



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

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

Title : Myntdu Leshka Hydro Electric Project in Meghalaya
Version of Document : 01
Date : 22/08/2008

A.2. Description of the project activity:

The project activity is a 2 X 42 MW new Run-Of-the-River (ROR) hydro power plant in Jaintia Hills district in Meghalaya, India. The project is a high head over ground power plant. The Myntdu Leshka Hydro Electric Project (MLHEP) is a Run of the River (ROR) scheme which envisages the utilization of the river Myntdu & its tributaries namely Lamu & Umshariang. The tri-junction of the above three tributaries is called Leshka. The power generated at the project would be connected to North-Eastern Regional Grid of India.

The project activity involves construction of concrete gravity dam with live storage capacity, surge tank, steel lined circular high pressure tunnel, over ground power house. The stored water is conducted through a water conductor system comprising a tunnel, surge shaft, high pressure tunnel and penstock pipe to the power house on the bank of the river Lynriang housing two Francis V – shaft turbine of 42 MW each. The power generation is from the potential energy available in flowing water from ROR. The power generation potential study for the project was done for the 90% dependable year as well as the other years as per Central Electricity Authority (CEA) with a dam height of 59 meters. The study suggested a firm power of 13.93 MW in the dependable year of the project which was in accordance with the inferences of the study done by the CEA. The process involved is converting the potential energy available into mechanical energy using hydro turbines and convert into electrical energy using alternators. And it is also estimated that approximately 0.1% of power generated by the power plant is consumed by the auxiliary equipment required for the operation of the hydro power plant. The additional funds required for the project activity were raised through bonds with the assistance from UTI Securities.

The project operation will contribute to sustainable development, displacing fossil fuel based power generation, reducing GHG emissions while responding to increasing energy demand, contributing to stabilize the price of power to consumers and reducing the dependence on fossil fuels. Thus the power generation will be carried out in a most clean and sustainable manner without causing any negative impact on the environment.

The project activity's contribution to Sustainable Development

The Ministry of Environment and Forests (MoEF), Government of India, has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects.

Social well being

Economic well being



Environmental well being

Technological well being

The project activity contributes to the above indicators in the following manner.

Social well-being

The project is located in the most backward region of Suchen village of Jaintia Hills district of Meghalaya state. The implementation of the project activity has contributed positively towards the sustainable development of the region as follows.

- Employment opportunities have increased significantly for both skilled and unskilled labours in the surrounding areas due to the implementation of the project. The increased income has improved the living standards of the people. Local people in the surrounding villages are employed for civil and mechanical works.
- Access to electricity would improve in the future due to the project activity, both in Jaintia district as well as in the State. The project activity has contributed to the development of the surrounding area and has contributed towards the improvement of the socio economic conditions of the local area.
- A total road length of nearly 40 km, office buildings and residential buildings for employees and schools for the local community in Suchen Village are also been constructed. Many unskilled labour and skilled labour are involved for buildings, road and other related works.
- As part of its commitment, 1400 Ha area of forest cover would be raised and about 2,00,000 number of fruit bearing trees in an area of 450 Ha (oranges- being the most common) are planted in the area.
- Other local benefits include provision of water supply, business opportunities to land owners and local people. The land value in the region has also improved as a result of the project.
- A primary school has been established for MLHEP employees. The project engineers of MLHEP contribute a portion of their salary for the administration of the school.

Economic well-being:

- The project activity reduces the state's dependence on power and fossil fuel import; thus enhancing the national economy.
- The project location is characterized by numerous precipices, cliffs, waterfalls & beautiful platforms overlooking the plains of neighbouring Bangladesh which had resulted in as one of the favourite destination for tourism. An Eco-park near the project area is also on the anvil.
- The overall economic status of the population around the project site will improve as a result of additional employment by the project as well as the new business opportunities that will emerge



after implementation of the project based on tourism development, better communication and access to power for new industries.

Environmental well-being:

- Hydro power generation is an emission-nil activity and there are no GHG emissions into the atmosphere. The project reduces the import of power from fossil fuel intensive grid and import of the fossil fuels for power generation. The project implementation will add about 2000 Ha of new Forest cover.
- The project proponent has implemented the catchment area treatment and plantation of fruit bearing trees near the project location to improve the local environment thus increasing the economic level of the local population.

Project activity's contribution to the overall development of the region

The project proponent is proposing to spend a minimum of 2% of the revenues to be accrued from the CDM for the sustainable development of the region. In addition to this to the following facilities are to be provided in the region by the project proponent:

1. School with proposed plinth area of 300 m²
2. Post office with proposed plinth area of 100 m²
3. Dispensary with proposed plinth area of 200 m²
4. Club house with proposed plinth area of 100 m²
5. Guest house with proposed plinth area of 200 m²

Also there will be a construction of 61 km of new approach roads and repair of 11km of existing road in the region.

A.3. Project participants:

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 Country)	Meghalaya State Electricity Board (A public entity)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):



India

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

Meghalaya

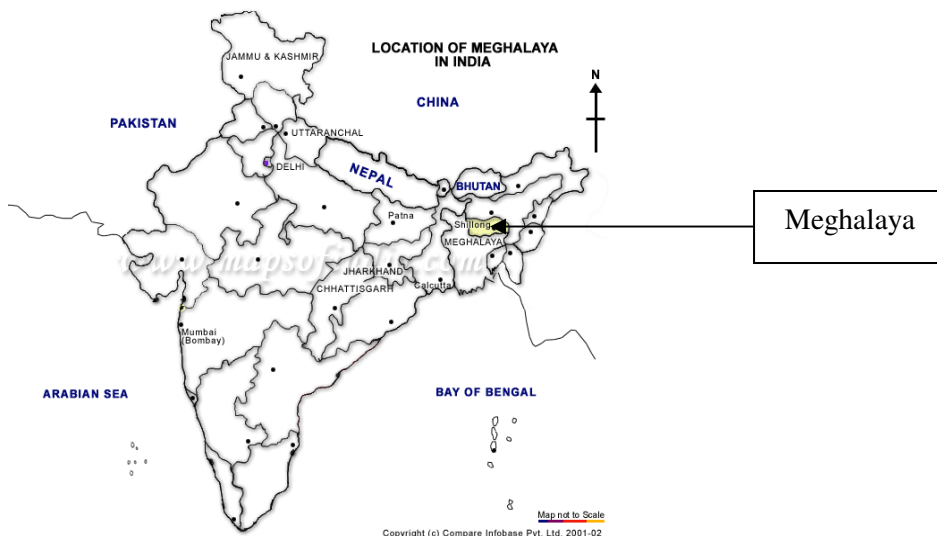
A.4.1.3. City/Town/Community etc:

