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:

Project title: Thanh Thuy Hydropower Project.
Version 3.3: Updated for request for post registration changes
Completion date: 19/04/2012

A.2. Description of the project activity:

Project Entity and Purpose of the Project Activity

Thanh Thuy hydropower project is being developed by Viet Long Industry Joint Stock Company. The proposed project activity aims to construct and operate a run-of-river hydropower project which is considered as an environmentally friendly solution to growing energy demand. It will be situated in Xin Chai, Thanh Duc and Thanh Thuy Communes, Vi Xuyen District, Ha Giang Province in the north of Viet Nam and is hereafter referred to as “the project activity”. The proposed project utilises the Thanh Thuy stream which starts from mountain ranges in Viet Bac region with a steep gradient.

The project will use imported critical items of plant to generate approximately 76.665 GWh p.a. of power, leading to estimated average annual emission reductions in the order of 44,190 tCO_2 during the first seven year crediting period. This will offset the combustion of thousands of tonnes of fossil fuels and, in doing so, will help preserve non-renewable resources by promoting the exploitation and use of renewable resources and technologies.

Currently, due to shortfalls in the amount of electricity available, Viet Nam imports electricity from China, where the grid emission factor is higher than that of Viet Nam.

Contribution to Sustainable Development

An analysis of the economic, social and environmental aspects of the project shows that the project meets the host country’s sustainable development criteria for a Clean Development Mechanism project. In order to quantify the sustainable development contribution of this project, the project owner has voluntarily agreed to donate 2% of the CER revenue from the project towards sustainable development initiatives for the local community.

The project has positive impacts with respect to the environment (offsetting fossil fuel use and lowering greenhouse gas emissions), socially (providing jobs, ensuring a reliable electricity supply and developing infrastructure), technologically (technology, knowledge and skill transfer) and economically (satisfying growing energy demands to allow the country to develop, contributing taxes to local budget and alleviating poverty).

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)
Socialist Republic of Viet Nam (host)	Private Entity: Viet Long Industry Joint Stock Company (as the project owner)	No
Switzerland	Private Entity: Bunge Emissions Holdings Sarl	No

Viet Long Industry Joint Stock Company: set up to develop energy projects and also trading in the energy industry, based in Hanoi, Viet Nam.

Bunge Emissions Holdings Sarl: Bunge is an integrated, global agribusiness and food company operating in the farm-to-consumer food chain. With respect to carbon emission reductions, Bunge has been active in this sector through is subsidiary Ecoinvest carbon SA for a number of years. Bunge Emissions Holdings Sarl, one of the subsidiaries that act as a buyer of CERs, VERs and ERUs and as financial partner, has been active for more than one year with expertise in more than thirty projects in more than ten countries across three continents.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Socialist Republic of Viet Nam

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

Ha Giang Province

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

Xin Chai, Thanh Duc and Thanh Thuy Communes, Vi Xuyen District

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

The proposed project location is Ha Giang province in the north of Viet Nam, which is one of the poorest areas in Viet Nam. It is situated on the Thanh Thuy stream which starts from mountain ranges in Viet Bac region with the high slope.. The Thanh Thuy watershed is penniform, with the divide running

from a height of 2324m to the height of 501m. The project site is 20 km from Ha Giang town, Ha Giang province.

