CDM project activity;*
2. *No project activity*, in which case equivalent amount of electricity would be generated by grid electricity system through its currently operating power plants and by new capacity addition (which are mostly thermal), i.e., status quo.

The demand- supply scenario of power in the country is huge and growing. The alternative scenarios explained above are the only plausible alternatives to the project activity as there is very limited that can be achieved with the options such as solar, biomass, wind etc in terms of service and output equivalent to the project activity. The Teesta project is a 510 MW hydro power project which will supply power to the NEWNE grid. To compare a project of such generation capacity with other climate friendly forms of energy such as solar, wind, biomass or mini-hydel is imprudent. These are only complimentary technologies which can help bridge the demand – supply gap but cannot alone meet the growing power demands. Further,

setting up gas based power plants in mountainous regions is also not an option as laying gas pipelines is not feasible. Thus the only other alternative may be to set up a thermal power project of equivalent capacity; however that too involves many logistical and infrastructural difficulties in hilly regions. Hence:
Alternative 1 is an unattractive proposition as in the absence of returns from carbon credits, the scenario is not feasible. This has been demonstrated below.

Alternative 2 is considered as credible and realistic alternative to the project activity since the project activity is displacing the equivalent amount of electricity in the carbon intensive grid system. In the absence of the project activity, the equivalent amount of electricity would be generated by grid electricity system through its currently operating power plants and by new capacity addition.

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

The project activity is not mandated by any state or national laws[16]. The project proponent was not bound by any legislative mandate to implement the project activity. Both the alternatives listed above are in conjunction with the regulatory requirements of the state and central authority in India and neither of these is prohibited from prevailing rules and regulations. Thus, both the alternatives qualify for the next step of the tool.

Step 2: Investment Barrier

The project proponent has chosen project IRR to demonstrate the additionality of the project. The project IRR is compared with the benchmark Return (RRR) and if the IRR is less than the RRR, the project activity cannot be termed as financially attractive.

Sub-step 2a. Determine appropriate analysis method

The benchmark analysis (Option III) has been chosen for the investment analysis of the project activity as per the latest version of Tool for the demonstration and assessment of additionality. Investment Analysis of the project activity is carried out to ascertain financial viability of the project without the revenue from the sale of certified emission reductions. To analyse the financial attractiveness of the Project Internal Rate of Return (Project IRR) has been chosen as the financial indicator.

Sub-step 2b – Option III. Apply benchmark analysis

As per the **Guidance on the Assessment of Investment Analysis, Version 03, EB 51, Annex 58, para 12:**

In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. ***Local commercial lending*** *rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR.*

In the project activity, PP has considered the local lending rate as the benchmark for the project. The base month for considering the lending rate is February 1999. The benchmark for the project is 12.75%[17]. These lending rates are available on the Reserve Bank of India (RBI) website and relate to the prime lending rates (PLR) of five major banks in the country.

Sub-step 2c. Calculation and comparison of financial indicators:

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[16] Electricity Act 2003, section 7

[17] http://www.rbi.org.in/scripts/WSSView.aspx?Id=594

The Project IRR is evaluated for the entire lifetime of the project activity, ie 35 years. It is calculated based on the cash outflows from and cash inflows into the project activity. The following financial parameters are used to arrive at the IRR.

Financial analysis parameters

Parameter	Details
Total project cost	252356 lacs
Debt : equity ratio	50:50
Auxiliary consumption	0.5%
Transformation loss	0.5%
Power Generation	2573 MU
O&M cost	1.5% with 6 % escalation from 2nd year
Tariff Rate for power	Rs. 1.62/ kWh
Depreciation Rate	2.57 %
Minimum Alternative Tax	10.5%
Corporate Tax	35.00%

Based on the above assumptions, the project IRR works out to 7.82 % in contrast to the benchmark of 12.75%. This shows that the project is financially additional and VCU benefits help improve the returns from the project.