Jaintia Hills District

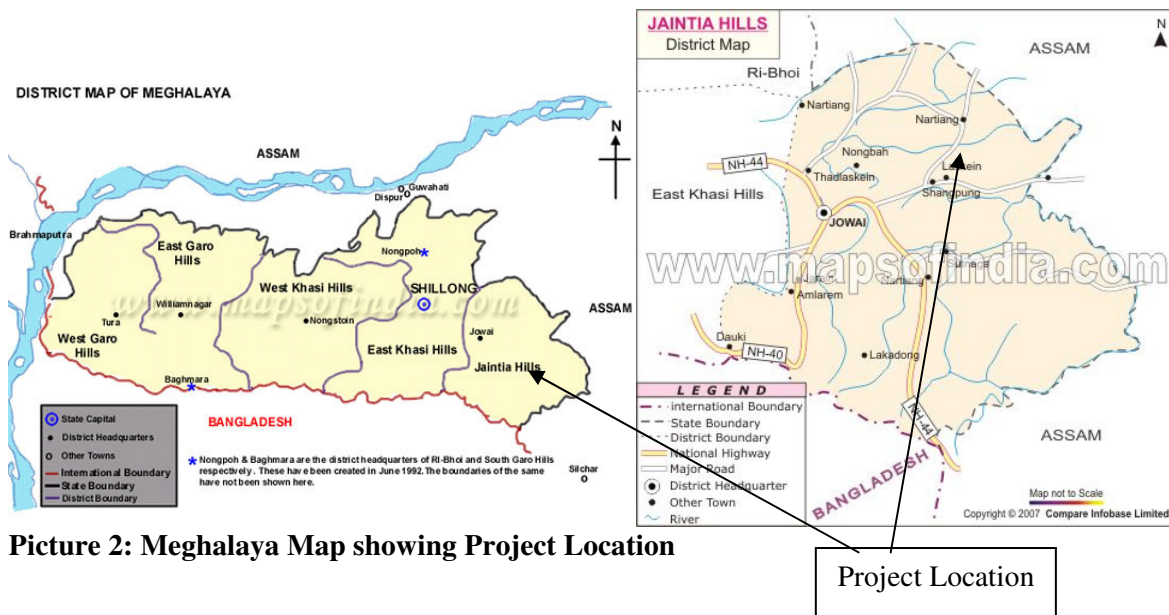
A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The location of the project activity is 216 km away from Guwahati. The nearest Sub-Division (Civil) head quarter's is located at Amlarem in the East side and Khliehriat on the West side. The nearest district head quarter is at Jowai.

The project activity is located at latitude-25⁰ 13'45''N and longitude-92⁰13' 45'' E at the tri- junction of the two tributaries of the Myntdu River in Meghalaya, North-East India.



Picture 1: India Map showing Meghalaya



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

Scope Number : 1
Sectoral Scope : Energy Industries (renewable sources)

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

The project activity involves use of conventional technology for hydropower generation where potential energy due to the head of water is converted to mechanical energy and then into electrical energy using the alternators.

Run-of-the-river hydroelectricity power generation is a type of power generation whereby the natural flow and elevation drop of a river are used to generate electricity. Power stations of this type are built on rivers with a consistent and steady flow, either natural or through the use of a large reservoir at the head of the river which then can provide a regulated steady flow for stations down-river.

The project activity involves the construction of a concrete gravity dam with live storage capacity 7.32 million cum ($141.8 \times 10^6 \text{ m}^3$) and maximum height of 63 metre. The surge tank height is of 85.00 m and diameter of 8.00 m. The steel lined circular high pressure tunnel length is of 314 m with diameter 5.6 m. The size of the over ground power house is 54.7 X 25.5 m with gross head 334.00 m. The stored water is conducted through a 3.605 km long water conductor system comprising a head race tunnel, surge shaft, high pressure tunnel & penstock pipe to the power house on the bank of the river Lynriang housing two Francis V – shaft turbine each of 42 MW capacity.

The turbine and generator are the key components of the plant. The type of turbine has been selected after a detailed study of the hydrology and other technical details. The project envisages using Francis-V shaft turbine with rotational speed 500-600 rpm. The technical details of project activity with all the major civil works and equipment are given below:

**(a) Dam**

S.No.	Description of Work	Parameters
1.	Type	Concrete Gravity
2.	Live Storage	7.32 M Cum
3.	FRL	618.00 m
4.	MDDL	606.15 m
5.	Bed Level	561.00 m
6.	Length i. Overflow ii. Non-Overflow	107.50 m 212.10 m
7.	Deepest Foundation Level	557.00 m
8.	Crest Level	587.50 m
9.	Maximum Height	63.00 m
10.	Top of Non-Overflow Section	620.00 m
11.	Spillway Capacity	10,440 Cumecs
12.	Gates	seven Nos.

(b) Head Race Tunnel Intake

S.No.	Description of Work	Parameters
1.	Type	Semi-circular with trash rack
2.	Control	Fixed wheel gate operated through shaft.
3.	Inlet Elevation	599.55 m

(c) Head Race Tunnel

S.No.	Description of Work	Parameters
1.	Type	Modified Horse Shoe
2.	Length	3313.46 m
3.	Diameter	3.40 m (Modified Horse shoe).
4.	Design Discharge	30.094 cumecs

(d) Surge Tank

Sl.No.	Description of Work	Parameters
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1.	Type	Restricted Orifice
2.	Height	85.00 m
3.	Diameter	8.00 m

(e) Pressure Tunnel

Sl.No.	Description of Work	Parameters
1.	No.	one
2.	Type	Circular
3.	Diameter	3 dia.
4.	Length	314.00 m

(f) Penstock

Sl.No.	Description of Work	Parameters
1.	No.	two
2.	Diameter	2.00 m
3.	Length	738.043 m

(g) Power House

S.No.	Description of work	Parameters
1.	Type	Surface power house
2.	Size	54.70 x 25.50 m
3.	Gross head	334.00 m
4.	Average Net Head	316.16 m
5.	Type of turbine	Francis-V Shaft
6.	Rotational Speed	500/600 RPM
7.	C.L. of distributor level	282.00 m
8.	Generator Floor level	289.50 m
9.	Maximum T.W.L.	295.29 m
10.	Normal T.W.L.	288.18 m
11.	Minimum T.W.L.	286.78 m

The power generation potential study for the project was done for the 90% dependable year as well as the other years as per the Central Electricity Authority (CEA) with a dam height of 59 meters. The study suggested a firm power of 13.93 MW in the dependable year for the project in accordance with the inferences of the study done by the CEA. The annual generation is estimated to be around 372.69 million



units (kWh) assuming 95% of the installed capacity for the 90% dependable year giving an annual plant load factor of 50.65%. Also approximately 0.1% of the power generated from the hydro power plant to be utilized by the auxiliary equipment required for the operation of the project activity.