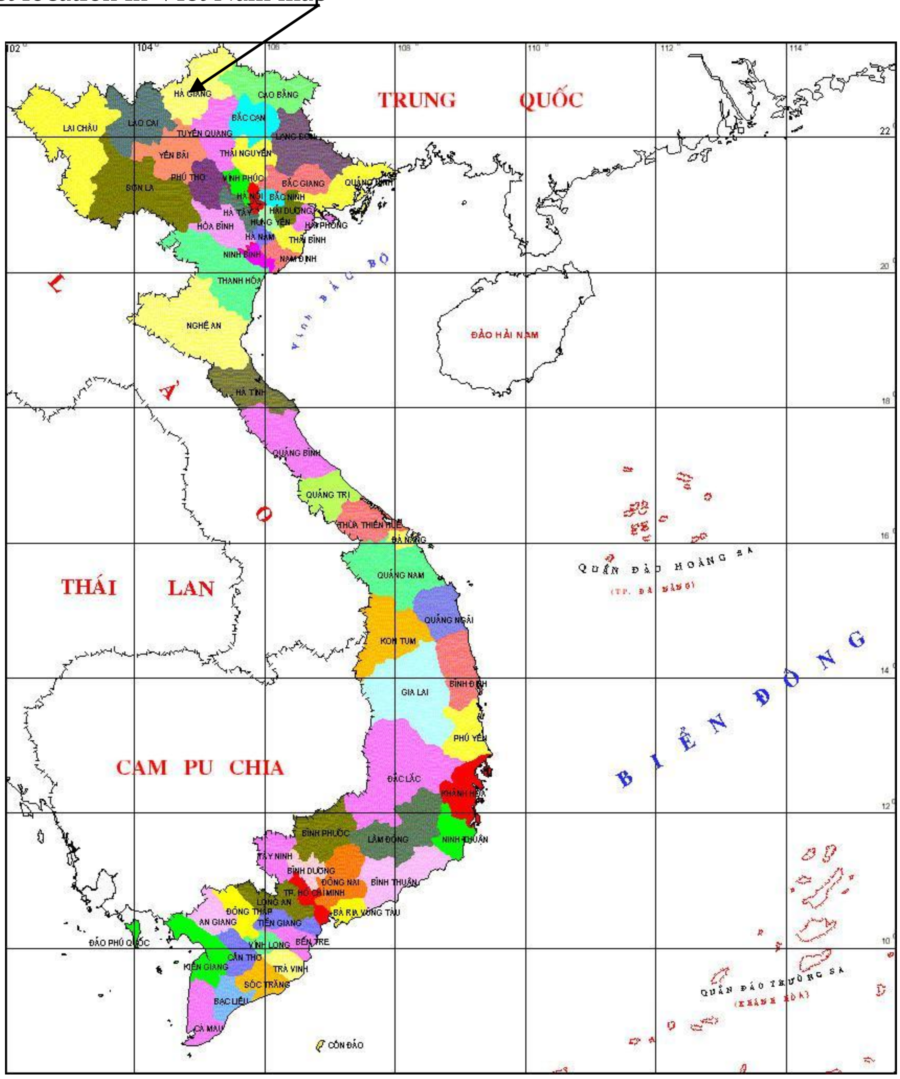
The co-ordinates of the site are:

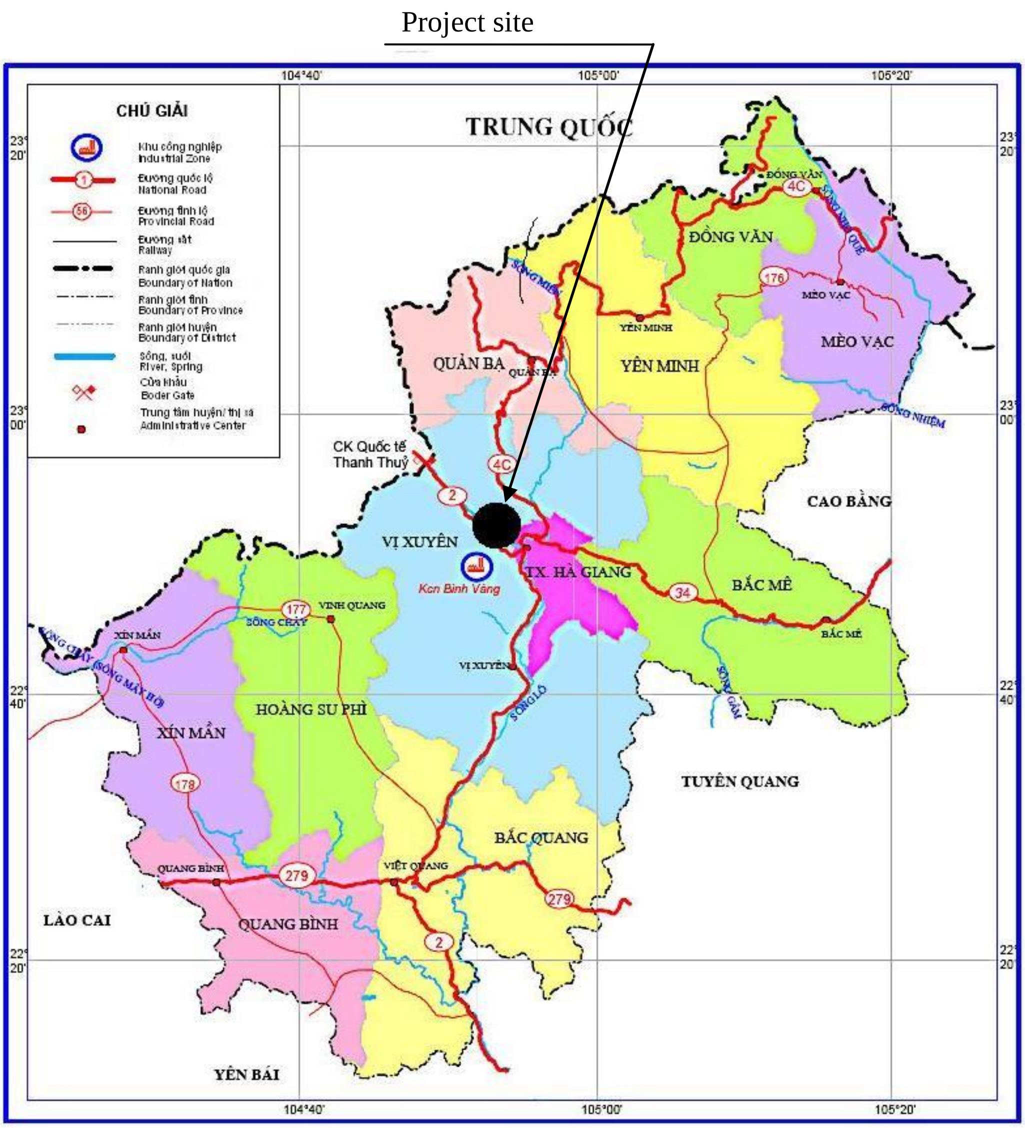
Cascade 1 weir: latitude of 22°52'00"N and longitude of 104° 48'16"E
Cascade 2 weir : latitude of 22°52'32"N and longitude of 104° 48'23"E