Sub-step 2d. Sensitivity Analysis

Further the sensitivity analysis of the project parameters which may substantially influence the IRR is carried out to assess the robustness of the conclusion. The results of the sensitivity analysis are presented below:

Factor	% Change	IRR	Remarks
Power Generation	10%	8.67%	The project IRR does not cross over the benchmark value. The actual performance of the project for the last one year since the commissioning of the project (April 2008 – March 2009) also shows that it has not achieved its design energy generation.
	-10%	6.85%	This is lower than the benchmark
O&M cost	10%	7.67%	This is lower than the benchmark
	-10%	7.91%	This is lower than the benchmark
Tariff rate	10%	8.67%	This is lower than the benchmark. The tariff rate is calculated on a cost – plus approach and depends on the CERC tariff regulations.
	-10%	6.84%	This is lower than the benchmark
Project Cost	10%	6.93%	The project cost at the time of conceptualization will be lower than the cost at the time of start of the project. It is quite likely that the project cost will increase over this time frame. In such a case the returns from the project would only decrease for the PP.

	-10%	8.78%	This is lower than the benchmark and is quite improbable that the project cost will decrease from the approved cost.

It can be seen from the above that the project does not cross the benchmark even under the most optimistic assumptions of power generation or tariff rate increasing by 10%.

In the above background, it may be concluded that it is unlikely to achieve a project IRR of more than 12.75 % and hence the project is termed additional.

Step 3: Common Practise

Sikkim State has a large potential for hydro power (4286[18] MW), but a very small quantity of it has been harnessed. Only 2.35% (100.70 MW as given in the table below) of the total potential has been harnessed before implementation of this 510 MW capacity of hydropower.

The following sub-steps are applied as per the "Tool for the demonstration and assessment of Additionality" to analyze the common practice.

Sub-step 3a: Analyze other activities similar to the proposed project activity:

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

For the purpose of the common practise analysis, similar projects in operation at the time of project commissioning for Teesta - V were considered. Large hydro power projects are defined as those projects with a capacity greater than 15 MW as per CDM/VCS guidelines. The projects considered for analysis are located in the same region – Sikkim.

The proposed project is a large scale hydropower station with a total installed capacity of 510 MW. Similar projects being considered are in the range of +/- 50% of the proposed project activity. According to *Energy and Power Department, Government of Sikkim, India*, there was only one large hydro power project operating in Sikkim state with the installed capacity of 60 MW at Rangit River prior to Teesta – V project. Additionally this project is not of a comparable capacity to the proposed project activity (+/- 50% of the proposed project). The table below shows that predominantly small hydro power projects were operating in the state prior to implementation of Teesta – V.

S. No	Name of the Project[19]	Installed capacity (MW)	Commissioning year	Remark
1	Lowe Lagyap Hydroelectric	12	1979-80	Not of a comparable capacity

[18] http://www.cea.nic.in/hydro/Status%20of%20Hydroelectric%20Potential%20Development.pdf

[19] http://sikkim.gov.in/asp/ANNUAL-REPORT-06-07/DOCUMENTS/ENERGY-&-POWER.pdf

	Project			
2	Jali Power House	2.1	1966	Not of a comparable capacity
3	Rimbi -I	0.6	1971-72	Not of a comparable capacity
4	Rongnichu -II	2.5	1988-89	Not of a comparable capacity
5	Chaten	0.1	-	Not of a comparable capacity
6	Rimbi -II	1	1989-90	Not of a comparable capacity
7	Lachung	0.2	1991-92	Not of a comparable capacity
8	Meyonchu	4	1993-94	Not of a comparable capacity
9	Upper Rongnichu	8	1994-95	Not of a comparable capacity
10	Rothak	0.2	1970-71	Not of a comparable capacity
11	Kalez Khola	2	1995-96	Not of a comparable capacity
12	Rabomchu	3	-	Not of a comparable capacity
13	Rangit -III	60.00	1997	Not of a comparable capacity
	Total	**100.70**		

It was also observed that during the construction period of the proposed project, no other projects of capacity greater than 15 MW were constructed.

