CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Rongnichu Hydroelectric Project (RHEP), India
Version: 4
Date: 26/10/2012

A.2. Description of the project activity:

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The Rongnichu Hydroelectric Project (RHEP) is a run-of-river hydro project proposed for development on the Rongnichu stream, a tributary of the Teesta River, in the East Sikkim district of Sikkim state in India. The project will have an installed capacity of 96 MW and generate approximately 384 GWh of electricity (gross) per annum in a 90 % dependable year with 95 % machine availability. The project is being developed by M/s. Madhya Bharat Power Corporation Ltd. (MBPCL).

The electricity generated by the project will be exported to the Northern, Eastern, Western and North-Eastern (NEWNE) grid via the Eastern Regional Load Dispatch Centre (ERLDC), which supplies electricity to the states of Bihar, Jharkhand, Orissa, West Bengal, Sikkim and Andaman-Nicobar. This network also obtains a portion of its electricity from the Central Sector.

Prior to the implementation of the proposed project activity, the electricity that will be supplied by the proposed project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of other new generation sources. The baseline scenario is the same as the scenario existing prior to the implementation of the proposed project activity.

The basic purpose of the proposed project activity is to generate clean energy and contribute towards meeting the rapidly growing demand for energy in India. Importantly, the RHEP will reduce associated emissions of Greenhouse Gas (GHG) as well as the country's dependence on fossil fuels. The project activity result in a reduction in greenhouse gas (GHG) emissions of approximately 313,713 tCO_2e per annum.

Contribution to Sustainable Development

The India Designated National Authority (MoEF), has developed social, economic, environmental, and technological well-being indicators for the sustainable development impacts of Indian CDM projects.

The proposed project activity will contribute strongly to the environmental, social and economic and technological well being of the state of Sikkim and the country more broadly in the following ways:

Social well-being:

- The proposed project activity will lead to alleviation of poverty by generating direct employment, intensively during the construction phase and on continuing basis during the operation of plant. The project will also improve infrastructure surrounding the project area.
- Local villages partially depend on firewood for their daily energy needs, which can lead to adverse ecological impacts, such as forest degradation, soil erosion and reduction in soil fertility. Increased availability and reliability of power supply from the RHEP to villages in Sikkim will reduce the need for firewood.

- A survey in respect to the public perception was carried out in and around the vicinity of the proposed project. It included directly affected and indirectly affected people of the area. Nearby communities are fully aware of the proposed project and have not objected to its implementation.
- The RHEP does not require any resettlement.

Economic well-being:

- The development of the RHEP will improve access to the area and distribution of goods through the construction of new roads and one major bridge.
- Power shortages are common in the area surrounding the proposed project activity as the current system is unable to meet load requirements, particularly in the winter season. Since the generated power feeds into the nearest substation, the project will increase the availability and reliability of power supply to villages connected to the grid through this substation, facilitating increased economic productivity.
- The project proponent will provide 12% free electricity to the Sikkim Government for 15 years and 15% from 16th year onwards. This free power may be used by the government for irrigation, industry, commercial and domestic needs of the people.

Environmental well-being:

- Electricity to be generated will reduce the carbon intensity of the NEWNE grid by reducing the emission of greenhouse gases on a per MWh basis across the entire system.
- The generation of electricity by the proposed project activity will not result in the emission of any greenhouse gases to the atmosphere.
- The RHEP will result in a reduction in air borne pollutants, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates, through the reduction in the combustion of fossil fuels. The RHEP will result in minimal disruption to the local environment during and after construction, as it is a run-of-river hydro scheme that does not require the building of a reservoir.
- Project proponent would provide 1% free electricity to the state government for Local Area Development Assistance and specifically for environmental projects around the project site.
- As per the guidelines of the Indian DNA for large power projects, MBPCL will be spending a further 2 % of the revenue from the sale of CERs on the sustainable development of the surrounding area, including social/community development. The Action Plan for monitoring of the 2 % CER revenue for sustainable development is mentioned in section B.7.2 of the PDD.
- The RHEP will not compromise access to the river resources for downstream users, or impact upon local aquatic wildlife. Project authorities will release 10 % (0.3 cumecs) of the lean season discharge through the barrage to maintain and sustain the aquatic ecosystem. Moreover, a small tributary, Andheri Khola joins Rongnichu about 50 m downstream of barrage site. Therefore, there will not be a shortage of water for downstream end users. De-silting chambers and check dams will be provided to avoid silting of the Rongnichu.
- A greenbelt of approximately 23.25 ha will be created around the reservoir, to mitigate soil erosion and prevent landslips.
- Afforestation measures shall be taken up under Catchment Area Treatment Plan (CAT) on 462 ha of land for which funds have been earmarked in the RHEP budget.
- There are no conservation/preservation areas in the form of any wildlife sanctuary, national park, etc., in the vicinity of the proposed project activity. The project poses no threats to rare ecosystems or any species of conservation significance.

Technological well-being:

- The project activity use environmentally safe and sound conventional technology for the generation of hydroelectric power.

The proposed project activity is being developed in line with India's National Electricity Policy[1]. Section 5.2.5 of the policy outlines the Government's emphasis on the full development of feasible hydro potential in the country. Section 5.2.6 of the policy states that harnessing hydro potential is a priority as it will facilitate economic development, particularly in the North-Eastern State, Sikkim, Uttarakhand, Himachal Pradesh, and Jammu and Kashmir, where a large proportion of India's hydro power potential is located.

A.3. Project participants:

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Please refer to the Table A.1 below:

Table A1: Parties Involved in the Project

Name of Party Involved (*) ((host) indicates a host Party)	Private and/or Public Entity(ies) Project Participants (*) (as applicable)	Kindly Indicate if the Party involved wishes to be Considered as Project Participant (Yes/No)
India (host)	M/s. Madhya Bharat Power Corporation Ltd. (MBPCL) (Private Entity)	No
Australia	Perenia Pty Ltd (Private Entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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India

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

Region: Eastern Region of India
State: Sikkim
Province (district): East Sikkim

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

City/District: East Sikkim
Community (Village): Namli, Sumin,Duga, Kumrek

[1] http://powermin.nic.in/indian_electricity_scenario/national_electricity_policy.htm

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

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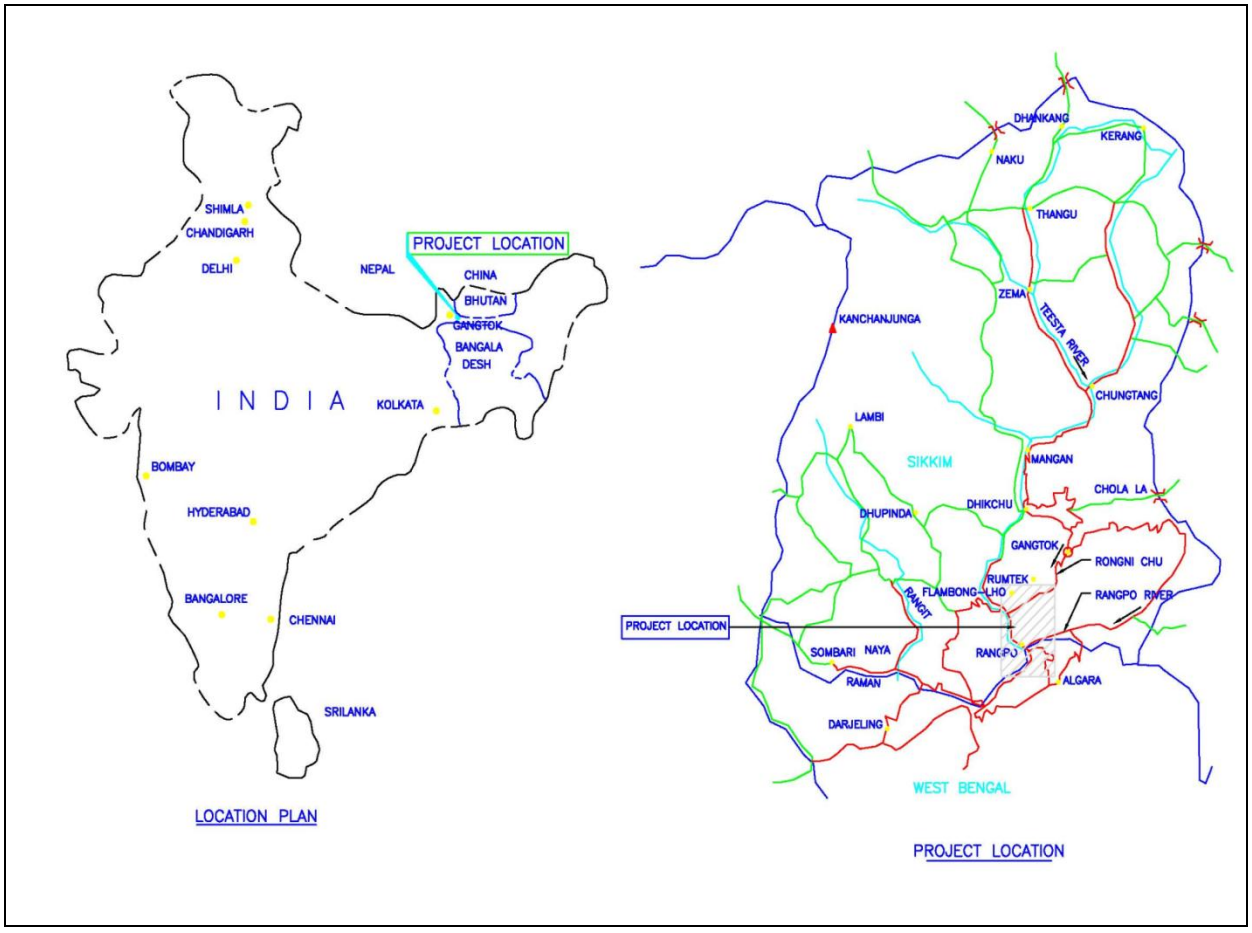
The RHEP is a run-of-the river hydroelectric project proposed for development on the Rongni River, a major tributary of the Teesta River. The project area can be approached from Bagdograand Gangtok via National and State highways. The nearest railhead is at Siliguri / New Jalpaiguri in West Bengal. The project catchment is located between longitude of 88° 31' E to 88° 44' E and latitude 27° 14' N to 27° 24' N.

The proposed barrage (diversion) site will be located across the Rongnichu, at 27° 16' 27" N, 88° 35' 38" E near Namili village about 200 m upstream of Andhei Khola-Rongnichu confluence.

The surface power house is proposed to be located on the right bank of the Rangpo River, at 27° 10' 58" N ,88° 32' 27" E, 2.5 km from Rongpo Town on Rongpo-Rongli State Highway.

The powerhouse is about 4.0 km from Rangpo on NH 31 A and is about 5.0 km upstream of the confluence of the Rangpo and Teesta Rivers. At the site of the power station the Rangpo River flows nearly in an NE-SW direction.



A.4.2. Category(ies) of project activity:

Sectoral Scope 1: Energy Industries (Renewable / Non-renewable sources)
Category : " Grid connected electricity generation from renewable energy sources"

A.4.3. Technology to be employed by the project activity:

The proposed RHEP is a new run-of river hydroelectric project that will utilise the natural flow of the Rongnichu River to generate electricity and hence does not involve the construction of a reservoir. The project activity is a Greenfield project, no power generation facility existed in the pre-project scenario. The project activity is the generation of power to the tune of 96 MW. In the absence of the project activity the equivalent power would have been generated from the existing fuel mix in the grid as the future capacity additions.

The proposed project involves the construction of a 14m high barrage on Rani Khola (Rongnichu) and a 12.60 km long headrace tunnel with a powerhouse on the right bank of Rongpochu River and switchyard. A small diurnal storage area for peaking power during non-monsoon season is envisaged behind the barrage.

Inclined trash racks will be installed in front of the power tunnel intake to avoid intake of floating debris and large size boulders.

The water will be diverted through an interconnecting channel from the barrage into a desilting basin before being conveyed into a headrace tunnel, penstock tunnel and surge shaft. The water will pass from the penstock tunnel into the surface type powerhouse that will accommodate two (2) 48 MW vertical shaft Pelton turbines directly coupled to vertical shaft, synchronous generators. The powerhouse shall have appropriate ventilation, cooling and heating systems and will be fitted with a heating and ventilation tunnel. From the powerhouse the water will be discharged back into Rongpochu River as it is a trans basin development, via a tailrace channel.

The technology employed for the RHEP is converting hydro potential energy into electrical energy, which is a proven, environmentally sound technology.

There is no technology transfer envisaged for the CDM project activity.

The main features of the project are provided in Table A2.

Table A2: System Specifications of the Project[2]

Category	Item	Specification
Hydrology	Catchment Area	190 km^2
	Energy generation at 90% Dependable year and 95 % machine availability	384 MUs
	Design Discharge	27.50 m3/s per unit
	Net head	406.0 m
Reservoir	Submergence	10.7 ha

[2] Since the project is still under construction, some of the information provided in this section may be subject to change

Turbine	Type of turbine	Pelton, Vertical shaft
	Number of generating units	2
	Capacity of each generating unit	48 MW
	Turbine efficiency	90 %
	Turbine speed	300 rpm
	Life time	35 years s
Generator	Voltage	11 kV
	Frequency	50 Hz
	Generator efficiency	98 %
	Life time	35 years
Transformer	Unit Capacity	60MVA
	Voltage evacuated	220 kV
Annual Plant Load Factor	Percentage	45.662 %

The voltage of the electricity generated at the generator terminals will be 11kV, which will be stepped up to 220kV at the switchyard of the powerhouse. The power from 220 kV Switchyard will be evacuated through one 220 kV double circuit transmission line to be connected to the pooling substation at Rangpo which is about 2 km from the Power House Site. The electricity generated by the project will be exported to the NEWNE grid.