Figure A.2 shows the location of the project.

Figure A.2 Project Location

Project location in Viet Nam map





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

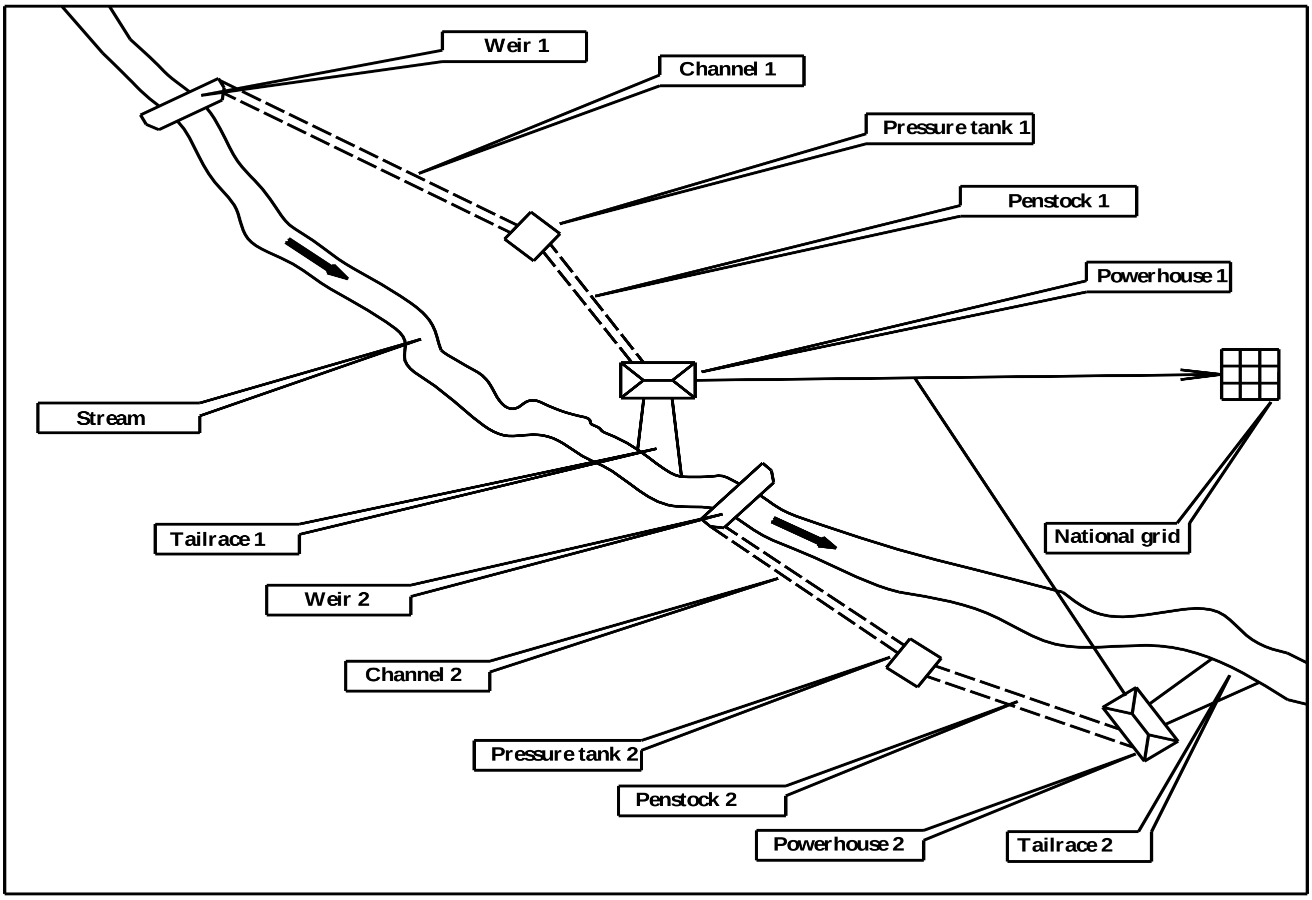
Sectoral Scope 1: Energy industries (renewable/non renewable sources)