The hydro power projects does not require any fossil fuel for its operation and the electricity is generated from the potential energy stored in the water by converting into kinetic energy through turbines that requires very less external energy compared to the quantity of electricity that is to be produced. Thus, hydro projects prove themselves to be environmental friendly and there will not be any green house gas emission into atmosphere which would have been otherwise emitted if the alternatives of the project activity are implemented.

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

Years	Annual estimation of emission reduction in tonnes of CO ₂ e
2010	298,368
2011	298,368
2012	298,368
2013	298,368
2014	298,368
2015	298,368
2016	298,368
2017	298,368
2018	298,368
2019	298,368
2020	298,368
Total estimated reductions (tonnes of CO ₂ e)	2,983,680
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	298,368

A.4.5. Public funding of the project activity:

No public funding is involved in the project activity

SECTION B. Application of a baseline and monitoring methodology

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

Title : Consolidated baseline methodology for grid-connected electricity generation from Renewable sources
Version : 09
Meth No. : ACM0002
Reference :

Methodology<http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDA0V5K382HW0JR14GS7XYQUMCP>**Tool for the demonstration and assessment of additionality**http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdfh**Tool to calculate project or leakage CO2 emissions from fossil fuel combustion**http://cdm.unfccc.int/methodologies/Tools/meth_tool03_v02.pdf**Tool to calculate the emission factor for an electricity system**http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf**B.2 Justification of the choice of the methodology and why it is applicable to the project activity:**

Applicability Criteria	Project Activity
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is a green field grid-connected renewable power generation facility.
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 project activity is the installation of hydro power plant with a run-of-river reservoir.
In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The project activity is a green field activity



<p>In case of hydro power plants, one of the following conditions must apply:</p> <ul style="list-style-type: none"> - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or - 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 section, is greater than 4 W/m²; or - 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. 	<p>The project activity results in a new run-of-river reservoir and the power density of the power plant, as per definitions given in the Project Emissions section, is 118.31 W/m² which is greater than 4 W/m². (The surface area of the reservoir is 710,000 m²)</p> <p>Calculated as :</p> $PD = (Cap PJ - Cap BL) / (APJ - A BL)$ <p>Where PD= Power density of the project activity in W/ m²</p> <p>Cap PJ = Installed capacity of the hydro power plant after implementation of the project activity (W)</p> <p>Cap BL = Installed capacity of the hydro power plant before implementation of the project activity (W) for new hydro projects, this values is zero.</p> <p>APJ = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full(m²)</p> <p>A BL = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, the value is zero.</p> $PD = (84 * 10^6 - 0) / (710000 - 0) = 118.31 \text{ W/ m}^2$
<p>The other applicability criterion does not pertain to hydro power projects.</p>	

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

According to ACM0002 Version 09, the spatial extent of this project activity includes the project site and the power plant connected physically to the electricity system that the project is connected to grid. This project supplies electricity to the North-Eastern regional grid and hence the project boundary encompasses the reservoir and the hydro power plant feeding power to the North-Eastern regional grid.

	Source	Gas	Included	Justification/Explanation
Baseline	Fossil fuel fired power plant	CO ₂	Yes	Primary emission gas
		CH ₄	No	Unidentified in the baseline methodology
		N ₂ O	No	Unidentified in the baseline methodology
Project Activity	For hydro power plants, emissions of	CO ₂	No	Clean energy resource with zero GHG emissions
		CH ₄	No	Power density is greater than 10



	CH ₄ from the reservoir.			W/m ² and hence methane emissions are considered as zero
		N ₂ O	No	Clean energy resource with zero emissions

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

The Project is implemented in Jaintia Hills district of Meghalaya and lies within the North-Eastern (N-E) Regional Electricity Grid of India and hence baseline emissions calculations are based on this grid. As prescribed in the applicable methodology, the baseline is the units generated by the renewable generating unit multiplied by an emission coefficient (measured in kg CO₂e/kWh) calculated in a transparent and conservative manner.

In this project activity, the grid emission coefficient was calculated based on the combined margin method consisting of Operating Margin (OM) and Build Margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Thus baseline emission reductions for the project activity will be the quantity of electricity (kWh) produced by the hydro energy turbines with equivalent quantity of units displaced from the grid multiplied with by the emission co-efficient of N-E grid, the power from which is displaced by the project activity.

The Central Electricity Authority of India (CEA) had recently released a “Baseline Carbon Dioxide Emission Database”¹ version 4.0 for the grid emission factor for calculating the emission reductions have been adopted from the above mentioned database.

The following parameters are used for determination of the baseline emissions:

EG _{PJ,y}	Electricity supplied by the project activity to the grid	372690	MWh
EF _{grid,CM,y}	Combined margin CO ₂ emission factor for grid connected power generation in year y	0.8	tCO ₂ /MWh

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):

As per the applicable methodology ACM 0002 (Version 09), the tool for demonstration and assessment of additionality to be utilized to establish that the GHG emission reductions due to the project activity are additional to those that would have occurred in the absence of the project activity. The additionality for the project activity is demonstrated below based on the “Tool for the demonstration and assessment of additionality” version 5.2.

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

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



The tool states that the project activities that apply the additionality tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity. The Sub-step 1a and 1b are explained based on the same below:

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

The following are the alternatives the project proponents could think off to take the project ahead:

Alternative 1: The project activity undertaken without being registered as a CDM project activity

Under this alternative, the project activity would be implemented and supply the generated power to the grid without consideration of CDM revenues.

However the implementation of project activity is not feasible without CDM benefits as the additional funds for the project has been mobilized by the project participant only based on serious consideration of CDM revenues.

Alternative 2: Continuation of the current situation

The continuation of the current situation for the project means that the project would not be implemented due to want of additional funds to complete the major civil construction activities and procurement and installation of major equipments. As more than 50% of the revised project cost has been already invested, there is no other alternative and unless additional project funds are available, implementation of the project activity would not happen. As a result, the North –Eastern regional grid would have to generate the equivalent quantity of power from the emission intensive fossil fuel based power plants.

Outcome of Step 1a: The above identified realistic and credible alternative scenarios would not have contributed to the sustainable development, and hence were not considered.

Sub Step 1b- Enforcement of applicable laws and regulations

The above alternatives identified for the project activity are in compliance with applicable laws and regulations as the project without CDM consideration is considered as the alternative.

Outcome of Step 1b: The identified realistic and credible alternative scenarios are in compliance with the mandatory legislations and regulations taking into account the enforcement in the region and EB decisions on national and or sectoral policies and regulations.