Sub-step 3b: Discuss any similar Options that are occurring:

As demonstrated above, implementation of projects similar to the one in the project activity are not wide spread in the region. Thus it may be concluded that the implementation of large hydro power projects is not a common practise in the region.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

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

The monitoring methodology applied to the project activity is:

Title: "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated monitoring methodology ACM0002/Version 10, Sectoral Scope: 1, EB 47

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

- *Purpose of monitoring*
- *Types of data and information to be reported, including units of measurement*
- *Origin of the data)*
- *Monitoring, including estimation, modelling, measurement or calculation approaches*
- *Monitoring times and periods, considering the needs of intended users*
- *Monitoring roles and responsibilities*
- *Managing data quality*

1. Purpose - The purpose of monitoring the project is to assess the annual emission reductions in tonnes of CO_2 that the project activity has achieved.

2. Data to be reported - Net Electricity Exported in MWh and periodical calibrations of monitoring equipments

3. Origin of data and monitoring including estimation approach- The basis of the net electricity exported will be the Joint Meter Readings/ monthly statements which are taken in the presence of Electricity Board personnel and a representative of the proponent every month.

4. Monitoring times and periods - The data will be monitored on a continuous basis but will be recorded on a monthly basis with the energy meters installed at the site.

5. Data Accuracy - The meters recording the electricity exported will be calibrated at least once 3 years[20].

6. Emission Reduction Calculation Approach - The emission reductions are calculated as a product of the net electricity generated from the project activity and the combined margin emission factor calculated in section 2.4 of this document. The calculation approach is explained in detail under section 4.1 of this document.

7. Monitoring roles and responsibilities: A project team would be constituted for the monitoring of the project. This team will be responsible for data collection and archiving. The team will meet periodically to review the data collected as per section 3.3. In case of any irregularity observed by any of the team members, it will be informed to the concerned person for necessary actions to be taken. The following be will the team structure for project monitoring:

   a. *Unit Head:* Overall responsibility of compliance with the monitoring plan.
   b. *Power Plant In-charge:* Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation

[20] http://cdm.unfccc.int/EB/035/eb35_repan35.pdf , Page 3

c. *Shift In-charge:* Responsibility of daily report generation from the SCADA system/ log-books

8. Managing Data Quality : The Power plant In-charge would prepare the report pertaining to the recorded values of the monitored parameters as by the shift-in-charge. The day to day records would be verified by Unit Head, compiled and documented. The company will introduce a safe storage of data. NHPC is an ISO – 9000, and ISO – 14000 certified company having an integrated management system. It will ensure also requirements are met for the project also.

Methodology proposed to be adopted for determining base line emission factor is the combined margin in the NEWNE grid system, which represent the intensity of carbon emissions of the grid system. The baseline emission factor would be adopted from the "CO_2 Baseline Database" published by CEA for the latest available year for the NEWNE grid and the same would be used for the future projection.

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

Emission Reduction Estimation:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year y (t CO_2e/yr)
BE_y	=	Baseline emissions in year y (t CO_2/yr)
PE_y	=	Project emissions in year y (t CO_2e/yr)

$$\boxed{BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}}$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Baseline Emission calculation:

Parameters	UoM	Value
Capacity	MW	510
Running hours	per day	24
Working days	per year	365
Auxiliary Consumption	%	0.5
Transformation loss	%	0.5
Power generation	MU	2573

Power generation by the project = 2573000 MWh/annum

Energy available after Auxiliary Consumption by the project = 2573000 *0.5 % = 2560153 MWh/ annum

Energy Available after transformation loss = 2560153 * 0.5% = 2547334 MWh/ annum

Combined Margin Grid Emission Factor = 0.803 tCO2/MWh

The baseline emission for the project activity is calculated as follows:

BE_y= 2547334 MWh × 0.803 tCO_2/MWh = 2044442 tCO_2/year

Project emissions:

The project emission includes the CH_4 emission from the reservoir. Since the project activity is a run-of-the-river project with a reservoir facility, the calculation for project emissions as per the methodology is as follows:

Parameters	UoM	Value
Capacity	MW	510
Running hours	per day	24
Reservoir area	ha	67.75

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD	=	Power density of the project activity, in W/m^2.
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W).
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.
A_{PJ}	=	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

Since the reservoir is a newly installed facility and does not result in the increase of existing reservoirs, Cap_{BL} and A_{BL} can be assumed to be zero.