The project activity is the installation of a new grid-connected renewable power plant/unit. The baseline scenario is identified in accordance with the applied methodology ACM0002 (Version 13.0.0) i.e. *"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 calculations".*

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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MBPCL (the project participant) has chosen three crediting periods of 7 years each.
The estimated emission reductions over the chosen crediting period are shown in Table A3

Table A3: Annual Emission reductions

Years	Annual Estimate of Emission Reductions in tones of CO2e
2014	319,713
2015	319,713
2016	319,713
2017	319,713
2018	319,713
2019	319,713
2020	319,713
Total estimated reductions (tones of Co2e)	2,237,991
Total No. of crediting years	7 years
Annual average over the crediting period of estimated reductions (tones of CO2e	319,713

A.4.5. Public funding of the project activity:

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The proposed project activity does not involve any public funding from Annex-1 countries.

SECTION B. Application of a baseline and monitoring methodology

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

Sectoral Scope : Energy Industries (renewable/non-renewable sources)
Scope Number : 01

Approved methodology : Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources, ACM 0002 (Version 13.0.0, EB 67, Annex 13).

Tools used:

- *"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1; EB 63, Annex 19)
- *"Tool for the demonstration and assessment of additionality"* (Version 06.1.0 ; EB 69, Annex 20).
- *"Tool to calculate project leakage CO_2 emissions from fossil fuels consumption*" (Version 02, EB 41, Annex 11)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

In accordance with the Methodology ACM 0002, applicability criteria for various projects are mentioned. The conditions for the present activity and fulfilment of the same are provided below;

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 installation of a new grid connected renewable power plants at the site where no renewable power plant was operated prior to the implementation of the project activity.
The project activity is the installation, capacity addition, retrofit or replacement 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 proposed activity is the installation of a hydro power plant with run-of-river reservoir.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): 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	The project activity is not a capacity addition, retrofit or replacement of an existing power plant. Hence, this not applicable.

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	
In case hydro power plants, one of the following conditions must apply. o The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or o The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions sections, is greater than 4 W/m2 ; or o 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/m2.	The project activity results in a small run-of-river reservoir and the power density of the plant is 897 W/m^2 which is far greater than the $4W/m^2$ threshold.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m2; Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m2 , is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	The project activity does not use multiple reservoirs. Hence, this applicability criterion is not required to be fulfilled.
This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	It is renewable energy project with no on site fuel-switch involved.
This methodology is not applicable to the biomass fired power plants;	Project activity is hydro power plant.
This methodology is not applicable for a hydro power	The power density of the project activity is

plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m^2 .	more than 10 W/m^2

The project meets the criteria mentioned in the methodology ACM0002, Version 13.0.0 (EB 67,Annex 13) and hence justifies the selection of approved consolidated baseline methodology (ACM0002) for this project activity.

B.3. Description of the sources and gases included in the project boundary:

The project boundary, as specified in ACM0002, (Version 13.0.0, EB 67, Annex 13), encompasses the spatial extent of the project boundary including the project power plant and all power plants connected physically to the electricity system that the proposed CDM project power plant is connected to. The electricity generated by the project activity will be fed into the North East West and North East (NEWNE) grid, which has a pool of state and privately owned power generating plants. The diagram depicting the project boundary is provided in Figure B1.

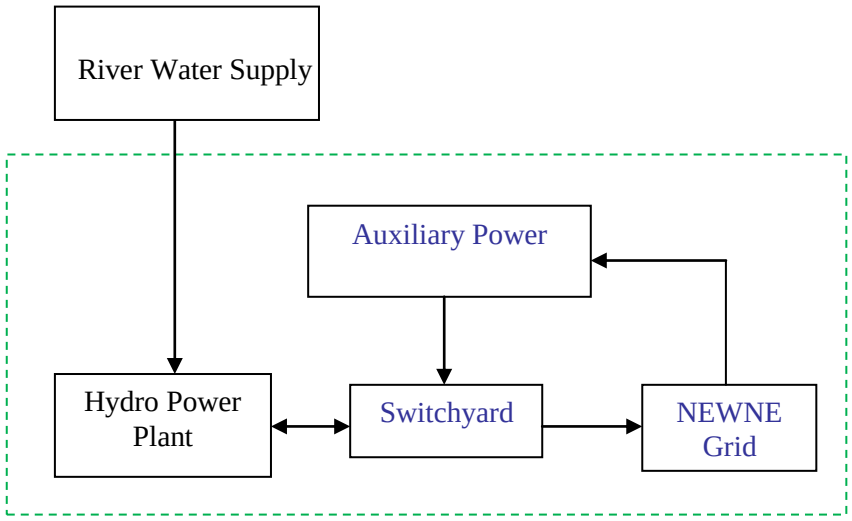

Figure B1: Rongnichu Hydroelectric Project Boundary (dashed lines)

The following section shows the greenhouse gas emissions sources included in or excluded from the project boundary:

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 Emissions from electricity generation in Fossil Fuel Fired Power plants that is displaced due to the project activity	CO_2	Yes	In accordance with ACM0002, the baseline should only include CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity.
		CH_4	No	
		NO_2	No	

Project Activity	For geothermal power plants, fugitive emissions of CH4 and CO2 from no condensable gases contained in geothermal steam	CO_2	No	The project activity is not a geothermal plant.
		CH_4	No	
		NO_2	No	
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The project activity does not involve combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants
		CH_4	No	
		NO_2	No	
	For Hydro Power Plants, Emissions of CH_4 from the reservoir	CO_2	No	Since the project involves a reservoir, this emission source is considered in the project boundary. However, since Power Density is >10W/m^2 this emission source is not significant.
		CH_4	Yes	
		NO_2	No	

Combustion of diesel by the diesel generators during start-up or emergencies is negligible and not a main emission source according to the methodology (<1% of baseline emissions). Therefore, there are no emissions sources expected to contribute more than 1% of the overall expected average annual emissions reductions, which are not addressed by the applied methodology.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"* (Version 13.0.0, EB 67 Annex 13) identifies two options for defining the baseline scenario, dependent on whether the project activity is a new project or a modification or retrofit of an existing generation facility.

The project activity is installation of a new grid-connected renewable power plant/unit, therefore, , the baseline scenario is defined as: *"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 identified baseline is in compliance with the existing laws and regulations as the power generation from the fossil fuel and renewable sources and that can be connected to the grid are allowed in the host country conditions.

The baseline scenario is calculated as a combined margin (CM) consisting of the operating margin (OM) and build margin (BM) factors calculated using steps specified in the *"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1; EB 63, Annex 19) which are outlined below and also in Section B6.

The grid emission factors calculation are sourced from the CO_2 Baseline Database for the Indian Power Sector - Version 5.0) published by the Central Electricity Authority (CEA), Ministry of Power, Government of India, which is the most recent data available at the time of submission of PDD for validation.

The key parameters and data sourced applied for calculation of emission reductions are provided below;

Key Parameter	Value	Description
$EF_{grid,OMsimple,y}$	1.005	Operating Margin CO2 emission factor for the project electricity System in year y(tCO2/MWh) (Calculated as three years generation weighted average 2006-2007, 2007-2008 and 2008-2009).
$EF_{grid,BM,y}$	0.675	Build margin CO2 emission factor for the project electricity system in year y(tCO2/MWh)
$EF_{grid,CM,y}$	0.9215	Combined Margin CO2 emission factor for the project electricity system in year y (tCO_2/MWh). (Calculated as using OM and BM as equal weights (50%).

Source: CEA's *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*[4]

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 CDM project activity (assessment and demonstration of additionality):

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The RHEP will generate electrical power without the emission of greenhouse gases. The power generated will be exported to the NEWNE grid of India, where it will displace the electricity generated from a fossil fuel-dominated generation mix, thereby reducing the carbon intensity of the grid (on a per MWh basis across the grid) and the quantity of greenhouse gases emitted.

In total, the project activity is estimated to result in a reduction in emissions of greenhouse gases of 2,237,977 tonnes of CO_2 over the first crediting period of 7 years. To demonstrate the additionality of the project, the steps prescribed in *"Tool for the demonstration and assessment of additionality"* (Version 06.1.0) have been used.

Prior CDM Consideration

As per EB 63, Annex 13 "*Guidance on the demonstration and assessment of prior consideration of the CDM":*

"The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the

[4] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity. Such notification is not necessary if a PDD has been published for global stakeholder consultation or a new methodology proposed to the Executive Board before the project activity start date."

In accordance with the above guidelines, the project proponent notified the UNFCCC and Indian National CDM Authority Designation National Authority (NCDMA) about the CDM project activity on 25th February 2009 and its intention to seek CDM status. The notification is available on the UNFCCC web site[5].

As per "*Guidance on the demonstration and assessment of prior consideration of the CDM*" such notification demonstrates that project proponent gave prior consideration to developing the proposed project activity as a CDM project. The dates of key decisions in the project development process are shown in the project activity timeline below:

Project Activity Timeline

Project Milestone	Date
Environmental Clearance received from Government Of India	4th April 2007
CDM Registration Agreement with CDM consultant signed	20 March 2008
Completion of Detailed Project Report (DPR)	August 2008
Techno-Economic Clearance (TEC) from Sikkim Government	1st October 2008
Investment decision taken by Board of Directors	16th December 2008
Submission of Prior Consideration Form to DNA and UNFCCC	25th February 2009
Loan sanctioned by Power Finance Corporation (PFC)	7th January 2010
Contract agreement signed for Civil work (Start Date)	14th June 2010
HCA obtained from National CDM Authority of India	15th November 2010
Appointment of DOE	26th November 2010
PDD published for Global Stakeholder Consultation	21st January 2011
Contract signed with Electro-Mechanical supplier	28th September 2011

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

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

As the project activity is the implementation of a new grid-connected renewable power plant, and is not a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit, the baseline scenario, according to the methodology ACM0002 Version 13.0.0 (EB 67, Annex 13), 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

[5] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html?s=60

the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

Therefore, further discussion on alternatives is not necessary.

Sub-Step 1b: Consistency with mandatory laws and regulations

The baseline scenario and proposed project activity comply with all mandatory applicable legal and regulatory requirements for electricity generation in India.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method:

As the proposed project activity will earn revenue from the sale of electricity, in addition to the CER revenue, simple cost analysis (Option I) is not applicable.

As outlined under Step 1 above, the only viable alternative to the proposed project activity is the supply of electricity from the electricity grid. As per the *Guidance on the Assessment of Investment Analysis* (Version 05, EB 62, Annex 5) *"if the alternative to the project activity is the supply of electricity from the grid, this is not considered an investment and a benchmark analysis is considered appropriate"*. Therefore, the option chosen to demonstrate additionality is a benchmark analysis (Option III).

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

As per *Guidelines on the Assessment of Investment Analysis* (Version 5, EB 62, 15th July 2011) *"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."*

Based on the guidelines, commercial lending rate, as represented by the Prime Lending Rate published by the Reserve Bank of India, in Weekly Statistical Supplement (WSS), has been taken as the benchmark for the project activity. Investment decision for the project was taken on 16th December 2008, and at that time the latest publication of WSS available was that of 12th December 2008. As per WSS, the PLR ranged between 13.00% - 13.50%[6]. The PP has chosen the lower end of the range namely 13.00% as the benchmark, which is conservative.[7]

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

The financial indicator chosen for the purpose of the benchmark analysis is post-tax project Internal Rate of Return (IRR). Since the project is in the private sector, and is financed 70% by debt, post-tax project IRR is considered as the most suitable financial indicator for additionality demonstration. Since Annex 5,

[6] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/88944.pdf

[7] In the webhosted PDD, 12.57% has been identified as the benchmark based on WACC. However, during validation, the benchmark has been changed to commercial lending rate, which is marginally higher than the benchmark given in the GSP PDD. However, it may be observed that the project remains additional not only in the baseline scenario, but also when the critical parameters are subjected to reasonable variations even if the benchmark given in the webhosted PDD is taken into account.

EB 62, and Additionality Tool permits the use of Project IRR as the financial indicator, the selection of Project IRR is in conformity with the CDM Rules.

The input values used in the financial model are contained in the assumptions worksheet of the model. These input values are shown in the table below together with source of evidence, which were valid at the time of investment decision and as per requirements of *"Guidance on the Assessment of Investment Analysis"* (EB 62, Annex 5, paragraph 6). Key financial inputs utilized to calculate the project IRR are contained in Table B1.