Step 2 is omitted and step 3 is considered as below.

Step 3: Barrier analysis

In this step, the barriers faced by the project activity are identified and analyzed to demonstrate that such barriers prevent the implementation of the project activity. The identified barriers provide sufficient evidence for demonstrating that they prevented the project participant from continuing to implement the project activity undertaken without considering the projected revenue from the CDM project activity. It is further demonstrated that the CDM revenue is essential to overcome the identified barriers that prevent the implementation of the project activity.

**Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:**

The realistic and credible barriers that prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a CDM activity includes the following:

(a) Investment barriers:

There is no alternative to the project activity other than the project being implemented without CDM benefits. The project would not have been implemented without additional funds based on serious consideration of CDM.

The construction of the project was started during May 2004 with an original project outlay of INR 363.08 crores was faced with various difficulties viz., shear zone, geological surprises, seismicity, non-provision of diversion system and acidic nature of water at the site, resulting in substantial change in the civil design. Together with inflation, the project outlay was revised upwards by 308.21 INR Crores and the total project cost was estimated to be around INR 671.29 Crores in April 2006. During mid 2007, due to increase in the construction cost of the project activity, there was a shortfall in the financial resources and as a result the major contractor, who performed the construction work could not be paid, leading to disruption and stoppage of all the major works at the site during the period July-August 2007. Subsequently, the project participant made several attempts to mobilize the additional funds. It was extremely difficult to raise additional funds for the project at a competitive return. North Eastern States are not considered as attractive destination for infrastructure investments by investors due to regional concerns related to policies, returns, reliable resources for power generation etc., The rate of interest proposed by the existing debt provider for the initial project cost (Rural Electrification Corporation - REC) for the additional funds were much higher than that for the original loan combined with a condition that additional loan could be released only after the project participant has spent such additional funds for the project. However during mid 2007, the project participant due to the financial crisis could not meet the REC's new terms for loan. After considerable efforts, the additional funds were raised through bonds with the assistance from Standard Chartered –STCI Capital Markets Limited (erstwhile UTI Securities) after seriously considering CDM benefits during October 2007. The CDM revenues from the sale of CERs from the project activity during the crediting period has been estimated to cover the interest rate to be paid annually for the additional loan raised through Standard Chartered –STCI Capital Markets Limited. Upon receipt of the additional funds based on projected CDM benefits, the construction work resumed and the project is expected to be commissioned during May 2009.

The following is a list quantifying the barriers faced by the project during the construction since additional costs contributed by various components:

Sl. No.	Items	TEC Cost (1999) (INR Crore).	Completion Cost (June,2008) INR Crore	Increase (INR Crore)	% increase Over TEC	% Increase contribution Over Total Hard cost Increase
1.	Preliminary & Land	8.35	24.98	16.63	199.16%	5.09 %
2.	Civil Works					



	a) Dam including Instrumentation	70.52	223.38	152.86	216.76%	46.81 %
	b) Other Works	89.92	219.63	129.71	144.25%	39.72 %
3.	Establishment, Audit & Accounts, Receipt & Recoveries	12.9	28.23	15.33	118.84%	4.69 %
4.	E&M Works	103.67	115.69	12.02	11.59%	3.68 %
	Total Cost	285.36	611.91	326.55	114.43%	100.00 %
5.	IDC	77.72	59.38	-18.34	-23.60%	
	Total Cost with IDC	363.08	671.29	308.21	84.89%	

TEC: Initial Techno-Economic Clearance given by Central Electricity Authority

(b) Technological Barrier:

The construction of dam was started in May 2004, and during digging / excavation of the foundation it was found that the project is located in a highly seismic area. This is due to the reason that the dam site is very close (10.4 km) to Dawki fault. The specification drawings were initially prepared based on the existing dams in the State of Meghalaya and none of these dams are so close to the same fault. The PGA level considered for seismic design of the existing dams has been much lower. Based on this seismic finding, the design of the dam has been modified.

During the initial construction period it was also observed that the water in the Myntdu River (to be used for power generation by the project) becomes acidic in nature. This is due to increased activities related to coal washeries by the coal mining. The acidic nature has decreased the pH value of the Myntdu River to very low levels (around 4.0). This acidic water is corrosive to steel structures and disastrous to dam. To prevent the construction and corrosion of the project equipment due to acidic nature of water, Anti-corrosion steel, Stainless Steel, Micro Silica and other admixtures have been identified as additional requirements for the project. Central Soil & Materials Research Station (CSMRS), Ministry of Water Resources, New Delhi (for concrete), NML, Jamshedpur (for steel) and IIT, Kharagpur have been involved in assisting the project authorities to evaluate and adopt remedial measures of adverse effects of acidic water. Due to shear zones and other geological barriers, the dam axis has been changed to avoid colossal increase.

(c) Barriers due to prevailing practice

The source of water for Myntdu Leshka hydro power project is run of the river project, which is acidic in nature. The acidic nature of the stream is due to the discharge of waste water from the coal mine due to activities related to coal washeries in the catchment area. Thus the project activity will use acidic water for the whole year for generating power, which is the first of its kind in Meghalaya state.

Further the project activity based on acidic water is also the first of its kind in the country as compared to other hydro power projects in India. This is evident from Letter of Central Soil & Materials Research



Station, Ministry of Water Resources, stating the uniqueness of the project. Hence, the project faces barriers as compared to the prevailing practice.

The project also employs a new type of spillway design i.e., Sluice Spillway. This type of dam is first of its kind in the country and hence the operational risk involved is higher as compared to other hydro projects in the country. Also the MeSEB engineers do not have experience in design and construction of the Sluice Spillway dam. It is evident from the above that the project faces major technological barriers.

Outcome of Step 3a: The above barriers would prevent the implementation of the project and implementation would have been difficult without the consideration of CDM revenue.

Sub-step 3 b: *Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)*

The identified barriers in the sub-step 3a would not prevent the implementation of the identified alternatives such as the continuation of the current situation or the generation of power from a fossil fuel. Since these did not require the huge investment nor technological difficulties that are experienced in the implementation of the project activity.

Step 4: Common practice analysis

The construction of such hydro power project is not a common practice analysis because of the following reasons:

- Producing power even though the water is acidic
- The project is located very close to the potential fault where it has experienced frequent earthquakes of 9+ on Richter Scale in the past unlike the other hydro power projects in India.