Thus,

$$PD = \frac{Cap_{PJ}}{A_{PJ}}$$

$$= \frac{510*1000*1000}{67.75*10000}$$

$$= 752.7 \text{ W/m2}$$

As per the methodology if the power density (*PD*) of the power plant is greater than 10 W/m2 then the project emissions are zero.

Hence the project emissions are PE_y=0.

Leakage:

As specified in approved CDM methodology ACM 0002, leakage is not to be included for such project activities.

Hence, $LE_y = 0$

Emission reduction calculation:

Emission reduction is calculated as follows:

$$ER_y = BE_y$$

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	**$EG_{PJ, y}$**
Data unit:	MWh
Description:	Net Electricity supplied to the grid by the project activity during the year y
Source of data to be used:	Joint Meter Reading (JMR)/ Monthly Special Energy Meter statement (SEM) from the energy meters
Value of data applied for the purpose of calculating expected emission reductions	2547334
Description of measurement methods and procedures to be applied:	For the measurement of net energy delivered to the grid, energy meters (SEMs) are provided. The transmission lines have a set of main meter and check meter. Further one standby energy meter at 400 kV side of generator transformer is also provided. All these energy meters are special energy meters (accuracy class 0.2s). The meters are capable of metering export and import data separately. The net electricity delivered to the grid would be the difference of export and import energy. The monthly SEM statement forms the basis for calculation of the emission reductions. The Readings taken at the substation are taken in the presence of SEB officials and the PP representative. Monitoring Frequency: Monitoring is on a continuous basis with monthly recording of data.
QA/QC procedures to be applied:	The main meters and the check meters are

	maintained and will be calibrated at least once in three years[21].
Any comment:	

3.4 Description of the monitoring plan

The project proponents at the power station have a procedure to ensure proper monitoring of the VCS project activity. The project activity has installed monitoring and control equipment that measure, record, report, monitor and control various key parameters.

The methodology requires monitoring of the net electricity supplied from the project activity. The energy meter is maintained by the proponent for the monitoring of the net electricity generation.

The monitoring plan includes monitoring of energy generation parameter at the substation. The metering system comprises of individual special energy meters (SEMs) for the three generating units of 400 KV generator transformers. These are connected via two transmission lines each having its own SEM meter (main meter and check meter) - Line 1 (400 KV Teesta – Binaguri) and Line 2 (400 KV Teesta – Binaguri). The meter is installed and sealed by the Power Grid Corporation Limited in the presence of the representatives of the power producer. The readings of the power generated (Ex-bus) are taken every month; and this data is used for billing purposes. The check meter shall be used during the period the main metering system is not in service. The meters will be calibrated periodically. The accuracy class of the energy meters is 0.2 s.

The monthly SEM statement is used for the calculation of net power exported from the power station. The proponent shall maintain complete and accurate records and all other data required for the purpose of proper administration and operation of the hydro power plant. The data will be kept for at least 2 years after the end of the crediting period.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

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

Grid Emission Factor (EF_Y)

The combined margin of the regional grid calculated is accordance with the “Tool to calculate emission factor for an electricity system”. The combined margin for the NEWNE Grid is derived from the Central Electricity Authority (CEA) database available at

[21] http://cdm.unfccc.int/EB/035/eb35_repan35.pdf , Page 3

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

Baseline calculation:
The project activity is generation of electricity using Hydro potential energy and exporting the same to the NEWNE grid system. For the baseline determination, project participants account CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity calculated as follows:

$$\boxed{BE_y = EG_y \times EF_{grid,CM,y}}$$

Where,
BE_y = Baseline emissions in year *y* (tCO2/yr).
EG_y = Electricity supplied by the project activity to the grid (MWh).
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.
It has been calculated and fixed ex-ante in the PD (value applied = 0.803 tCO2/MWh).