Table B1: Financial Assumption used to calculate the project IRR

Description	Units	Value	Data Source
Electricity Generation			
Installed Capacity	MW	96.00	DPR August 2008, (Section 7, Table 7.5, page number 6)
Plant Load Factor	%	45.662%	DPR August 2008, (Section 7, Table 7.5, page number 6)
Aux. consumption & trans. losses	% of Net Generation	1.00%	DPR (Section 15.3 page number 3)
Date Definitions			
Start Date	Date	1-Jun-10	DPR August 2008, Section 1.5.
Construction Period	Months	43.00	DPR August 2008, Section 1.5.
Commercial Operations Start	Date	1-Jan-14	DPR August 2008, Section 1.5. Construction period 42 months, plus one month for testing/commissioning
Financial year end	Date	31-Mar-14	Calculated
Revenues (Electricity Tariff)			
Electricity sold via merchant power	%	40.00%	Hydro policy 2008; para 10.1 (f).
Electricity sold via PPA	%	60.00%	Hydro policy 2008; para 10.1 (f).
Electricity Tariff - merchant power	INR / KWh	4.00	DPR, August 2008, Section 15.5.1
Escalation in Merchant Power Tariff	%	1.0[8]0.01	WPI of Electricity (Commercial) between April 2005 & Dec 2008
Electricity Tariff - PPA	INR / KWh	3.82	As per CERC Regulations 2004 Formula
Energy Free to local development fund	% of Net Gen.	1.00%	New Hydro policy 2008, para 10.1 (h).
Royalty to State. Years 0 to 15	% of Net Gen.	12.00%	Agreement with State Government, dated 1st March 2006, page 2
Royalty to State. Years 16 to 35	% of Net Gen.	15.00%	Agreement with State Government, dated 1st March 2006, page 2
Operational Cost			
Environmental Cess	INR / MWh	10.00	0.01 per KWh (Agreement with State Govt., 1/03/2006, page 11)

[8]The escalation is based on the Wholesale Price Index for "Electricity (Commercial)" as published by the Office of Economic Advisor, Government of India. The Index in April 2005 was 96 and in December 2008 was 98.9 yielding an annual average growth rate of 1%. Though the index with 2004-05 was introduced in April 2004, growth rate was not computed from April 2004 because the index in April 2004 was 101 and hence the annual average growth rate would have been negative. The data can be accessed at http://eaindustry.nic.in/indx_download_0405/month2.xls

O&M expense	% of Capex	1.50%	DPR, August 2008, Section 15.5.1
O&M Expenses effective date	date	Jan-09	DPR, August 2008, Section 15.5.0
O&M - escalation	% per annum	4.00%	DPR, August 2008, Section 15.5.1
Capital Expenditures			
Land	INR	100	DPR August 2008, Section 14.1
Civil	INR	131	DPR August 2008, Section 14.1
E & M + Trans. Line	INR	4,100	DPR August 2008, Section 14.1
Contingencies	INR	497	DPR August 2008, Section 14.1
Interest During Construction	INR	457	DPR August 2008, Section 14.1
Preliminary Expenses	INR	149	DPR August 2008, Section 14.1
Pre Operative Expenses	INR	394	DPR August 2008, Section 14.1
Total Capital Cost	INR	5,828	DPR August 2008, Section 14.1
Financing Pattern			
Debt-Equity Ratio		70:30	DPR August 2008, Section 15.4
Equity		1,748	Calculated
Debt		4,080	Calculated
Interest Rate	%	12.50%	DPR August 2008, Section 15.4
Debt Repayment Period	Years	10	DPR August 2008, Section 15.4
Initial Grace Period	Months	6	DPR August 2008, Section 15.4
First Debt Repayment	Date	1-Jul-14	Calculated
Fund Phasing Periods			
31-Mar-11		15.0%	DPR August 2008, Section 15.4
31-Mar-12		40.0%	DPR August 2008, Section 15.4
31-Mar-13		30.0%	DPR August 2008, Section 15.4
31-Mar-14		15.0%	DPR August 2008, Section 154
Refurbishment Cost			
Refurbishment Cost (2008 Price Level)	% of Capex	15.0%	DPR August 2008, Section 14.1
Working Capital			
Receivables	Months	2.0	DPR August 2008, Section 15.5.1
O&M cost	Months	1.0	DPR August 2008, Section 15.5.1
Spares	% of O&M cost	20.0%	DPR August 2008, Section 15.5.1
Escalation on spares	%	4.0%	DPR August 2008, Section 15.5.2
Interest on Working Capital Loan	%	12.50%	DPR August 2008, Section 15.5.1
Return on Equity	%	14.0 %	CERC Tariff Regulations 2004, p.43
Depreciation			
Book Depreciation - Civil	%, SLM	3.34%	Schedule XIV, Companies Act, 1956
Book Depreciation - Plant &Machinery	%, SLM	5.28%	Schedule XIV, Companies Act, 1956
IT Depreciation- Civil	% of WDV	10.00%	Income Tax Rules
IT Depreciation- Plant & Machinery	% of WDV	15.00%	Income Tax Rules
Salvage Value	% Capital Costs	0%	Implementation Agreement, 1st March 2006 (Clause 5.3)
Tax			
Corporate Income Tax	%	33.99%	Finance Act, 2008

MAT Rate	%	11.33%	Finance Act, 2008
CDM			
Baseline emissions factor	tCO_2e / MWh	0.841	CEA Baseline C02 Emission Factor
CER sale price	EURO	15.00	CER Price forecast
Exchange Rate (INR per EUR)	INR/EUR	62.58	Oanda Web Site
CER Income	INR/MWh	789.45	

All the input parameters have been sourced from the DPR, which was finalised in August 2008, and/or CERC Regulations 2004, which were available at the time of decision-making, and therefore, the input parameters used in the financial indicator conform to Guidance 6, Annex 5, EB62. Since the DPR was finalised in August 2008 and Investment Decision was taken in December 2008, the time gap between the finalisation of DPR and Investment Decision is very short (5 months), for any parameters to undergo a change. Therefore, the consideration of DPR is in conformity with paragraph 54 of EB38.

The Annual Energy Generation used in PDD has been sourced from the DPR, which has been prepared by a third-party technical consultant -*SMEC India Pvt. Ltd.* -appointed by the PP. The generation has been determined based on hydrological study for 30 years. The Annual Energy Generation has been submitted to the Government of Sikkim, which has approved the same. Since the Annual Energy Generation (and hence PLF), has been estimated by a third-party technical consultant, and has been approved by the government, it conforms to the Guidance vide Annex 11, EB48, by EB.

The investment analysis has been conducted for 35years, which is as per guidance from the Central Electricity Regulatory Commission (CERC, 2004). This complies with the *"Guidelines on Investment Analysis"*(paragraph 3 of Annex 5, EB 62). Since the project has to be handed over to the Government of Sikkim "in good operating conditions", as recommended by the technical consultant in the DPR, refurbishment cost has been provided once in 10 years. Since as per Clause 5.3 of the Implementation Agreement signed with the Government of Sikkim, the project has to be handed over at the end of the concession period free of cost, salvage value has been reckoned at zero.

Based on the above assumptions and input parameters, the project is expected to yield a post-tax project IRR of 10.7% in contrast to the benchmark of 13%. Therefore, the project is additional and not a 'business-as-usual' scenario.

Sub-step 2d. Sensitivity analysis

The robustness of the conclusion, i.e., the project is additional, was checked through a sensitivity analysis. Sensitivity analysis was conducted for the major input variables namely electricity generation, merchant power tariff, the project cost and O&M costs. The PPA tariff is calculated using the CERC Regulation 2004 formula and will remain fixed during entire lifetime of project. These variables other than O&M cost, constitute more than 20% of total project costs / total project revenues. Even through O&M cost constitutes less than 10% of the project cost/project revenue, this cost has also been subjected to sensitivity analysis as it's the only standalone cost in the financial indicator calculation. Therefore, the parameters selected for sensitivity analysis conforms to paragraph 20 Annex 5, EB62.

These parameters have been subjected to ±10% variation, which is considered appropriate for the project activity. Since the Annual Energy Generation has been estimated by technical consultant based on the study of 30 years of hydrological data and has been accepted by the Government after scrutiny, the expectation of any variation in the generation is hypothetical. The project under implementation and the value of contracts already signed and contracts yet to be signed is INR 5,880.0 Millions. Therefore, a reduction in the project cost by 10% is not possible. The merchant power tariff has been registering a

decline of late with the generation going up and the promotion of Ultra Mega Power Projects (UMPPs), on a competitive-bid basis, the tariff is unlikely to register any increase. Despite this fact, the merchant power tariff has been subjected to an escalation of 1%, even though the power tariff as evidenced by the Wholesale Price Index of Electricity (Commercial) has registered less than 1% growth in the past. Therefore, any increase in the merchant power tariff is unlikely. O&M Cost represents wages & salaries, repairs & maintenance, travel & conveyance, statutory expenses, and other miscellaneous expenses, all of which are subject to inflationary forces. With the country experiencing inflation of about 5%[9], any reduction in O&M cost is hypothetical. In the above background, subjecting the parameters to ±10% variation is considered appropriate and suitable for the project activity, and therefore is in conformity with paragraph 21 of Annex 5, EB62.

The results of the sensitivity analysis are presented in Table B2.

Table B2: Project IRR Using Alternative Project Parameters

Scenario	Parameter change	Project IRR
Base case	-	10.7%
Project cost	Plus 10%	10.0%
	Minus 10%	11.4%
Annual electricity generation	Plus 10%	11.4%
	Minus 10%	9.9%
O&M cost	Plus 10%	10.6%
	Minus 10%	10.7%
Merchant power tariff	Plus 10%	11.4%
	Minus 10%	9.9%

As could be seen from the results given above, the project is additional and continues to remain additional even when the critical parameters are subjected to reasonable variation. Besides the above parameters, two other factors have also been subjected to sensitivity analysis. In the financial indicator calculation, the terms of loan have been taken as per DPR, which was available to the project participant, MBPCL, at the time of decision making in conformity with Guidance 6, Annex 5, EB62. However, since Guidance 11, Annex 5, EB62, requires the project to use 'actual interest' where the post-tax benchmark is used, IRR has been computed with actual interest. The IRR works out to 11.2%, and the project becomes all the more additional. In computing the tariff as per CERC formula, ROE has been taken at 14% in conformity with CERC Tariff Regulations 2004, which was available at the time of decision-making. However, vide Tariff Regulations of 2009 issued by CERC, the ROE has been increased to 15.5%, to which the project is entitled to. Therefore, a sensitivity analysis has been conducted to ascertain the financial indicator with a revised ROE and the results reveal that the Project IRR will remain at 10.9% and the project continues to remain additional.

It is in the above background, that the CDM benefits become necessary. CDM benefits enable the Project to achieve an IRR of 13.9%, which is higher than the benchmark. Therefore, the project requires CDM benefits to become viable and self-sustaining in nature.

[9]Wholesale Price index was 97.5 in April 2004 (when the new series of Wholesale Price Index with 2004-05 as the base was introduced) and 126.9 in November 2008. The CAGR of Wholesale Price Index for this period works out to 5.92%. The data can be accessed at http://eaindustry.nic.in/indx_download_0405/month2.xls

Outcome of Step 2

The investment analysis clearly demonstrates that the project activity is unlikely to be considered as a financially attractive course of action.

Step 3.Barrier analysis.

Not used.

Step 4. Common practice analysis

Step 4 of the *"Tool for the Demonstration and Assessment of Additionality (version 06.1.0)"* requires project proponents to undertake an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. This requires the identification of projects that are operational and are similar to the proposed project activity. The *"Tool for the Demonstration and Assessment of Additionality"* indicates that 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. The following stepwise approach is applied using data sourced from *"Central Electricity Authority: CO_2 Baseline database version 7.0*[10] which is the latest database available and covers the starting date of the project, and in reference to clarification CLA_TOOL_0015[11] as complete data for wind and solar plants are not publicly available in the Host Country. The following stepwise approach is applied.

***Step 1**: Calculate the applicable output range as ±50% of the design output or capacity of the proposed project activity.*

The following definition applies for common practice analysis applies:

- *Applicable Geographical Area:* Host Country, India
- *Applicable output range: The applicable output rage is considered between* 48 MW to 144 MW of designed/ installed capacity as the design output /installed capacity of project activity is 96 MW.

***Step 2:** In the applicable geographical area, identify all plants that deliver the same output or capacity, and using the same energy source/fuel, within the applicable output range calculated in Step1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number $N_{all,energy\ source}$. . Registered CDM Project activities and project activities undergoing validation shall not be included in this step. This is in accordance with request for clarification CLA_TOOL_0015 as data for wind and solar plants are not publicly available. The start date of the project is 14/6/2010, therefore all the plant that deliver the same output or capacity ,and using the same energy source/fuel have been considered up to the start date.*

[10] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm. This data is the latest data available at the time of validation (after Global Stakeholder Consultation process).