From the above, it's evident that the project activity has faced many barriers and hence additional to the baseline scenario. It is also evident that the project would not have restarted without the consideration of the CDM benefits

The following is the sequence of events to demonstrate the serious consideration of CDM for the project activity:

Period	Activity	Reference
April 2007	Discussion with UTI on CDM consideration	Letter from UTI to MeSEB dated 07 April, 2007
July 2007	Letter from the civil contractor on slow-down in work due to non-availability of funds.	Letter from SEW to CDM non-payment of dues / intimation for slowdown the work on 24 July, 2007
August 2007	Disruption and stoppage of major construction works	Letter from SEW to CPM on stoppage of work dated 23 August, 2007
August 2007	CDM consideration to raise funds for the project	Note to Member Secretary, MeSEB from CAO dated 23 August, 2007
August 2007	Fund mobilization	Letter from CPM to SEW on efforts of MeSEB to mobilize the funds dated 24 August, 2007
September 2007	Tripartite agreement between MeSEB, UTI and ACG	Copy of the agreement dated 24 September, 2007



October 2007	Restarting of the construction activity	Letter for MF, MeSEB to CPM to resume work dated 11 October, 2007
October 2007	Funds allotted for construction works	Letter from CPM to SEW to resume work as funds are allotted for construction work dated 11 October, 2007
October 2007	Receipt of additional funds from UTI	Debit note from UTI to mF, MeSEB on successful fund mobilization of Rs.120 cr dated 16 October, 2007
December 2007	Local stake holders meeting	Attendance sheet and filled in feedback forms from stake holders dated December 05, 2007
July 2008	Call for CDM validation quote	Letter from MF / MeSEB to ACG on authorization to call for validation quote dated 31 July, 2008
August 2008	Tender for pre-assessment for CDM	Tender notice dated 06 August, 2008
August 2008	Finalization of the DOE for pre-assessment	Work order to TUV NORD for pre-assessment dated 26 August, 2008
August 2008	Acceptance for pre-assessment	Acceptance letter from TUV NORD on pre-assessment dated 29 August, 2008
November 2008	Submission of the PDD to MoEF	Letter from project participant to MoEF
January 2009	HCA meeting	Letter from MoEF to project participant

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions

As prescribed in the methodology, the baseline emission include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emissions are calculated as follows:

$$BE_y = (EG_y - EG_{\text{baseline}}) * EF_{\text{grid,CM,y}}$$

Where,

BE_y = Baseline emissions in year y (tCO₂/yr)

EG_y = Electricity supplied by the project activity to the grid (MWh)

EG_{baseline} = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero

EF_{grid,CM,y} = Combined margin CO₂ 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”

Calculation of Combined margin CO₂ emission factor for grid



The electricity generated by the project activity to be metered, both at the source (power plant site) and the point of discharge (grid). The energy supplied to the grid will be used to estimate the emission reductions and is measured in terms of kWh.

Emission factor of grid = Combined margin of the North Eastern grid calculated as below

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

Where,

$EF_{\text{OM},y}$ = emission factor of Operating Margin

$EF_{\text{BM},y}$ = emission factor of Build Margin

w_{OM} = weight factors of Operating Margin

w_{BM} = weight factors of Build Margin

with respective weight factors w_{OM} and w_{BM} (where $w_{\text{OM}} + w_{\text{BM}} = 1$), and by default, are weighted equally ($w_{\text{OM}} = w_{\text{BM}} = 0.5$).

The Operating Margin Emission Factor ($EF_{\text{OM},y}$) is based on the Simple Operating Margin and is calculated as the generation weighted-average emissions per electricity unit (tCO₂/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{\text{OM},y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j,y}}{\sum_j GEN_{j,y}}$$

Where,

$F_{i,j,y}$ = amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y

$COEF_{i,j,y}$ = is the CO₂ emission coefficient of fuel i (tCO₂/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y

$GEN_{j,y}$ = is the electricity (MWh) delivered to the grid by source j .

The CO₂ emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{\text{CO}_2,i} \cdot OXID_i$$

Where,

NCV_i = net calorific value (energy content) per mass or volume unit of a fuel i

$OXID_i$ = oxidation factor of the fuel

$EF_{\text{CO}_2,i}$ = CO₂ emission factor per unit of energy of the fuel i

Build Margin emission factor (EF_{BM})



The Build Margin emission factor EF_{BM_y} is given as the generation-weighted average emission factor of the selected representative set of recent power plants represented by 5 most recent plants or the most 20% of the generating units built (summation is over such plants specified by k):

$$EF_{BM_y} = \frac{\sum_i F_{i,y} \times COEF_i}{\sum_k GEN_{k,y}}$$

Project emissions

As per the methodology ACM002 for hydro power plants, “If the power density (PD) of the power plant is greater than $10W/m^2$, Project emissions, $PE_y = 0$ ”.

The power density of the project activity is calculated as follows:

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

Where,

PD = Power density of the project activity, in W/m^2

Cap_{pJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{pJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

Leakage

As per the applicable methodology ACM0002, Version 09 “The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydro electric projects). Project participants do not need to consider these emission sources as leakage in applying this methodology. Project activities using this baseline methodology shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario”. No leakage emissions are considered..

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂e/yr)

PE_y = Project emissions in year y (t CO₂/yr)

LE_y = Leakage emissions in year y (t CO₂/yr)

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

Data / Parameter:	Grid Emission factor (<i>Operating Margin</i>)
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Data unit:	tCO ₂ /MWh
Description:	Emission factor of Regional grid, NEWNE Grid
Source of data used:	Central Electricity Authority data, http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value applied:	1.00
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Simple Operating Margin is used, by including Imports

Data / Parameter:	Grid Emission factor (<i>Build Margin</i>)
Data unit:	tCO ₂ /MWh
Description:	Emission factor of Regional grid, NEWNE
Source of data used:	Central Electricity Authority http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value applied:	0.60
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Value is calculated based on ex-ante data and the data does not call for reworking every year

Data / Parameter:	Grid Emission factor (<i>Combined Margin</i>)
Data unit:	tCO ₂ /MWh
Description:	Emission factor of Regional grid , NEWNE
Source of data used:	Central Electricity Authority data, http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value applied:	0.80
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Value is calculated based on ex-ante data and the data does not call for reworking every year



Data / Parameter:	Auxiliary power consumption
Data unit:	MW
Description:	Power consumption by the auxiliary equipment
Source of data used:	Detailed Project Report (DPR)
Value applied:	0.042 MW
Justification of the choice of data or description of measurement methods and procedures actually applied :	The power consumption for auxiliary equipment is estimated as per the provisions in the detailed project report i.e. 0.1% of the installed capacity
Any comment:	Value is estimated based on assumption and the data to be monitored every year

B.6.3 Ex-ante calculation of emission reductions:

Project Emissions

As per the methodology ACM002 for hydro power plants, “If the power density (PD) of the power plant is greater than 10W/m², Project emissions, PE_y = 0”.