Project emission calculation:
The project emission calculation as per the methodology includes the CH_4 emission from the reservoir. However since the project activity does not involve the installation of a new reservoir, it does not result in any project emissions. Thus, PE_y=0.

Leakage:
As specified in ACM0002, *The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above).*

Hence project participants do not need to consider leakage in applying this methodology.

Thus L_y = 0

Emission Reduction Calculation:
The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reductions ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y) as follows.

$$\mathbf{ER_y = BE_y – PE_y - L_y}$$

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

The baseline emission for the project activity is calculated as follows:

BE_y= 2547334 MWh × 0.803 tCO_2/MWh = 2044442 **tCO_2/year**

Year	Estimation of baseline emissions (tCO2e)
2008*-2009	2044442
2009-2010	2044442
2010-2011	2044442

2011-2012	2044442
2012-2013	2044442
2013-2014	2044442
2014-2015	2044442
2015-2016	2044442
2016-2017	2044442
2017-2018	2044442
Total (tonnes of CO2e)	20444420

*1st April – 31st March every year

4.3 Quantifying GHG emissions and/or removals for the project:

Year	Estimation of project activity emissions (tCO2e)	Estimation of leakage (tCO2e)
2008*-2009	0	0
2009-2010	0	0
2010-2011	0	0
2011-2012	0	0
2012-2013	0	0
2013-2014	0	0
2014-2015	0	0
2015-2016	0	0
2016-2017	0	0
2017-2018	0	0
Total (tonnes of CO2e)	0	0

*1st April – 31st March every year

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
2008*-2009	0	2044442	0	2044442
2009-2010	0	2044442	0	2044442
2010-2011	0	2044442	0	2044442
2011-2012	0	2044442	0	2044442
2012-2013	0	2044442	0	2044442
2013-2014	0	2044442	0	2044442
2014-2015	0	2044442	0	2044442
2015-2016	0	2044442	0	2044442
2016-2017	0	2044442	0	2044442
2017-2018	0	2044442	0	2044442
Total (tonnes of	0	20444420	0	20444420

CO2e)				

*1st April – 31st March every year

5 Environmental Impact:

The Environment and Pollution Control Division of Forest Department and the State Land Use and Environment Board was entrusted with the task by NHPC to assess the impacts of project activity through Environmental Impact Assessment and preparation of Environmental Management Plan. It was done in the planning stage of the activity.

Water environment: The water quality of Teesta River for physical, chemical, nutrient and heavy metal concentration is within permissible limits as per CPCB standard. There is no organic pollution as on major sources of domestic or industrial discharge in the river. Little effect may be seen during the construction, but after the construction is over, water quality may reach back to normal levels.

Land environment: The total land required for various activities of the project is 326.662 ha and include forest land (122.173 ha), Govt. land (3.100 ha) and private land (2201.389 ha). The forest land to be utilized does not cover extensive forest or trees or endangered species. The project falls in Zone IV of seismic zoning map of India as per IS 1893- 1984, suitable seismic factors have been taken while designing the various components of the project.

Air and Noise environment: The air quality and noise levels were assessed at different stations in the project area. The air quality is reported to deteriorate only during construction activities as there will be an increase in suspended particulate matter etc., but it is anticipated to go back to normal afterwards due to various afforestation programs taken up by the project activity. Noise levels show no effect due to the project activity except during the construction phase.

Biological environment: The project area enjoys considerable natural vegetation, but the construction will only cause 67.75 ha of land to be submerged. Though some rare and endangered species of plants and animals are reported, but it is seen that no such species in the area is likely to get significantly affected by the project (also these species are not reported in the area of submergence). The report shows that construction will not affect the migration of Mahseer fish.