[11] CLA_TOOL_0015, http://cdm.unfccc.int/methodologies/PAmethodologies/tools-clarifications/30494

Table B3: Commissioned project with installed capacity between 48 MW to 144 MW

No	Name	Date of commissioning [12]	Capacity (MW) as on 31/03/2011	State	Sector[13]	Type
1	Pykara	11-Jun-54	58.95	Tamil Nadu	State	Hydro
2	Maithon	12-Dec-58	63.2	Jharkhand	Center	Hydro
3	Machkund	08-Aug-59	114.75	Andhra Pradesh	State	Hydro
4	Kotla	14-Jul-61	84.57	Punjab	Center	Hydro
5	Ganguwal	23-Jan-62	83.58	Punjab	Center	Hydro
6	Periyar	22-Dec-65	140	Tamil Nadu	State	Hydro
7	Gandhi Sagar	09-Nov-66	115	Madhya Pradesh	State	Hydro
8	Sholayar	14-May-68	54	Kerala	State	Hydro
9	Aliyar	21-Mar-70	60	Tamil Nadu	State	Hydro
10	Dhalipur	31-Mar-70	51	Uttarakhand	State	Hydro
11	Sholayar I&II	04-May-71	95	Tamil Nadu	State	Hydro
12	Kodayar-I&II	17-Nov-71	100	Tamil Nadu	State	Hydro
13	J.Sagar	18-May-73	99	Rajasthan	State	Hydro
14	Vaitarna	26-Jun-76	60	Maharashtra	State	Hydro
15	Giribata	30-Jun-78	60	Himachal	State	Hydro
16	Kyredemkulai	30-Mar-79	60	Meghalaya	State	Hydro
17	Lower Jhelum	08-Nov-79	105	Jammu & Kashmir	State	Hydro
18	Liganamakki	15-Mar-80	55	Karnataka	State	Hydro
19	Subernrekha I &II	18-Oct-80	130	Jharkhand	State	Hydro
20	Bassi	03-Feb-81	60	Himachal	State	Hydro
21	Chilla	08-Mar-81	144	Uttarakhand	State	Hydro
22	Shanan	31-Mar-82	110	Punjab	State	Hydro
23	Loktak	29-May-83	105	Manipur	Center	Hydro
24	Khodri	30-Mar-84	120	Uttarakhand	State	Hydro
25	Khandong	02-May-84	50	Meghalaya	Center	Hydro
26	Anandpur Sahib ST-I&II	31-May-85	134	Punjab	State	Hydro
27	Kalinadi Supa	09-Nov-85	100	Karnataka	State	Hydro

[12] Full commissioning date of designed/ installed capacity of the project.

[13]Sector refers to the entity developing the project.

a) Center means the Central Government,

b) State means the State Government and

c) PVT means Private entity.

No	Name	Date of commissioning [12]	Capacity (MW) as on 31/03/2011	State	Sector[13]	Type
28	Tillari	10-Oct-86	60	Maharashtra	State	Hydro
29	Idamalayar	28-Feb-87	75	Kerala	State	Hydro
30	Bhira Tail Race	29-Mar-88	80	Maharashtra	State	Hydro
31	Bargi	29-Nov-88	90	Madhya Pradesh	State	Hydro
32	Sanjay Bhaba	22-Jul-89	120	Himachal	State	Hydro
33	Lower Mettur	18-Sep-89	120	Tamil Nadu	State	Hydro
34	Mahi Bajaj I&II	27-Sep-89	140	Rajasthan	State	Hydro
35	N Sagar RBC &Extn.	10-Sep-90	90	Andhra Pradesh	State	Hydro
36	Panchet	08-Mar-91	80	Jharkhand	Center	Hydro
37	U.B.D.C. St.-I& II	29-Dec-91	91.35	Punjab	State	Hydro
38	Tanakpur	06-Apr-92	120	Uttarakhand	Center	Hydro
39	Obra	01-Jul-92	99	Uttar Pradesh	State	Hydro
40	Umiami,II&IV	16-Sep-92	114	Meghalaya	State	Hydro
41	N_Sagar LBC	27-Sep-92	60	Andhra Pradesh	State	Hydro
42	Khara	29-Dec-92	72	Uttar Pradesh	State	Hydro
43	Hasdeobango	06-Jan-95	120	Chattisgarh	State	Hydro
44	Rammam	28-Jan-96	50	West Bengal	State	Hydro
45	Kodasali	28-Aug-99	120	Karnataka	State	Hydro
46	Bhivpuri	24-Sep-99	75	Maharashtra	Pvt	Hydro
47	Teesta I-III	13-Oct-99	67.5	West Bengal	State	Hydro
48	Kakkad	13-Oct-99	50	Kerala	State	Hydro
49	Rangit-III	05-Feb-00	60	Sikkim	Center	Hydro
50	Doyang	08-Jul-00	75	Nagaland	Center	Hydro
51	Kuttiadi&Extn.	27-Jan-01	125	Kerala	State	Hydro
52	Malana	09-Jul-01	86	Himachal	Pvt	Hydro
53	Sengulam	05-Dec-01	48	Kerala	State	Hydro
54	Upper Sindh I& II	29-Mar-02	127.6	Jammu & Kashmir	State	Hydro
55	Bansagar (III)	02-Sep-02	60	Madhya Pradesh	State	Hydro
56	Jog	30-Oct-02	139.2	Karnataka	State	Hydro
57	Khopoli	25-Mar-03	72	Maharashtra	Pvt	Hydro
58	WY.Canal A –D	20-Apr-04	62.4	Haryana	State	Hydro
59	Largi	27-Dec-06	126	Himachal	State	Hydro
60	Karbi Langpi	20-Mar-07	100	Assam	State	Hydro

Source: *Central Electricity Authority: CO_2 Baseline database version 7.0*

With CDM projects and project activity undergoing validation excluded, therefore, $N_{all} = 60$

Step 3: *Within the plants identified in Step2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number $N_{diff,energysource}$. $N_{diff,energy\ source}$ represents the number of plants that use the same energy source/fuel with the proposed CDM project activity, but apply different 'technologies'.*

a) *Investment climate:* Project developed in the private sector, and started after 2003.

The project activity is established pursuant to the enactment of Electricity Act 2003 by a private entity. The investment risks associated with the private sector entities are higher than the public entities (state and central government) due to different access to capital, lower cost of funds, investment criteria, and government guarantees. Also, the central and state governments have additional drivers for the development of projects, such as ensuring the reliable supply of the electricity to the community[14]. The Electricity Act 2003 established by the Central Electricity Authority under the Ministry of Power, Regulatory Commissions and an Appellate Tribunal consolidates the laws relating to the generation, transmission, distribution, trading and use of electricity. The Electricity Act came in India in 2003[15] and CERC Tariff Regulation was published in 2004. In the period prior to 2003, tariffs were considered on project to project basis and later on when CERC Tariff Regulations came into force in 2004, it detailed procedure to compute a regulated tariff based on annual fixed operating costs. Due to extensive change in the investment climate and regulatory landscape, projects commissioned prior to 2003 are considered as N_{diff}. Fifty Nine (59) hydro power plants commissioned prior to year 2003 are considered of different investment climate that was not based on competitive market conditions, and therefore excluded from this analysis. Out of 60 projects, Three (3) of the hydro power plants are developed by non-private entity (Central and State Government) subsequent to year 2003 as detailed in Table B.4 below.

[14] http://www.powermin.nic.in/whats_new/national_electricity_policy.htm

[15] http://www.powermin.nic.in/acts_notification/electricity_act2003/preliminary.htm

Table B.4: Commissioned Projects that apply different technology

No	Name	Date of commissioning[16]	Sector[17]	Energy Source
1	Pykara	11-Jun-54	State	Hydro
2	Maithon	12-Dec-58	Center	Hydro
3	Machkund	08-Aug-59	State	Hydro
4	Kotla	14-Jul-61	Center	Hydro
5	Ganguwal	23-Jan-62	Center	Hydro
6	Periyar	22-Dec-65	State	Hydro
7	Gandhi Sagar	09-Nov-66	State	Hydro
8	Sholayar	14-May-68	State	Hydro
9	Aliyar	21-Mar-70	State	Hydro
10	Dhalipur	31-Mar-70	State	Hydro
11	Sholayar I&II	04-May-71	State	Hydro
12	Kodayar-i&II	17-Nov-71	State	Hydro
13	J.Sagar	18-May-73	State	Hydro
14	Vaitarna	26-Jun-76	State	Hydro
15	Giribata	30-Jun-78	State	Hydro
16	Kyredemkulai	30-Mar-79	State	Hydro
17	Lower Jhelum	08-Nov-79	State	Hydro
18	Liganamakki	15-Mar-80	State	Hydro
19	Subernrekha I&II	18-Oct-80	State	Hydro
20	Bassi	03-Feb-81	State	Hydro
21	Chilla	08-Mar-81	State	Hydro
22	Shanan	31-Mar-82	State	Hydro
23	Loktak	29-May-83	Center	Hydro
24	Khodri	30-Mar-84	State	Hydro
25	Khandong	02-May-84	Center	Hydro
26	Anandpur Sahib ST-I&II	31-May-85	State	Hydro
27	KalinadiSupa	09-Nov-85	State	Hydro
28	Tillari	10-Oct-86	State	Hydro
29	Idamalayar	28-Feb-87	State	Hydro
30	Bhira Tail Race	29-Mar-88	State	Hydro
31	Bargi	29-Nov-88	State	Hydro

[16] Full commissioning date of designed/ installed capacity of the project

[17] Sector refers to the entity developing the project.

d) Center means the Central Government,

e) State means the State Government and

f) PVT means Private entity.

No	Name	Date of commissioning[16]	Sector[17]	Energy Source
32	Sanjay Bhaba	22-Jul-89	State	Hydro
33	Lower Mettur	18-Sep-89	State	Hydro
34	Mahi Bajaj I&II	27-Sep-89	State	Hydro
35	N_Sagar RBC &Extn.	10-Sep-90	State	Hydro
36	Panchet	08-Mar-91	Center	Hydro
37	U.B.D.C. St.-I& II	29-Dec-91	State	Hydro
38	Tanakpur	06-Apr-92	Center	Hydro
39	Obra	01-Jul-92	State	Hydro
40	Umiami,II&IV	16-Sep-92	State	Hydro
41	N_Sagar LBC	27-Sep-92	State	Hydro
42	Khara	29-Dec-92	State	Hydro
43	Hasdeobango	06-Jan-95	State	Hydro
44	Rammam	28-Jan-96	State	Hydro
45	Kodasali	28-Aug-99	State	Hydro
46	Bhivpuri	24-Sep-99	Pvt	Hydro
47	Teesta I-III	13-Oct-99	State	Hydro
48	Kakkad	13-Oct-99	State	Hydro
49	Rangit-III	05-Feb-00	Center	Hydro
50	Doyang	08-Jul-00	Center	Hydro
51	Kuttiadi&Extn.	27-Jan-01	State	Hydro
52	Malana	09-Jul-01	Pvt	Hydro
53	Sengulam	05-Dec-01	State	Hydro
54	Upper Sindh I & II	29-Mar-02	State	Hydro
55	Bansagar (III)	02-Sep-02	State	Hydro
56	Jog	30-Oct-02	State	Hydro
57	WY.Canal A –D	20-Apr-04	State	Hydro
58	Largi	27-Dec-06	State	Hydro
59	KarbiLangpi	20-Mar-07	State	Hydro

Thus, only one hydro power plant, Khopuli 72MW is similar to the proposed project activity
Therefore, N_{diff} = 59

Step 4: *Calculate factor $F_{energy\ source} = 1-N_{diff,energy\ source}/ N_{all,energy\ source}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity and use the same energy source /fuel as the proposed project activity.*

$F_{energy\ source}$ $= 1-N_{diff,energy\ source}/ N_{all,energy\ source}$
$= 1 – (59/60)$
$= 0.017$
And $= N_{all,energy\ source} – N_{diff,energy\ source}$

= 60 - 59 **= 1**

If it can be demonstrated that 1- $N_{diff,energy\ source}/N_{all,energy\ source}$ <= 0.2 (i.e. within the plants using the same energy source, the number of plants applying the same technology with the project is no more than 20%) or $N_{all,energy\ source}$ - $N_{diff,energy\ source}$ <= 3, then certainly 1 – N_{diff}/N_{all} <= 0.2 or N_{all}-N_{diff} <=3, justifying the conclusion that the proposed CDM project activity is not common practice following the requirements in the Additionality Tool and 'CLA_TOOL_0015' as follows:

The proposed project is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) The factor F is greater than 0.2, and

(b) $N_{all} - N_{diff}$ is greater than 3.

On this grounds, it can be clearly demonstrated that both conditions above for "common practice" are not fulfilled where $N_{all,energy\ source} - N_{diff,energy\ source}$ =1 (which is less than 3) and $F_{energy\ source}$=0.017 (which is less than 0.2). Thus, the development of the Rongnichu Hydroelectric Project is deemed not common practice in India and it is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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In accordance with ACM0002, the emission reductions attributable to the project during any given year *y* are calculated as the difference between the Baseline Emissions BE_y, the Project Emissions PE_y and the Leakage LE_y, in that year. This section outlines the step-wise methodology used to determine the emission reductions utilising the *"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1; EB 63, Annex 19)" to determine the required emissions factors.

Baseline Emissions

As per methodology ACM0002, the baseline emissions are calculated using the following formula:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

BE_y is the baseline emissions in year *y* (tCO2/yr)

$EG_{PJ,y}$ is the 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)

$EF_{grid,CM,y}$ is the 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)

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity then:

$$EG_{PJ,y} = EG_{facility,y},$$

Where:

$EG_{PJ,y}$ is the 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)

$EG_{facility,y}$ is the quantity of net electricity generation supplied by the proposed project activity to the grid in year y (MWh/yr).

Calculation of the Combined Margin CO_2 emission factor

The data used for the calculation of the baseline emission factor was obtained from the baseline calculations published by the CEA, *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*[18], which uses ACM0002. This was the most recent data at the time the PDD was submitted to the DOE for validation. The relevant parts of the calculations are referenced in the methodology outlined below, with detailed data provided in Annex 3. A complete explanation of the assumptions employed by the CEA can be obtained from the *CO_2 Baseline Database for the Indian Power Sector User Guide - Version 5.0*.