The power density of the project activity is calculated as follows:

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

Where,

PD = Power density of the project activity, in W/m²

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero

$$\begin{aligned} PD &= (84 * 10^6 - 0) / (710000 - 0) \\ &= 118.3 \text{ W/m}^2 \end{aligned}$$

Power density of the project activity is 118.3W/m², which is greater than 10MW/m². Hence the project emissions, PE_y = 0.

Leakage

Leakage is not applicable to hydro power projects and hence considered to be zero.

Baseline Emissions



Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = (EG_y - EG_{\text{baseline}}) * EF_{\text{grid,CM,y}}$$

Where,

BE_y = Baseline emissions in year y (tCO₂/yr)

EG_y = Electricity supplied by the project activity to the grid (MWh)

EG_{baseline} = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero

EF_{grid,CM,y} = Combined margin CO₂ 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”

$$\begin{aligned} EG_y &= (\text{Plant capacity in MW} * \text{Operating hours per year}) \\ &= 84 * 4440 \\ &= 372,960 \text{ MWh/yr} \end{aligned}$$

$$\begin{aligned} BE_y &= (372960 - 0) * 0.8 \\ &= 298368 \text{ tonnes CO}_2 / \text{yr} \end{aligned}$$

$$\begin{aligned} \text{Emission reductions} &= \text{Baseline emissions} - \text{Project emissions} - \text{Leakage} \\ &= 298368 - 0 - 0 \\ &= 298,368 \text{ tonnes CO}_2/\text{yr} \end{aligned}$$

The grid emission factor is taken from the new CEA user guidelines, Version 4 of “Carbon Dioxide Baseline Database for the Indian Power Sector”, released in October 2008 on the CEA. The power consumption for the auxiliary equipment are not accounted as negligible in quantity.

Website for CEA data: http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf

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

Year	Estimation of project activity emissions (tonnes of CO ₂ e)	Estimation of baseline emissions(tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
2010	0	298,368	0	298,368
2011	0	298,368	0	298,368
2012	0	298,368	0	298,368
2013	0	298,368	0	298,368
2014	0	298,368	0	298,368
2015	0	298,368	0	298,368
2016	0	298,368	0	298,368



2017	0	298,368	0	298,368
2018	0	298,368	0	298,368
2019	0	298,368	0	298,368
2020	0	298,368	0	298,368
Total (tonnes of CO₂e)	0	2,983,680	0	2,983,680

B.7 Application of the monitoring methodology and description of the monitoring plan:
B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Parameter:	$EG_{\text{facility},y}$
Unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data :	The data will be based on the operations of the hydro turbines over the crediting period.
Value of data:	372.69 million kiloWatts/year
Brief description of measurement methods and procedures to be applied:	The data to be accurately measured. The meters installed at the sub stations (grid interconnection point) will be used to measure the electricity supplied to the grid on a continuous basis. Every month the meter readings will be recorded by plant personnel. These records will be archived for crosschecking with the yearly figures. The meters at the sub station will be two-way meters and will be under the charge of State Electricity Board (SEB). SEB will record the readings from these meters and the same reading may be used to determine the net power generated. <u>Data type:</u> Measured <u>Archiving procedure:</u> Manually / Electronically <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Shift engineers would be responsible for monitoring and recording the data.
QA/QC procedures to be applied (if any):	QA/QC procedures for this are planned. These data will be directly used for calculation of emission reductions. Sales record to the grid and other records are used to ensure the consistency.
Any comment:	NA

Parameter:	EF_{grid,CM_y}
Unit:	tCO ₂ /MWh
Description:	Combined margin CO ₂ emission factor for grid connected power generation in year y
Source of data:	Central Electricity Authority data, www.cea.nic.in
Value of data:	0.8
Brief description of measurement methods	The value is provided as mentioned as in the Central Electricity Authority data.



and procedures to be applied:	
QA/QC procedures to be applied (if any):	Project participants have no control on the parameter. Hence, No QA/QC procedures are applicable
Any comment:	NA

Parameter:	C _{appj}
Unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Value of data:	84
Brief description of measurement methods and procedures to be applied:	Sensitivity analysis by Central Electricity Authority. <u>Responsibility:</u> Shift engineers would be responsible for monitoring the data.
QA/QC procedures to be applied (if any):	QA/QC procedures for this are planned. These data will be directly used for calculation of emission reductions. Sales record to the grid and other records are used to ensure the consistency.
Any comment:	NA

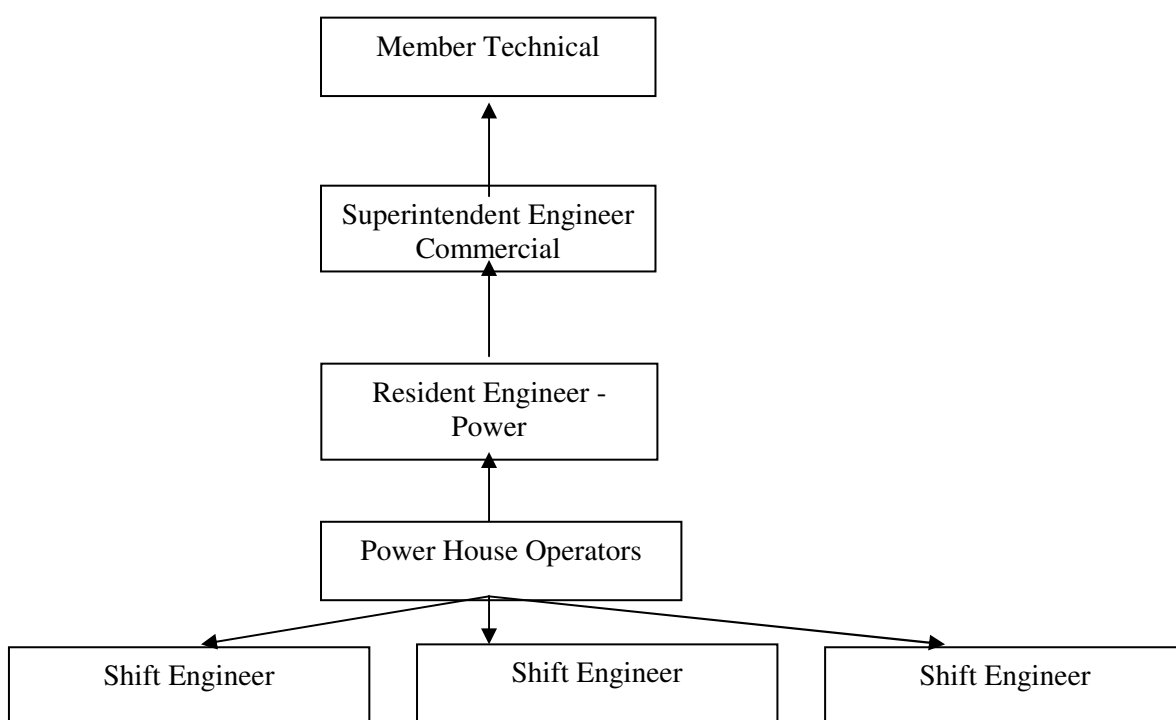
Parameter:	A _{PJ}
Unit:	m ²
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site
Value of data:	710000
Brief description of measurement methods and procedures to be applied:	Reservoir area is estimated by installing one or several water level indicating pillars within the reservoir bottom. These pillars have appropriate coloured marks indicating the reservoir water levels. The data on reservoir water levels will be regularly or periodically monitored and recorded to an operational diary by the plant staff. <u>Data type:</u> Measured <u>Archiving procedure:</u> Manually / Electronically <u>Recording Frequency:</u> Yearly <u>Responsibility:</u> Shift engineers would be responsible for monitoring and recording the data.
QA/QC procedures to be applied (if any):	QA/QC procedures are planned. These data will be directly used for calculation of emission reductions.
Any comment:	NA