Socio-economic environment: The generation of employment due to construction of dam will invite more workers to business opportunities at local as well as regional level. There is anticipation of development opportunities in the area s of infrastructure facilities, housing, water supply, health, sanitation, schools, transportation and communication. In a nutshell, it can be said that due to the construction of the project the entire area will be benefited.

Summary: NHPC has established an Environment Management Group under the Planning Division of Corporation, which looks after monitoring and implementation of environmental safeguards at project and corporate level. Also with respect to the latest guidelines issued by the MoEF, Govt. of India, an Environmental Management Cell is proposed for the planning and implementation of Environmental Management Plan. Under the rehabilitation and resettlement, 204 project affected families are provided with a compensatory package. Also there are plans for development of green belt around the project area and a compensatory afforestation plan is to started to cover a land area of 250.00 ha along with the development of Catchment Area and Treatment (CAT) plan for the overall conservation of surrounding ecosystem.

6 Stakeholders comments:

A detailed stakeholder consultation process has been conducted by NHPC. This task was accomplished by the Land Use and Environmental Board, Forest Department. The Member Secretary has issued notice for environmental public hearing on 28th October 1997. The pubic hearing was conducted on 2nd December 1997 in the conference hall building, Forest Department, Government of Sikkim, Gangtok.

The stakeholders identified for the project activity are as follows:

1. Government Officials
2. Local Citizens
3. Representatives of affected people including women residing in the project area.
4. Representatives of Panchayats of villages
5. NGO representatives

The discussions mainly aimed at–

- The basic protection of the biodiversity and environment affected due to the project
- Social issues like rehabilitation, compensation and employment
- Issues of water availability and natural calamities were also discussed

1. Significant impacts in the region due to the project
2. Possible impacts in the long run
3. To understand various stakeholder perceptions
4. Stakeholder awareness of project related issues

The comments of various stakeholders are reviewed below:

- The entire region of the Sikkim state, which falls under the Eastern Himalayas, is a relatively fragile ecosystem, which is likely to be affected by any construction activity. But, this project has taken up proper mitigation measures through a well implemented Environmental Management Plan (EMP).
- To generate employment and prevent the influx of population in form of unskilled labourers, NHPC will only employ local labourers, and only in case of non availability will it hire from outside.
- The project has caused displacement of local families, but proper compensation is provided to them and any grievances have been solved.
- The project development has lead to the anticipation of further developmental opportunities that will come up.
- The project area is under Zone IV seismicity, and proper earthquake parameters have been considered for the designing structures to prevent any calamity.
- That there are no apparent trends to indicate that the project has resulted in adversely affecting the livelihood, health, availability of water and other necessities of life in the region.

No major issue which would affect the life of the local community or raise any environment related problems in the region by the implementation of the project activity were identified during the discussion with stakeholders. All the minor issues were addressed and also the concerned departments are keeping a tight vigil for assessing any changes likely that may take place.

7 Schedule:

The chronological plan for the project activity is as follows:

- Techno-economic Clearance – 26th February 1999
- Forest Clearance – 14th May 1999
- Ministry of Environment and Forest – 19th May 1999
- Purchase Order for construction works – 29th August 2000
- Power Purchase Agreement - 9th September 2002
- Loan sanction from Deutsche Bank – 29th September 2002
- Line of Credit Agreement with LIC – 14th February 2003
- Commenced Generation – 25th February 2008
- Loan from Power Finance Corporation – 24th March 2008
- VCS Crediting Period start date – 1st April 2008
- Duration of crediting period: 3×10 years Renewable
- Lifetime of the project: 35 years[22]

The PP will monitor the parameters as explained in Section 3.3. The PP plans to conduct annual verifications to quantify the emission reductions (VCUs) from the project activity and report them in a transparent manner.

8 Ownership:

8.1 Proof of Title:

For the ownership details of the Teesta Stage V project following may be referred:

1. Project Proponent's Website link: http://www.nhpc.nic.in/
2. Power Purchase Agreement (PPA)
3. Commissioning certificates

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not Applicable

[22] http://www.powermin.nic.in/acts_notification/generating_companies.htm