Step 1 Identify the relevant electric power system

The spatial extent of the proposed project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

[18] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Due to significant changes in the grid structure, the Indian electricity system is now divided into two grids, the new integrated Northern, Eastern, Western, North-Eastern regional grid (NEWNE) and Sothern Regional grid. Historically, the Indian Power system was divided into five independent regional grids, namely, Northern Eastern, Western, Sothern, and North-Eastern. Each grid covers several states (see Table B5). All regional grids except the Southern-Grid have been integrated and are operating in synchronous mode i.e. at the same frequency. The power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in regional grid meets their demand with their own generation facilities and also with allocation from power plants owned by the central sector (such as NTPC, NEEPCO and NHPC etc). Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. There are also small exchanges in the form cross-border imports and exports.

Table B5: Geographical Scope of the Five Regional Electricity Grids

NEWNE Grid				**Southern Grid**
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryyana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar and Nagar Haveli	Meghalya	Tamil Nadu
Jammu &Kashmir	**Sikkim***	Madhya Pradesh	Mizoram	Pondicherry
Punjab	Andaman-Nicobar	Maharastra	Nagaland	Lakshadweep
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

*Location of project activity

For the purpose of determining the emission reduction achieved by the CDM Project, the *"Tool to calculate the emission factor for an electricity system"* states that the" project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints". On this basis the CEA, *Baseline Carbon Dioxide Emissions from Power Sector-Version 5.0* defines the project electricity systems within India as each of the two girds. This is justified " as electricity continues to be produced and consumed largely within the same region, as is evidenced by the relatively small volume of net transfer between the regions, and consequently it is appropriate to assume that the impacts of CDM project will be continued to the regional grid in which it is located[19].

The project activity is located in Sikkim state and is therefore as per the CEA's grid definitions it is within the NEWNE grid. The NEWNE grid is controlled by the Regional Load Dispatch Centre (RLDC).

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

Project proponent may choose between two options given below to calculate the Operating Margin and Build Margin emission factor:

[19] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Option I: Only grid power plants are included in the calculation
Option II: Both grid power and off-grid power plants included in the calculation

Only grid connected power plants are included in the calculation, as per Option I of the *"Tool to calculate the emission factor for an electricity system"*

Step 3 – Select a method to determine the Operating Margin (OM)

The *"Tool to calculate the emission factor for an electricity system"* provides four options for calculating the Operating Margin. For the proposed project activity the information required to conduct a "Dispatch Data Analysis Operating Margin" and "Simple Adjusted Operating Margin" cannot currently be applied is India due to lack of necessary data[20]. Therefore, option (a), simple Operating Margin, has been selected.

The Simple Operating Margin can only be used where low-cost/must run resources constitute less than 50% of total generation in the NEWNE grid in either the average of the five most recent years or based on long-term normals for hydroelectricity production.

In accordance with the CEA baseline calculations hydro and nuclear generation qualify as low-cost/must-run sources. Their share of the total generation of the northern regional grid over the last three years is shown in Table B6. As the data indicates low cost/must run resources constitute an average of 18.26 % of total generation and thus the simple Operating Margin method can be used.

Table B6: Share of Must-Run(Hydro/Nuclear) (% of Net Generation)

	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
NEWNE Grid			18.0%	18.5%	19.0%	17.3%
3 Year Average	18.26 %					

1. *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*

Prior to 2006, the grid delineations were on the basis of separate regions, the average is only calculated on the basis of three years. However, in both 2003-04 and 2004-05, the share of low/cost must run generation on the northern grid, to which the project exports electricity, was 28.1% and 26.8%[21]respectively. This therefore indicates that the simple Operating Margin is appropriate.

The project proponents has chosen an *ex ante* option for calculation of the OM with a three years generation weighted average, based on most recent data available at the time of submission of CDM – PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period.

Step 4 – Calculate the Operating Margin Emission Factor according to selected methodology

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low cost / must-run power plants / units. It will be calculated according to Option B as:

[20] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[21] Baseline Carbon Dioxide Emission Database Version 3.0 http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

(a) The necessary data for Option A is not available
(b) Only nuclear and renewable power generation are considered as low cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off grid power plants are not included in the calculation

Option B is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low cost/must-run power plants, and the fuel types and total fuel consumption of the project electricity system as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} \right)}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y(tCO2/MWh)
$FC_{i,y}$ is the amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/ mass or volume unit)
$EF_{CO2,i,y}$ is CO_2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)
EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i is all fossil fuel types combusted in power sources in the project electricity system in year *y*
y is the relevant year as per the data vintage chosen in Step 3

The simple Operating Margin emission factor is calculated *ex ante*, based on generation data from 2006-07, 2007-08 and 2008-09, which, in accordance with *"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1, EB 63, Annex 19), are the most recent three years for which data is available at the time of PDD submission (detailed data is provided in Annex 3). The Operating Margin calculation is provided below;

Most recent three years	2006-07	2007-08	2008-09
Net Generation (NEWNE) in MWh	379470597	401641585	421802632
Operating margin* (OM) in tCO2e/MWh	1.008	0.999	1.006
Recent three year weighted average Simple Operating Margin tCO_2/MWh)	1.005		

*including imports

The Simple Operating Margin is fixed for the entire crediting period.

The values used for the calculation of calorific values for each fuel type, and the fuel oxidization factors, are the assumed values used in the CEA baseline calculations (detailed data is provided in Annex 3).

The *"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1, EB 63, Annex 19) specifies that for the purpose of determining the operating margin emission factor net electricity imports from a connected electricity system located in the same host country must be included as power sources.

Step 5- Calculate the build margin (BM) Emission Factor

The *"Tool to calculate the emission factor for an electricity system"* provides two options with regards to the vintage of data used for calculating the build margin for the project activity. In this case option 1 has been chosen (i.e. calculate the build margin emission factor *ex-ante* based on the most recent information available on plants already built for the sample group (m) at the time of PDD submission to the DOE for validation)[22]. This option does not require the emission factor to be monitored during the crediting period.

According to "Tool to calculate the emission factor for an electricity system" the sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

[22]For the second crediting period, the build margin emission factor is required to be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period is required to be used.

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

The corresponding values of procedure (a) and (b) above for the NEWNE electricity grid are indicated in Table B.6. As demonstrated, the build margin sample group (SET_{sample}) is sample group $SET_{\geq 20\%}$ shown in procedure (b) as it results in the larger annual generation compared to the sample group of five power units that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$). Using CEA's *Baseline Carbon Dioxide Emissions from Power Sector - Version 6.0* data, all the power plant units in SET_{sample} started to supply electricity to the grid not more than 10 years ago.

Table B.8: Build margin power unit sample group selection

(a)	5 most recently built power units, $SET_{5\text{-}units}$	5,659	GWh
(b)	20% of system generation, $SET_{\geq 20\%}$	101,955	GWh
Total	NEWNE national electricity grid, AEG_{total}	509,776	GWh

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power plant units *m* during the most recent year *y* for which power generation data is available at the time of preparing the PDD.

The Build Margin is calculated as:

$$EFgrid,_{BM,\,y} = \frac{\sum_{m} EG_{,\,m,\,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m\,\,y}}$$

Where:

$EF_{grid,BM,y}$ is Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh)
y is most recent historical year for which power generation data is available

Build Margin emission factor is determined as below:

Build Margin (tCO_2/MWh) (not adjusted for imports)	**Year 2008-09**
Build Margin (BM) in tCO_2/ MWh	0.675

Step 6. Calculate the combine margin emission factor

The combined margin emissions factor is calculated as:

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

Where:

$EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ is the operating margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM} is the operating margin weight, which is 0.5 by default;
W_{BM} is the build margin weight, which is 0.5 by default;

Combined Margin (CM) in tCO_2/ MWh, $EF_{grid,CM,y}$	**0.841**

Project Emissions

The project emission will be calculated using following formula;

$PEy = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$

Where:

PE_y	= Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	= Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	= Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

Project emissions from fossil fuel consumption ($PE_{FF,y}$)

The project activity is not a geothermal or solar thermal project, and does not use fossil fuels for electricity generationCO_2emissions from the combustion of fossil fuels for the backup or emergency purposes (e.g. diesel generators)are not accounted for as project emissions in accordance with the methodology. $PE_{FF,y} = 0$.

Project emissions from the operation of geothermal power plants ($PE_{GP,y}$)

The proposed project activity is not a geothermal power plant. On this basis $PE_{GP,y} = 0$.

Project emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

The project has an installed capacity of 96 MW and a reservoir water surface area of 107,810 $m^{2.}$.

The power density calculated as :

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

Where:

PD	=	Power density of the project activity (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 single or multiple reservoirs 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 single or multiple reservoirs 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 project involves a new reservoir, Cap_{BL} and A_{BL} is zero.

PD = 96000000 – 0 / 107,810 – 0

PD = 890 W/m^2

This equates to a power density of 890 W/m^2which is greater than 10W/m^2.

On this basis, $PE_{HP,y} = 0$.

For the water density to reach 10W/m^2, the surface area of the reservoir needs to increase 89.7 times to 9,597,900 m^2 from 107,000 m^2, which is physically and legally impossible to happen, therefore the ex-ante value is appropriate to apply ex-post.

Total Project emissions

$PE_y = 0$

Leakage

Based on the methodology, no leakage emissions are considered. 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 and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

Combustion of diesel by the diesel generators (2 x 250kVA) during start-up or emergencies is negligible and not a main emission source according to the methodology (<1% of baseline emissions).

Thus $L_y = 0$

Emission Reductions

In accordance with ACM0002, the emission reductions attributable to the project are calculated using the formula:

$$ER_y = BE_y - PE_y - L_y$$

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

Data / Parameter:	**$EF_{grid,OM\ simple,\ y}$**
Data unit:	tCO_2/MWh
Description:	Simple Operating Margin Emission Factor for the NEWNE grid
Source of data used:	CEA's *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*
Value applied:	1.005
Justification of the choice of data or description of measurement methods and procedures actually applied :	The simple OM emission factor ($EF_{OM,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the grid, not including low-operating cost and must-run power plants. The value is the three year average 2006-2007, 2007-2008-and 2008-2009. Data obtained from "*Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0"* published by the CEA.
Any comment:	

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	CEA's *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*
Source of data used:	0.675
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	The BM emission factor ($EF_{BM,y}$) is calculated as the emissions per electricity unit (tCO_2/MWh) of the power plant capacity additions that comprise of 20% of the system generation for the period 2008-2009. Data obtained from "*Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0"* published by the CEA.
Any comment:	

Data / Parameter:	**$EF_{grid,CM,y}$ (equal to EF_{CO2})**
Data unit:	tCO_2/MWh
Description:	Baseline Emission Factor for the northern regional grid
Source of data used:	CEA's *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*
Value applied:	0.841
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline emission factor is calculated as the weighted sum of the simple OM emission factor and the BM emission factor in accordance with the Tool to calculate the emission factor for an electricity system . By default, both margins have equal weights (50%). Data obtained from "*Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0"* published by the CEA.
Any comment:	

Data / Parameter:	CAP_{BL}
Data unit:	W
Description:	Installed capacity of the hydropower plant before the implementation of the project activity. For new hydropower plants the value is zero.
Source of data to be used:	-
Value of data applied :	0
Justification of the choice of data or description of measurement methods and procedures actually applied:	The proposed CDM project activity involves a new hydropower station and hence CAP_{BL} is zero.
Any comment:	

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	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
Source of data to be used:	-
Value of data applied :	0
Justification of the choice of data or description of measurement methods and procedures actually applied:	The proposed CDM project activity involves a new reservoir and hence A_{BL} is zero.
Any comment:	

Data / Parameter:	CAP_{PJ}
Data unit:	W
Description:	Installed capacity of the hydropower plant (project activity)
Source of data to be used:	DPR
Value of data applied :	96
Justification of the choice of data or description of measurement methods and procedures actually applied:	The proposed CDM project activity has an installed capacity of 96MW (48 MW x 2)
Any comment:	The installed capacity of the project is fixed

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir during implementation of the project activity, when the reservoir is full (m^2).
Source of data to be used:	Feasibility Study
Value of data applied :	107,000
Justification of the choice of data or description of measurement methods and procedures actually applied:	The maximum reservoir area of the project activity is 1,133,000 m^2
Any comment:	This value is the maximum surface area of the reservoir

B.6.3. Ex-ante calculation of emission reductions:

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Baseline Emissions

As described in section B.6.1 as per methodology ACM0002 (Version 13.0.0, EB 67, Annex 13), the baseline emissions are calculated using the following formula:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$

Where:

$EG_{PJ,y} = EG_{facility,y}$,

Using above formula the baseline emission calculated as below;

$EG_{PJ,y} = EG_{facility,y}$ = 380,159 MWh

$EF_{grid,CM,y}$ = 0.841 tCO_2e/MWh

BE_y = 380,159 MWh * 0.841 tCO_2e/MWh

BE_y = 319,713 tCO_2e (rounddown)

Project Emissions

As stated in Section B.6.1, $PE_y = 0$

Leakage

As stated in Section B.6.1, $L_y = 0$

Emission Reductions

In accordance with ACM0002, the emission reductions attributable to the project are calculated using the formula*:*