B.7.2 Description of the monitoring plan:



The monitoring plan for the project activity has been developed as per the applied methodology, ACM0002 / Version 09

The project is a grid connected renewable energy project, emission reduction depends on the units of electricity generated and exported to the grid (in kWh) and the baseline emission of the state grid. The methodology covers the monitoring of units exported and the other parameters affecting the quantity of power exported and CO₂ emissions thereof. The net emission reductions will result from the units of power available from the project activity for export to the grid. The data collection and recording is done by the SLDC (State Load Automatic Centre) which automatically records all the readings and stores in the system, the daily data. SLDC facilitates transparent monitoring and recording which can be viewed by anybody. The data, monitored continuously, will be cross verified by the MSEB engineer frequently. The monitoring structure is as below.



All monitored data to be stored / archived in the plant both manually and electronically. The data can be recovered at any point of time throughout the entire crediting period.

The shift engineer monitors and records the data in log books on a shift basis. The power house operator and the resident engineer cross-checks and verify the data every day. The Superintendent Engineer verifies the data on a monthly basis and the verified data to be submitted to the member technical who is the executing authority for the CDM project activity.

Internal audit of the project activity is done every month. Performance reviews of the project activity are conducted during every week and corrective actions are submitted and implemented.

**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)**

01/09/2008

Organization:	Asia Carbon Emission Management India Private Limited
Street/P.O.Box:	Khader Nawaz Khan Road
Building	#34, 4 th floor, Kakani Towers
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600 006
Country:	India
Telephone:	044-39180501
FAX:	044-39180501
E-Mail:	ramesh@asiacarbon.com
URL:	www.asiacarbon.com

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:**

11/10/2007

The re-commencement of civil construction date for the project activity is considered to the start date of the project activity.

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

40 Years (As per DPR)

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:**

N/A

C.2.1.2. Length of the first crediting period:

N/A

**C.2.2. Fixed crediting period:****C.2.2.1. Starting date:**

The start date of the crediting period is 01/01/2010 or a date not earlier than the date of registration of the project activity.

C.2.2.2. Length:

10 Years

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

The environmental appraisal report was initiated on Aug 4th 2007; studies were carried on as per the guidelines of Ministry of Environment and Forest, Government of India. The report was based on survey reports from Scientists belonging to National Institute of Hydrology, Guwahati, North Eastern Hill University and Department of forest, Government of Meghalaya. A comprehensive report was submitted to MoEF and Pollution Control Board, Government of Meghalaya on 22nd May 2001. The MoEF accorded the clearance on 26th September 2001.

Since the project has been conceived as run-off-the river scheme, the impact on the surrounding environment and ecology will not be significant. The following are some significant points which had been identified and addressed:

Deforestation:

It has been estimated by the Forest Department of Meghalaya that approximately 54.5 hectares of the covered forest area will be submerged by Leskha reservoir (as per the original proposal) and the trees along the banks of the river will be submerged. The trees to be submerged belong to a miscellaneous species and other shrubs and herbs. Myntdu- Leskha H.E. project being a run-off-the river project, the District forest officer has commented that the run-off-the river scheme will have no significant impact on the ecology. Further, the proposed afforestation scheme along the hill slopes, will in fact, improve the intensity of forest cover in the area.

Rehabilitation:

The problem of loss of forest cover due to rehabilitation is not pertinent to Myntdu (Leskha) H.E. Project, as there will not be a single case of displacement of local people with the construction of Myntdu Leskha H.E. Project.

Soil Erosion:

The problem that would arise with the dam construction is due to soil erosion; during the construction stage, if the vegetal cover is removed, is bound to be a problem of erosion ultimately reducing the life of the reservoir. However, in the proposed project, afforestation and soil conservation measures have been



contemplated and necessary budget provision has been taken into consideration in the cost estimate to minimize the problem of soil erosion. The recommendations from National Institute Hydrology, Guwahati, as regards to Soil Conservation measures in the catchment also to be sorted out in consultation with Soil Conservation Directorate, Meghalaya.

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:

The Ministry of Environment and Forest sanctioned environment clearance as per the provisions of EIA (Environmental Impact Assessment) notification, 1994 subject to compliance of certain terms and conditions. All relevant documentation on EIA is undertaken in accordance with the procedures as required by the host party is available.

SECTION E. Stakeholders' comments

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

The project activity involves the construction of dam and operation of the project by Meghalaya State Electricity Board at Amlarem, Jaintia Hills district in Meghalaya, India. A stakeholder consultation meeting had been conducted in order to identify the concerns of the people regarding the implementation of the project activity. Formal invitation letter were sent to the stakeholders both in English as well as local language prior to the meeting and also telephonically they were invited for the meeting.

The stakeholders identified for the project were:

- Contractors
- NGO Representatives
- School Teachers
- Local people
- Equipment suppliers

The stakeholders' meeting was conducted at the project location (MLHEP Guest House) on 5/12/2007 in Jaintia Hills District, Meghalaya. MSEB representatives explained about the project activity and the benefits of its implementation, the concept of green house gas reductions. Two sets of questionnaires were circulated to the stakeholders; in English as well as local language and their comments were received in writing.

E.2. Summary of the comments received:

A brief introduction about the project activity under Clean Development Mechanism was delivered to the stakeholders and their doubts and concerns were clarified by the MSEB representatives. The comments can be summarized as positive.



The Stake holder's expressed satisfaction due to the implementation of the project, as it has created employment opportunities both for skilled and unskilled people, led to cleaner environment which have positively helped in improving living standards and socio-economic conditions of the area as well.