$ER_y = BE_y - PE_y - L_y$

ER_y = 319,560 tCO2e – 0– 0

ER_y = 319,713 tCO2e

The ex-ante emission reductions were calculated using the steps described in Section B.6.1 and the data parameters described in Section B.6.2. The baseline emissions for the first crediting period are outlined in Table B9 below;

Table B9: Baseline Emissions Factors and Baseline Emissions during the first crediting period

Electricity Generated Emissions Reductions	Per Year	Crediting Period (7 years)
Simple Operating Margin Emission Factor ($EF_{grid,OM,y}$ in tCO_2/MWh)	1.005	-
Build Margin Emissions Factor ($EF_{grid,BM,y}$ in tCO_2/MWh)	0.675	-

Combined margin Emissions Factor ($EF_{grid,CM,y}$ in tCO_2/MWh)	0.841	-
Electricity generated by Project ($EG_{facility,}$ in MWh)	380,159	26,661,114
Baseline Emissions (*BEy*, in tCO_2)	**319,773**	**2,237,991**

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

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A summary of the estimated ex-ante emission reduction for the crediting period is provided in Table B9:

Table B9: Ex-ante Emission Reductions for the Crediting Period

Year	Estimation of Project activity Emission reductions (tonnes of CO_2e)	Estimation of baseline emission reductions (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of emission reductions (tonnes of CO2 e)
2014	0	319,713	0	319,713
2015	0	319,713	0	319,713
2016	0	319,713	0	319,713
2017	0	319,713	0	319,713
2018	0	319,713	0	319,713
2019	0	319,713	0	319,713
2020	0	319,713	0	319,713
Total	0	2,237,991	0	2,237,991

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{facility,y}$**
Data unit:	MWh
Description:	Net Electricity Supplied to the Grid by the Project activity
Source of data to be used:	Metered on site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	380,159
Description of measurement methods and procedures to be applied:	The electricity will be measured continuously and reported monthly. It will be metered using state-of-the-art sealed and tested meters. The metering system will comprise of main meters and check meters. The main meters will record the net electricity export/import to/from the grid. The metered data from main meters will be used for accounting and billing of electricity. The net metered electricity generation data will be used to calculate and monitor the greenhouse

	gas emission reductions from the proposed project activity. The data from check meter shall be used for monitoring and transaction purposes in case of failure of main meters. Any additional power imports, if any, such as from a distribution grid, will be similarly measured with calibrated electricity meters.
QA/QC procedures to be applied:	All meter data will be stored in electronic and paper formats as specified in the monitoring plan. The measurements results will be crosschecked with the records for sold electricity.
Any comment:	Further details of the data collection, recording and storage procedures and the QA/QC procedures are contained in the Monitoring Plan, in Section B7.2

B.7.2. Description of the monitoring plan:

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The purpose of the monitoring plan is to ensure that the required data is accurately monitored and recorded to enable the calculation of the emission reductions achieved by the project.

Operational and Management Structure

Madhya Bharat Power Corporation Ltd. (MBPCL) proposes to appoint a CDM Management Team with the responsibility of overseeing the collection, recording and storage of the data required to calculate and monitor the greenhouse gas emission reductions from the project activity. The data that is required to be monitored is described in detail in Section B7.1. The team consists of three key positions and will be supported by the company's Quality Assurance Officer. An outline of responsibilities and reporting function of each of these key positions are contained in Table B10. The specific monitoring provisions are described in more detail following the table.

Table B10 CDM Management Team

Position	Outline of Responsibilities	Reporting
CDM Monitoring Officer	• Overseas the collection, recording and storage of data. • Reviews the monitoring reports prepared and investigates any irregularities. • Ensures on-going compliance with the CDM monitoring plan. • Supervises meter calibration requirements • Prepares biannual Emission Reduction Report • Prepares Baseline Emission Factor report at the end of each crediting period • Conducts training programs	Reports to the General Manager (Projects).
Site Supervisor	• Responsible for the completeness and reliability of the data. • Responsible for carrying out meter calibration. • Calculates Emission Reductions. • Generates quarterly metered net electricity generation data reports.	Reports to the CDM Monitoring Officer.
Shift Supervisor	• Responsible for monitoring net electricity supplied to the grid, calculating emission reductions, and ensuring that	Reports to the Site Supervisor.

(Shift Based)	meters are functioning correctly.	
Quality Assurance Officer	• Ensures compliance with Company Quality Assurance Procedures.	Reports to the General Manager (Projects).

Monitoring Provisions

Training

All persons that form part of this CDM Project Team shall receive appropriate training. The training will provide an overview of the CDM and cover all elements of the monitoring plan in detail. A copy of the project monitoring plan will be distributed to all of the CDM Project Team during the training, and an additional copy will be easily accessible at appropriate locations on site.

Specific Data Monitoring Procedures

Installation of the Meters: The electricity will be monitored through state-of-the-art sealed and tested meters. The metering system will comprise of two sets of meters. The main meter and check meter. The main meters will record the net electricity export/import to/from the grid. The data from check meter will be used to calculate the net electricity export to the gird in case of failure of main meter. The accuracy class of electricity meters shall be as defined in the Central Electricity Authority (Installation and Operation of meters) regulation, 2006.

Calibration of Meters: The calibration and maintenance of meters will be carried out as per the PPA, or relevant statutory requirements. The CDM Monitoring Officer will ensure that a manufacturer's test certificate accompanies all purchased meters. Meters will be calibrated prior to synchronization of the project and then recalibrated from time to time. The accuracy class of active electricity measurement shall be as defined as per Central Electricity Authority (Installation and Operation of Meters) regulation 2006/ or in applicable IEC/Indian Standards. A report summarising meter calibration requirements will be prepared by the CDM Monitoring Officer on project commissioning, and updated with each recalibration.

Metered Net Electricity Export Data: Metered net electricity export data will be measured continuously. A quarterly report of metered net electricity export data will be generated by the Site Supervisor, and saved in electronic and paper form. The quarterly report will be generated using a template, approved by the CDM Monitoring Officer, to ensure that the data is reported consistently and can be compared to previous months. The CDM Monitoring Officer will review this report and cross check the data against the invoices for the quantity of electricity exported to grid. Any irregularities will be investigated as described below in "Review of Reports and Treatment of Uncertainty".

Emission Reductions: Emission reductions will be calculated using the project and baseline emission data. Emission reductions occurring as a result of the project activity will be summarized in a biannual report that will be prepared by the Site Supervisor. The report will be generated using a template, approved by the CDM Monitoring Officer, to ensure that the data is reported consistently and can be compared to previous quarters. The biannual report will be reviewed by the CDM Monitoring Officer and submitted to the General Manager (Projects).

Updating the Baseline Emission Factor: The baseline emission factor will be updated at the end of the each crediting period through reference to data supplied by the CEA. If this data is unavailable the baseline emission factor will be calculated in accordance with ACM0002 and the methodology stipulated

in A6.1. A report summarizing this information will be prepared at the end of each crediting period by the CDM Monitoring Officer. The report will be submitted to the General Manager (Projects).

Emergency Preparedness: The project has the necessary provisions for emergency preparedness to deal with any unforeseen events such as fire or an electrical blackout. These provisions include installed fire fighting systems, and standby features for critical items. No sources of significant unintended emissions are foreseen for the project activity.

In the event that the main meter, which is used to record the net electricity exported by the project, is found to be faulty it will be repaired or replaced and the data from the check meter will be used in its place. In the unlikely event that the check meter fails it will also be repaired or replace immediately. In the event of meter failure, the details will be recorded by the Site Supervisor and summarized in a discrete section of the Emission Reductions biannual report.

Reporting

A summary of the monitoring reports is contained in Table B11. All reports will be reviewed by the CDM Monitoring Officer and then sent to MBPCL's General Manager (Projects) for review and acceptance.

Table B11 Monitoring Reports

Report	Responsibility	Frequency
Meter Calibration Report	CDM Monitoring Officer	At project commissioning and updated with each recalibration.
Metered Net Electricity Export Data	Site Supervisor	Quarterly
Emission Reductions	Site Supervisor	Biannual
Baseline Emission Factor	CDM Monitoring Officer	End of each crediting period
Emergency Report: Meter Failure	Site Supervisor	As required

Record Storage

A paper copy of all documentation will be stored in a secure area within the site head office. All reports will be signed and date stamped after review by the CDM Monitoring Officer, prior to being filed in storage. All electronic reports will be backed-up on a monthly basis and sent to MBPCL's Head Office. All archived data will be kept until two years after the last issuance of CERs for this project.
The documents that will be stored include:

- Manufacturer's test certificate accompanies and meter calibration reports
- Quarterly report of metered net electricity generation
- Biannual report of emission reductions
- Biannual internal audit reports
- Baseline emission factor reports at the end of each crediting period

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

Date of completion of the Baseline Study: 10/04/2010

Details of the person/entity determining the baseline:

Contact Person	:	Mr. Jitendra Mohan Singh
Company Name	:	Perenia Pty Ltd
Mobile Number	:	+91 9899794142
E-mail Address	:	jitendra.singh@pereniacarbon.com
Contact Address		
Head Office	:	5th Floor, DLF Building No.8, Tower C DLF Cyber City, Phase-II Gurgaon-122002
Telephone Number	:	+91 124-450 1100
Fax Number	:	+91 124-438 0043

The entity determining the baseline study and the monitoring methodology is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
14/06/2010 (date of contract agreement for civil works)

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

>>
35 years

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

C.2.1. Renewable crediting period:

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

>>
01/01/2014 (or after registration of project whichever comes later)

C.2.1.2. Length of the first crediting period:

>>
7 years, 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not Applicable

C.2.2.2. Length:

>>
Not Applicable

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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The project required approval from the Ministry of Environment and Forests (MoEF), under the *Environmental (Protection) Act 1986.* As part of the approval process, a comprehensive environmental assessment of the Project was prepared in accordance with the requirements of MoEF.

Relevant documents submitted to MoEF include:

- EIA and EMP Study Report
- Catchment Area Treatment Plan

A copy of the EIA Study Report is available upon request from State Pollution Control Board, Department of Forest, Environment & Wildlife Management, Govt. of Sikkim.

Consent to establish the Rongnichu Hydroelectric Project under Air (Prevention & Control of Pollution) Act.196, and Water (Prevention & Control of Pollution) Act. 1974, was obtained from the State Pollution Control Board, Department of Forest, Environment & Wildlife Management, Government of Sikkim on November 12,2008.

The Environmental Clearance was obtained from the MoEF on April 04, 2007.

The environmental impacts due to the implementation of project activity are described below;

i. Habitat Disturbance, Degradation, Fragmentation and Destruction due to Acquisition of land

A total of 38.0443 Ha of land has been acquired for construction of project activity, out of which 0.06 ha Government land, 14.753 ha Private land and 23.2313 ha Forest land. In addition approximately 7 ha of Private land is being taken on lease for construction facilities such as installation of construction equipment, camps, stores, offices etc. required during the construction period of the project. . The areas do not comprise of, encroach on or border with any biosphere reserves or national parks. The area does not have any mineral deposits; there are no human settlements in the submerged area. The forest areas proposed to be acquired do not constitute critical habitat for any plant or animal species. There are no endangered species present on or around the project site. Hence, no major impact on any species or its habitat is expected. Minor disruption to the habitats of local flora and fauna will be caused due to the proposed project activity. However, a proper Biodiversity Management Plan and Afforestation Plan have been designed and shall be implemented by the project proponent.

ii. Impact of Aquatic Environment and Fisheries

The proposed barrage on Rongnichu is expected to change the habitat conditions in the stretch immediately downstream of the barrage site by reducing the flow to below average levels during the lean season. In order to maintain the river ecosystem, the project authority will release 10 % (0.3 cumec) environmental discharge during the lean season. No migratory or endangered species of fish are found in the Rongnichu River.

The RHEP would result in some disruption of fish breeding grounds, hampering of upstream movement of fish and reducing fish production on the flood plains. To counter this, a comprehensive fisheries development plan has been prepared.

iii. Air Quality

The construction of road, increase in vehicular traffic, drilling activities, and construction of project works are likely to increase level of suspended particulate matter, NOx, SOx and CO, which may contribute to slight deterioration of ambient air quality. Dust suppression system will be employed to minimise dust pollution. Proper maintenance of vehicles and use of good quality fuels will be ensured to further reduce air pollution and noise. Air quality impacts are minor and limited to the construction stage. After construction, the quality will improve considerable due to the greenbelt, landscaping etc.

iv. Water Quality

Construction activities may contribute to marginal negative impacts on water quality parameters such as colour, turbidity, etc. In order to avoid any substantial deterioration in water quality and subsequent changes in the aquatic biota, the project authority has proposed the installation of proper sewage disposal systems in and around various labor colonies to check the discharge of waste and refuse into river. Once the works are completed, water quality will quickly return to its original state.

v. Noise Quality

The proposed project activities like drilling operation, blasting operation, vehicular traffic etc activities may result in increase in noise levels in the area. This impact is minor and limited during construction period phase only.

vi. Geology and Seismicity

The geology of the project area has been studied by the EIA consultant. The study from the seismic data revealed that the Sikkim region lies within the ambit of the Seismic Zone –IV on the seismic zone map of India (I.S. code 1893-1984/1998/2000). The data on earthquakes occurred in Sikkim indicates that the area is venerable to earthquakes frequently. Engineering designers have taken full account of the risk of seismic activity on the proposed project activity and suitably strengthened all relevant structures.

vii. Socio-Economic Impacts

The project proponent has conducted a Socio-economic Impacts study of the project activity. A survey of public perceptions was carried out in the vicinity of the proposed project. It included directly affected and indirectly affected people of the area. The survey shows that local people are aware about the power project and most residing in the vicinity of proposed project showed their willingness to accept the construction of the RHEP.

A total of 76 families are partially affected by various aspects of the proposed project activity. About 28.039 ha private land will be impacted by the project activities directly or indirectly. Of this land, 14.325 ha would be acquired permanently and 13.714 ha are to be acquired on lease. None of the households affected will be rendered landless or displaced.

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:

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The Environmental Impact Assessment was conducted as per EIA notification 1994 and 2006. The EIA Study Report identifies several environmental impacts associated with the project. Each of these impacts is addressed in the EMP for the Project which is contained within the EIA Report. The EMP was developed in consultation with the various state government agencies such as Sikkim Power Corporation, Sikkim Pollution Control Board, Fisheries Department, Power and Water Supply Department, Horticultural Department and MBPCL. A Catchment Area Treatment (CAT) Plan has also been developed and is contained within the EIA and EMP Report.

Measures to mitigate the environmental Impacts that were identified in the EIA have been addressed in the environmental Management plan (EMP). Adequate funds have been allocated by the project developer to implement these measures, a summary of which is outlined below.

(i) Biodiversity conservation and Management

The proposed project aims to mitigate any potential disturbance or pressure on land and biological resources and ensure conservation and preservation of natural ecosystems. The conservation policies and plans for the State are administered by the Department of Forests and Wildlife. The Project Developer will allocate funding to the Department of Forests and Wildlife to manage and execute biodiversity conservation issues associated with the Project.

A Board, chaired by the Principal Chief Conservator of Forests, Sikkim, shall govern conservation work related to the RHEP. It shall include appropriate representation from the State Forest Department, Ecologists/Conservationists and local NGOs. The main responsibilities of the board will be to define a conservation area, monitor and enforce regulatory provisions relating to the protection of this area and ensure that the natural ecosystems not significantly altered or subjected to any serious threats.

Documentation of the existing biological diversity in the area (flora/fauna surveys) will be carried out and special attention will be paid to the prevention of overexploitation of forest resources. The inhabitants of the area will be encouraged to adopt sustainable forest conservation practices. This will ensure that the habitat is protected and will minimise the disruption, disturbance and fragmentation of wildlife habitats. South and West Sikkim Forest Divisions are rich in a variety of medicinal plants and in order to augment the natural stock of medicinal plants in the forests, it is proposed to take up planting of medicinal plants and establish a medicinal plants nursery.

(ii) Action Plan for Catchment Area Treatment Plan

The terrain of the area the Rongni Chu catchment is susceptible to erosion and landslides. Project-related construction activities have the potential to accentuate natural erosion processes, and may also trigger minor landslides.

The catchment area treatment plan has been formulated with the main objective of arresting soil erosion in the catchment area. Suitable remediation measures will be implemented as necessary, including construction of check dams/walls, retaining walls and wire crates for gully control; and stabilization of flood prone nallahs, landslides/slopes, river banks and roads.

Afforestation measures shall be taken under catchment area treatment plan on 464 ha of land. MBPCL obtained a letter from North Eastern Regional Office, MoEF, Govt. of India dated: 17th January 2008 that approved the diversion of forestland to MBPCL. All afforestation activities will be taken up in such forest areas that contain large patches of barren grassy slopes and generally devoid of tress.

Two to three new nurseries are proposed to be developed in the area. The nurseries will be raised in the first year of the project and maintained until the completion of project construction. The nurseries will be supplied with local seedlings obtained from designated local pasture areas. The seedlings developed in the nursery will be used preferentially for afforestation activities.

(iii) Fisheries Development

Rongnichu is an important left bank tributary of Teesta in lower stretch. It harbours 26 fish species belonging to orders Cyprinidae, Sisoridae, Cobitidae and Channidae. *Acrossocheilushexagonolepis* (Catli), *Schizothoraxrichardsoniil* (Snow trout) and *Schizothoraicthysprogastus* (Snow Trout) are the most common and important species in respect to their fishery status.

There are no migratory fishes in the river. In order to ensure protection of these populations, trash racks will be fitted before the power intake to prevent any fish from being sucked in. In addition, it is proposed to build a hatchery (including nursing ponds, rearing ponds and stocking ponds) in the vicinity of Rongnichu River.

(iv) Public Health Delivery Systems

Migrant workers might act as carriers of new diseases hitherto unknown/unreported from the project area. Diseases like AIDS, VDS, malaria, gastro-enteritis, etc. are some of the potential risks to human health. Existing health services in the project area are insufficient to cater for an influx of labour from outside of the area. The project proposes to have all labourers, including their family members registered, quarantined, tested and vaccinated prior to registration. The project authorities will ensure that the contractors follow this strict quarantine procedure with a clause included in the award of contracts/works. In addition the existing medical facilities would also be strengthened and proper health delivery system will be provided by the project authorities.

(v) Solid waste Management

The project authorities will ensure that the colony of labourers and workers will be provided with proper sewage treatment including septic tanks and soak pits for individual dwellings; waste disposal; and sanitary facilities. Four community latrines, of adequate size, will be constructed at suitable locations in the colony area. Adequate free fuel arrangement should be made for the labour forces engaged in the construction work to prevent any felling of trees.

(vi) Provision for Fuel Wood/LPG Depots

The consumption of fuel wood by the local population has been identified as a significant environmental concern. Consequently it is likely that the influx of a labour force would exert further pressure on the forest areas in the immediate vicinity of the proposed project activity. In order to meet the labourers' fuel wood requirements, it is proposed to provide free fuel wood/kerosene/ LPG from depots. This will discourage illicit tree-felling and removal of fuel wood and timber from the adjoining forests.

(vii) Resettlement and Rehabilitation Plan

A total of 38.0443 Ha of land has been acquired for construction of the project activity. Of these 0.06 Ha is Government land, 14.753 Ha is Private land and 23.2313 Ha is Forest land.. In addition approximately 7 Ha of private land is being taken on lease from private land owners for construction facilities, camps etc. during construction period. A plan for compensation and rehabilitation of the land affected people has been formulated in consultation with the Revenue Department, Energy & Power Department of Government of Sikkim and Sikkim Power Development Corporation (SPDC) along with the project-affected families.

The surveys and preparation of the plan included the following procedures;

- Revenue survey of the land required for various project activities was conducted by State Revenue Department, SPDC, Forest Department and the project authorities.
- Onsite verification of the land involved, by the officers of Revenue Department, Forests Department, SPDC and District administration.
- Door to door socio-economic survey of the project-affected families was conducted by team of scientist to collect the baseline data.
- Discussions were held with all project affected families/persons, who have expressed their acceptance of the proposed compensation package.

No family will become landless as a result of the project.

(viii) Relocation and Rehabilitation of Dumping Sites

Material which is excavated during construction of the project will be relocated and rehabilitated. Most of the excavated material will be piled at six suitable locations identified specifically for this purpose. Efforts will be made to relocate and rehabilitate the material within short distances from the construction site, and a detailed work plan for re-vegetation has been formulated.

(ix) Landscaping and Restoration of Construction Areas

Project construction activities can potentially result in modification of the existing landscape of the area. The project authorities have therefore made provisions to ensure that restoration works will be carried out at the completion of construction to return disturbed areas to similar or near-similar pre-construction conditions and land use.

(x) Creation of Green Belt around Reservoir

A green belt of approximately 23.25 ha will be created around the inundated area to prevent soil erosion and land slips from spilling directly into the reservoir. The green belt will start from the immediate vicinity of the reservoir rim on both the banks, up to the tail of the reservoir, wherever moderately steep slopes are available for plantation. In area with moderately steep slopes indigenous, economically important, soil binding tree species, which are able to thrive well under high humidity and flood conditions, will be planted. The creation and maintenance of the greenbelt involves a high level of technical expertise and therefore will be carried out by the State Forests/Horticulture Department as their staff are suitably trained and experienced, with funding set aside by MBPCL.

(xi) Environmental Monitoring Programme

In order to monitor the impact and efficacy of the above mentioned plans the project authorities have specified detailed monitoring parameters, which are contained in the EMP. Additionally, the developer shall deploy trained staff for monitoring and implementation of the EMP under guidance of the CISMHE (Centre for Inter-Disciplinary Studies of Mountain & Hill Environment), University of Delhi. The project developer will undertake environmental studies to monitor the various environmental parameters provided in EMP.

SECTION E. Stakeholders' comments

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

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An Implementation Agreement was executed between MBPCL and Energy & Power Department, Government of Sikkim, on 1st March 2006.

An environmental public hearing was held on October 28, 2006 at Central Public Works Department (CPWD) Dak-bungalow, Lower Martam, East Sikkim. The public hearing was advertised on September 26, in the "NOW"(English), "Samay Dainik" (Local Language) and "Chetana" (Nepali), a leading local daily newspaper. Apart from this, notice was also sent to concerned departments, NGOs and Posters were hanged for over a fortnight prior to the date of public hearing at various locations in and around the Rongnichu HE Project areas..

At the public meeting the proposed RHEP project was presented and comments invited. 127 attendees signed the meeting register and participants included the following representatives:

- Area MLA & Minister for Food Security and Agriculture Department,
- MLA –Lossing Pacheykhani constituency
- State Land Use and Environment Board-Sikkim
- Energy and Power Development, Sikkim
- Sikkim Power Development Corporation
- Additional District Collector-East Sikkim
- SDM-Pakyong
- Forests Environment &W/L Management Department
- CISMHE, University of Delhi
- Directorate of Fisheries
- State Pollution Control Board
- Panchyat's members
- NGOs
- Senior Citizens
- Madhya Bharat Power Corporation Limited (MBPCL)

No Objection Certificates (NOCs) were obtained from the following village panchyats: Central Pendam East, Central Pendam GPU, E.Sikkim, Sumin Lingzey GPU/East, Karthek Namcheybong GPU.

No Objection Certificate for the development of Rongnichu hydro power project was obtained from Directorate of Fisheries, Gangtok on 7th July 2008.

The entire stakeholder present in the public hearing/stakeholder consultation meeting recommended for establishment of project activity.

CDM Specific Stakeholder Consultation:

A CDM specific stakeholder was conducted on 26th February 2010 in the Singtam office of Madhya Bharat Power Corporation, which is located centrally within the Rongni Hydro Electric project Area. It was attended by 17 (Seventeen)project affected peoples besides 3 (three) officers from MBPCL.

A notice was circulated on 4th February 2010 to the concerned village panchayats, Landowners and Project affected peoples inviting suggestions, views, comments, objection from the stakeholders and other project affected peoples. The basic objective of the meeting was to create awareness about the Clean Development Mechanism and contribution of project towards sustainable development of the area by registering the project as CDM project.

The meeting started at 10.00 AM and lasted for nearly 3 hours. Deputy Manager (Coordination) of MBPCL, gave a brief introduction about the 96 MW Rongnichu Hydro Electric Project. The concept of green energy and the Kyoto Protocol were broadly elaborated followed by a discussion on project implementation activities and their impact on the future development of the local area.

Chief Executive Officer (CEO) of MBPCL assured the project affected peoples present that every effort shall be made to protect the environment and ecology of the area. He also described the numerous provisions & policies laid down in the approved Environment Impact Assessment including mitigation measures to be adopted as detailed in the Environmental Management plan.

The MBPCL CEO further discussed the Clean Development Mechanism (CDM) He informed the stakeholders that the hydro project would be developed as a CDM project activity and will contribute towards sustainable development of the area. The entire discussion was constructive and positive.

On behalf of the stakeholders, Mr. L.B. Chetrial summarized the following points to the people present in the meeting, in the local Nepali Language:

i. That 96 MW Rongnichu HEP is being developed as a CDM project.
ii. The project viability depends on the CDM revenue
iii. That CDM projects contribute to reduction of greenhouse gases and global warming
iv. That hydroelectric projects in general are environmentally friendly
v. The project shall ensure employment of stakeholders/local village peoples
vi. The road networks within the project area shall improve
vii. The stakeholder shall get a share of the CDM revenue as per Government of Sikkim policy
viii. The project shall bring all round prosperity of the peoples and the area.

Proceeding of this stakeholder meeting along with the list of participant's have been provided to DOE for validation.

E.2. Summary of the comments received:

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A summary of issues raised by stakeholders in the meeting on October 28, 2006 is given below;

1. It was demanded that local people should get priority on job and other works according to their qualification, experience and satiability.
2. A concern was raised regarding the source of drinking water during the tunnelling process.
3. A question was asked about the future of the aquatic life after the construction of the dam.
4. A question was asked about the various provisions kept by the Company for the resettlement of the displaced family.
5. An issue was raised that the land survey has not been done with the prior permission of a few land owners.
6. It was stated that short term training should be provided to the educated local youth which will in turn help them to get the job in the project.