The stakeholder's comments are summarized & separately attached as Appendix. The summary clearly indicates that all the stakeholders agree that would not be any negative impact due to the project activity.

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

The participants clarified on global warming and prime reasons for the same, the activities that help fight climate change and the criterion of projects qualifying for GHG reductions under the Clean Development Mechanism.

The representatives of the project participant (MSEB) replied to the queries raised, by explaining the various aspects and concepts related to climate change, mitigation of the same, CDM being one of those mechanisms and also the other ways and means adopted by people across the globe.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Meghalaya State Electricity Board
Street/P.O.Box:	Lum Jinghai, Short Round Road
Building	New Office Complex
City:	Shillong
State/Region:	Meghalaya
Postfix/ZIP:	793001
Country:	India
Telephone:	0364-2590610/2590742/2590710
FAX:	0364-2590355
E-Mail:	meseb-shil-meg@nic.in
URL:	www.meseb.nic.in
Represented by:	
Title:	Member Finance
Salutation:	Mr.
Last Name:	Wahlang
Middle Name:	Phillip
First Name:	Donald
Department:	Accounts Department
Mobile:	09862011111
Direct FAX:	0364-2591344
Direct tel:	0364-2590135
Personal E-Mail:	dwahlang@yahoo.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding of any kind is applicable for the project activity

**Annex 3****BASELINE INFORMATION**

This project uses grid emission factor calculations officially published by the Central Electricity Authority (CEA) of India, following the approaches and rules defined in ACM0002. For details and further information on data please see CEA CO₂ data base from the following web link:

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

Baseline Emissions:

Combined margin CO ₂ emissions factor	tCO ₂ /MWh	0.8
Electricity supplied by the project activity to the grid	MWh	372960
Baseline electricity supply to the grid	MWh	0
Baseline Emissions	tCO ₂ /yr	298368



Annex 4

MONITORING INFORMATION

Please refer to Section B. 7.2

**Appendix A1****CONTRIBUTION TO SUSTAINABLE DEVELOPEMENT**

The following table provides the monitoring action plan on contribution to the sustainable development

Sustainable Development	Monitoring Action Plan
<u><i>Educational facilities</i></u> MeSEB will commit itself in developing the educational facilities of the region by promoting a school with a plinth area of 300 m ²	Relevant receipts dealers will be documented. Acknowledgements from the local community will also be provided
<u><i>Post Office</i></u> MeSEB will be responsible for up bringing of postal facilities by promoting office space with a plinth area of 100 m ²	Relevant documents from the postal department will be documented. Acknowledgements from the local community will also be provided
<u><i>Dispensary</i></u> As part of its commitment for providing better health facilities, MeSEB will construct a dispensary with a plinth area of 200 m ²	Documents on the health facilities provided will be recorded. Acknowledgements from the local community will also be provided
<u><i>Club and Guest house</i></u> To promote recreational facilities and for the community development, the project proponent will develop Club and Guest house for the benefit of the people in the region.	Acknowledgements from the local community will also be provided



Appendix A: Summary of Stake holder's Comments

Sl. No.	Participants name	Category	Employment opportunities increased?	Whether land values are increased?	Infrastructure facilities are developed ?	Whether you have learnt or exposed to new technology?	Whether you are facing any type of pollution (Air / Water / Sound) problems due to the project?	Whether the electricity facilities are improved?	Whether your local area is improved?
1.	Ms. Depalim Lamurong	School Teacher	YBVV	Y	YVVV	Y	N	Y	YVMVV
2.	Mr. A. Kassar	NGO Representative	YBVV	Y	YVVV	Y	N	Y	YVVMV
3.	Mr. Social Thoo	Contractor	YBVV	Y	YVMM	Y	N	Y	YM
4.	Ms. Justina Syih	School Teacher	YBVV	Y	YVVV	Y	N	Y	YVVMV
5.	Mr. S. Prabhakar Rao	Contractor	YBMV	Y	YMMM	Y	N	Y	YMMNM
6.	Mr. N. V. saradhi	Contractor	YBMM	Y	YMVM	Y	N	Y	YMVM
7.	Mr. Lakshman Chandra Jha	Equipment Supplier	YBVV	Y	YVVV	Y	N	Y	YVVNV
8.	Mr. Sucil Kr. Sojh	Contractor	YBVV	Y	YVVM	Y	N	Y	YVVMV
9.	Mr. Teibor. L. Hing	NGO Representatives	YBVV	Y	YVVM	Y	N	Y	YVVMV
10.	Mr. Amrit Singh Mann	Equipment Supplier	YBVV	Y	YVVM	Y	N	Y	YVMMM
11.	Mr. Wolmon Sumer	Student	YSLV	Y	YVMM	Y	N	Y	YVMMV
12.	Mr. Lamphrang Shylla	Local People	YBVV	Y	YVMV	Y	Y	N	EMMM



13.	Mr. F. Pakyntein	Local People	YSLVV	Y	YVMM	Y	N	E	EVMV
14.	Ms. Sundaj Sumer	School Teacher	YBVV	Y	YVMM	Y	Y	N	EMMM
15.	Mr. W. Turasag	Local people	YBVV	Y	YVVV	Y	N	Y	YVVV
16.	Mr. Pakyrten	Local People	YBVV	Y	YVVV	Y	N	Y	YVVV
17.	Mr. Horismassar	Local People	YBVV	Y	YVVV	Y	Y	Y	YVVV
18.	Ms. Jubili Sumer	Local People	YBVV	Y	YVVV	Y	N	Y	YVVV
19.	Ms. Tiewlyban Pakynten	Local People	YBVV	Y	YVVV	Y	N	Y	YVVV
20.	Ms. Kyrmer Sumer	Local People	YBVV	Y	YVVM	Y	N	Y	YVMV
21.	Ms. Nangkiew Sumer	Local People	YBVV	Y	YV	Y	N	Y	YMV
22.	Ms. Mila Sumer	Local People	YBVV	Y	YVV	Y	N	Y	YVMV
23.	Ms. Deris Dkhar	Local People	YBVV	Y	YVVM	Y	N	Y	YVMV
24.	Ms. T. Suther	Local People	YBVV	Y	YVVV	Y	N	Y	YVVV
25.	Mr. Kein Massar	Farmer	YBVV	Y	YVVV	Y	N	Y	YVVV
26.	Mr. Meko Thoo	Contractor	YBVV	Y	YVMM	Y	N	Y	YVVV

Y = Yes, N = No, SL = Skilled Labour, B = Both Skilled & Unskilled Labours, V = Visible, M = Marginal, S = Slightly increased