7. It was stated that all the supplies of the essential commodities should be done through multipurpose co-operative Society of the concern areas.
8. A concern was raised about the acquired land if the developers leave the project incomplete.
9. A concern was raised that the life and properties in and around the project area will not be hampered by the commencement of the project.
10. A concern was raised regarding to release of 10 % of the water during the lease period of the project.
11. A question was raised that endangered species of fishes found in these areas may vanish forever. What are the provisions made for their protection?
12. A suggestion was made to the developer to avoid construction of roads over the religious site and the source of drinking water.
13. A concern was raised that the road should be constructed in well conditions having full drainage and protection wall should be constructed whenever necessary.
14. A question was raised "why the project developer is buying land through SPDC and not directly".
15. A concern was raised about the quantity of muck and place for disposal.
16. An issue was raised that why fish ladder has not been included in the management plan.
17. One Temple and one Catholic Church should be constructed for which the local people will donate the land.
18. An issue was raised that the compensation of land should be considered per sq, feet.
19. A question was raised about the provision for the family members to get jobs at the project.
20. One person raised the issue that the project is likely to affect his land and for which he was not given notice.

Summary of Issues rose during CDM specific stakeholder consultation:

1. Will the water sources on the surface dry during excavation of the tunnel?
2. Whether adequate safety precautions shall be taken while constructing the major structures like dam surge shaft, tunnel and power house keeping in view of the fragile geology of the Sikkim Himalaya ?
3. What are the various provisions kept by the company for the resettlement of the displaced family?
4. The developers are requested to provide medical facilities to the local people from their Project Hospital/Dispensary.
5. The essential commodities such as green vegetables, rice and other essential provisions should be procured by the Contractors through Multipurpose Co-operative Society of the concerned areas? What will happen to the acquired land if the developers leave the project incomplete? Shall the land be returned to the land owners
6. The company should ensure that the life and the properties in and around the project areas shall not be damaged during the construction of the project?
7. What about the exotic Flora & Fauna in the project area, shall they be protected
8. The study of environmental aspects of Rongnichu Project was given to the experts from New Delhi, may we know the reason why it was not given to local experts
9. Will the company provide compensation to the properties damaged indirectly during the construction of the Project ?
10. What will be the quantity of muck that has to be disposed of and where will you dispose it?
11. Is there any provision for employment of one member each from the project affected families in the project?

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

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The project proponents have taken due account of the suggestions and view expressed during the Public hearing point wise as follows;

1. The priority of jobs and work for local people based on suitability and capability are already provided in contract agreement. In order to ensure compliance by the project authority, Govt. of Sikkim will constitute a Monitoring Committee and a Welfare Committee.
2. Tunnelling will take place at the depth of 100 meters to 300 meters from the surface of the earth using advanced tunnelling techniques. So, there will be very little disturbance on the earth crust and as such there will be no deviation of water sources.
3. The project will not compromise access to the river resources for downstream. 10 % (0.3 Cumec) of water will be released during lean period and on top of these there are many other small streams/rivulets downstream of the proposed barrage, which will add water to it and in rainy season there will be no problem.
4. The project proponent informed that rehabilitation will be done as per the norms of the Central and the State Governments. It is clearly stated in the EIA and EMP.
5. The project proponent informed that the survey can be conducted again if Land Revenue Department agrees.
6. Employment will be provided to locals as per their qualifications through employment Cell, Govt. of Sikkim. The same has been provided in Memorandum of Understanding.
7. Regarding the supplies of the essential commodities, the project proponent informed that this matter can be discussed at the time of the formation of project welfare committees.
8. The project proponent confirmed that MBPCL is a reputed registered company, so there is no question of leaving it incomplete.
9. The project proponent will ensure that there will be no loss of the life and property. Project will not render any people landless or homeless. The owners of private land required for the project shall be suitably compensated.
10. Regarding the release of 10 % of water during the lean period, it is clearly stated for release of 10 % water in Environmental Management Plan and there shall be a project monitoring committee that will ensure release of 10 % water during the lean period.
11. Provision shall be made in the EMP to address this problem.
12. The project will construct roads in consultation with the Panchayat Members.
13. As per the Sikkim Government rules, private parties are not allowed to buy land in Sikkim directly. On top of this, the project proponent will own the project for 35 years only after that SPDC will be the sole owner of the project.
14. The project proponent assures that precautions shall be taken during the construction of the roads which will have drainage and protection wall whenever needed.
15. A total of approximately 0.5 million cubic meter of earth will be generated and it will be disposed off in four different sites allotted by the Government. The detail has been provided in EMP.
16. The project proponent has confirmed that a fish ladder will be provided in the environmental management plan.
17. Re-construction of the Temple and Catholic Church has already been reflected in the EMP under resettlement and rehabilitation plan.
18. The project proponent confirmed that the compensation of land will be decided by the Revenue Department in consultation with the land owner based on prevailing norms.
19. There is specific provision in the contract agreement regarding employment of the land affected people. The project proponent shall comply with the provision of contract agreement strictly.
20. State Pollution Control Board Sikkim confirmed that had brought out notices in local newspapers for the information of all concerned.

Project participants' response of issues rose during CDM specific stakeholder consultation:

1. The tunnelling will be done by drilling and blasting method with modem tunnelling equipment. Rongnichu HEP tunnel shall pass at an average depth of 150 to 200 meters below the surface. So

there will be very little disturbances on the earth crust. As such there will be no diversions of surface water sources. If any such incident takes place MBPCL will arrange drinking water from other sources.

2. the major project components shall be designed by specialists design & engineering consultants having vast experience of Himalayan geology. As such regarding safety of the structures, there will be no compromise.
3. Rehabilitation will be done as per the norms of the Central and the State Movements, the details of which have been clearly incorporated in the Environmental Impact Assessment and Environmental Management Plan approved both by the Government of Sikkim and Government of India.
4. The Project Authorities are duty bound and shall provide medical facilities to local people in the Project Hospital/Dispensary free of cost.
5. This issue shall be discussed with the Project Welfare Committee of the locality and the mutually agreed decisions shall be implemented.
6. Madhya Bharat Power Corporation is a Special Purpose Vehicle (SPV) of well reputed and established M/S Sarda Energy & Minerals Ltd (SEML), a renowned and financially sound Company registered in the Bombay Stock Exchange. Therefore there is absolutely no reason as to why the Project shall not be implemented. MBPCL simply needs the cooperation, guidance and good wishes from the people of Sikkim in general and the project affected people in particular for successful implementation of Rongnichu HEP.
7. The company shall follow well established safety norms and shall adopt advanced technology during the construction of the project to ensure that there will be no damage to properties and loss of life.
8. During the construction of the Project, adequate measures shall be taken by the Project Authorities to preserve Flora & Fauna in the Project area. The measures to be taken have been elaborated in the Environmental management Plan (EMP) of the Project already approved by the Forest & Environment Departments of Government of Sikkim and Government of India. The Project Monitoring committee appointed by the State & Central Government shall oversee the same.
9. The Centre for Interdisciplinary Studies of Mountain & Hill Environment, a Unit of reputed Delhi University, being the third neutral force was the natural Choice for the study. The reports prepared by them have already been approved by the Expert Committee of the state Government and the Ministry of Environment & Forest, Government of India.
10. Yes, based on the Project Welfare Committee's decision, suitable compensation shall be paid by the Project Authorities.
11. There is a specific provision in the Implementation Agreement signed between Government of Sikkim and MBPCL that at least one willing member each from the land affected families shall be employed by the Project Authorities.

Project participant has also informed to the stakeholder that the project is being developed as CDM project.

The Project developers of Rongnichu HEP are most welcome to start the construction of the Project immediately and complete the same within the schedule time. This will bring innumerable benefits not only to the Stakeholders but also to the general public of the project area and the State of Sikkim. With the implementation of the Project, road & telecommunication network will improve, adequate electricity will be available and socio-economic condition of the people of the Project area and the state will improve. For all these benefits we are prepared to put up with a little inconvenience such as noise and dust during the construction stage of the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	M/s. Madhya Bharat Power Corporation Ltd. (MBPCL)
Street/P.O.Box:	
Building:	E-585,Ground Floor, Greater Kailash-II
City:	New Delhi
State/Region:	
Postcode/ZIP:	110048
Country:	India
Telephone:	+91 11 32634937
FAX:	+91 11 30824411
E-Mail:	imbinode@gmail.com
URL:	
Represented by:	
Title:	Director and CEO
Salutation:	Dr.
Last name:	Goswami
Middle name:	Mohan
First name:	Binode
Department:	
Mobile:	+91 9250924624
Direct FAX:	
Direct tel:	
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Organization:	Perenia Pty Ltd
Street/P.O.Box:	Level 7
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City:	North Sydney
State/Region:	NSW
Postcode/ZIP:	2060
Country:	Australia
Telephone:	+61 9926 1700
FAX:	
E-Mail:	cdm@pereniacarbon.com
URL:	www.pereniacarbon.com
Represented by:	
Title:	
Salutation:	Mr
Last name:	Wiener
Middle name:	
First name:	Michael
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	michael.wiener@pereniacarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project.

Annex 3

BASELINE INFORMATION

All data for Baseline calculation is taken from the *Baseline Carbon Dioxide Emissions from Power Sector - Version 5.0*[23]. Assumptions are contained within the *CO_2 Baseline Database for the Indian Power Sector User Guide - Version 5.0*[24].

Reference:

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

Table A3-1 Fuel Emission Factors (EF)

	Unit	Coal	Lignite	Gas	Oil	Diesel	Naphta	Corex
EF based on NCV	gCO2 /MJ	95.8	106.2	54.3	75.5	72.6	69.3	0.0
Delta GCV NCV	%	3.6%	3.6%	10%	5%	5%	5%	n/a
EF based on GCV	gCO2 /MJ	92.5	102.5	49.4	71.9	69.1	66.0	0.0
Oxidation Factor	-	0.98	0.98	1.00	1.00	1.00	1.00	n/a
Fuel Emission Factor	gCO2 /MJ	90.6	100.5	49.4	71.9	69.1	66.0	0.0

n/a = not applicable (i.e. no assumptions were needed)

Table A3-2 Gross Generation Data (GWh)

Gross Generation Total (GWh)			
	2006-07	2007-08	2008-09
NEWNE	4,99,380	5,31,539	5,48,029
South	1,61,897	1,67,379	1,67,587
India	6,61,277	6,98,918	7,15,616

Table A3-3 Share of Must-Run (% of Net Generation)

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)			
	2006-07	2007-08	2008-09
NEWNE	18.5%	19.0%	17.3%
South	28.3%	27.1%	22.8%
India	20.9%	21.0%	18.6%

Table A3-4 Simple Operating Margin (tCO_2/MWh) (incl. Imports)

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

[24] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf

	2005-06	2006-07	2007-08	2008-09
NEWNE	1.02	1.01	1	1.01
South	1.01	1	0.99	0.97
India	1.02	1.01	1	1.01

Table A3-5 Build Margin (tCO_2/MWh) (not adjusted for imports)

Build Margin (tCO_2/MWh) (not adjusted for imports)

	2005-06	2006-07	2007-08	2008-09
NEWNE	0.67	0.63	0.6	0.68
South	0.71	0.7	0.71	0.82
India	0.68	0.65	0.63	0.71

Table A3-6 Combined Margin (tCO_2/MWh) (incl. imports)

Combined Margin in tCO_2/MWh (incl. Imports) (1) (2)

	2005-06	2006-07	2007-08	2008-09
NEWNE	0.85	0.82	0.8	0.84
South	0.86	0.85	0.85	0.9
India	0.85	0.83	0.81	0.86

Table A3-7 Imports/Exports NEWNE Grid (Net, in GWh)

Year 2006-2007

From	To	NEWNE	Southern	Bhutan	Nepal
NEWNE			-2,376.5	-2,957.4	207.5
Southern		2,376.5		0.0	0.0
Bhutan		2,957.4	0.0		0.0
Nepal		-207.5	0.0	0.0	
Net imports		5,126.5	-2,376.5	-2,957.4	207.5
Total Imports		5,333.9	0.0	0.0	207.5

Year 2006-2007 (Imports only)

From	To	NEWNE	Southern	India
NEWNE			0.0	
Southern		2,376.5		
Bhutan		2,957.4	0.0	2,957.4
Nepal		0.0	0.0	0.0
Total Imports		5,333.9	0.0	2,957.4

Year 2007-2008

From	To	NEWNE	Southern	Bhutan	Nepal
NEWNE			-3,252.5	-5,230.0	289.9
Southern		3,252.5		0.0	0.0
Bhutan		5,230.0	0.0		0.0
Nepal		-289.9	0.0	0.0	
Net imports		8,192.6	-3,252.5	-5,230.0	289.9
Total Imports		8,482.5	0.0	0.0	289.9

Year 2007-2008 (Imports only)

From	To	NEWNE	Southern	India
NEWNE			0.0	
Southern		3,252.5		
Bhutan		5,230.0	0.0	5,230.0
Nepal		0.0	0.0	0.0
Total Imports		8,482.5	0.0	5,230.0

Year 2008-2009

From	To	Combined	Southern	Bhutan	Nepal
Combined			6,325.9	-5,897.1	90.0
Southern		-6,325.9		0.0	0.0
Bhutan		5,897.1	0.0		0.0
Nepal		-90.0	0.0	0.0	
Net imports		-518.8	6,325.9	-5,897.1	90.0
Total Imports		5,897.1	6,325.9	0.0	90.0

Year 2008-2009 (Imports only)

From	To	Combined	Southern	India
Combined			6,325.9	
Southern		0.0		
Bhutan		5,897.1	0.0	5,897.1
Nepal		0.0	0.0	0.0
Total Imports		5,897.1	6,325.9	5,897.1

Annex 4

MONITORING INFORMATION

Please refer section B.7 of the PDD

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