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

The proposed project is a run-of-river hydropower plant without reservoir and consists of 2 cascades with a weir, an intake, a forcebay or pressure tank, a penstock, a powerhouse (containing turbines and generators) and a tailrace for both cascades as shown in Fig. A.3. The installed capacity of the project is 20 MW with total expected annual net generated electricity of 76,665 MWh per annum. The specific items of plant employed by the project are expressed in Table A.2. The main items of equipment such as turbines, generators, governors shall be imported from China. This will contribute to the transfer of skills and technology to Viet Nam. The electricity generated by the first cascade of the project will be delivered to the Viet Nam national grid initially via a new 35 kV transmission line from Thanh Thuy hydropower plant and eventually through a series of transmission lines and transformers to the

Vietnamese national electricity grid (full details are provided in Annex 4) After the construction of the second cascade, provision will be made to connect both cascades output to a 100 kV transmission line.

Fig. A.3. A schematic representation of the proposed project activity



The technology of the project is detailed in the Table A.2. This technology is considered to be relatively environmentally friendly as the plant is a run-of-river project without a reservoir. The plant can therefore be constructed and operated in a manner which does not involve significant land clearing or development, as in the case of accumulation reservoir types of projects. This is in addition to the fact that power is generated by a renewable resource and resulting in zero emissions.

Table A.2. The main technologies used in the project, imported from China

Equipment Of Cascade 1	Items	Specification (4MW Unit)	Specification (3MW Unit)
Turbines	Quantity	2	1
	Capacity	4.180MW	3.105MW
	Type	Horizontal axis, 2 jets	Horizontal axis, 2 jets
	Rated speed	600 rpm	750 rpm
	Runaway speed	1080 rpm	1350 rpm
	Efficiency	87%	89.2%
Generators	Quantity	2	1
	Capacity	4.000 MW	3.000 MW
	Type	Three- phase synchronization, horizontal axis	Three- phase synchronization, horizontal axis
	Cosφ	0.8	0.8
	Rated speed	600 rpm	750 rpm
	Runaway speed	1080 rpm	1350 rpm
	Rated Efficiency	95.7%	95%
Governors	Quantity	2	1
	Type	Electricity-Hydraulic-Digital	Electricity-Hydraulic-Digital
	Working capacity (A)	1000 Kgm	1000 Kgm

Equipment Of Cascade 2[1]	Items	Specification (3MW Unit)
Turbines	Quantity	3
	Capacity	3.105MW
	Turbine Type	HLA351-WJ-84
	Rated speed	1000 rpm
	Runaway speed	1661 rpm
	Rated head	167.06 m
	Maximum head	171.6 m
	Minimum head	166.98 m
Generators	Quantity	3
	Capacity	3.000 MW
	Type	SFW3000-6/1730
	Cosφ	0.8
	Rated speed	1000 rpm
	Runaway speed	1750 rpm
	Rated Efficiency	96.6%
Governors	Quantity	2
	Type	Electricity-Hydraulic- Digital
	Working capacity (A)	1000 Kgm

[1] As built specification

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

The annual average emission reductions of the proposed project are estimated to be 40,718 tCO_2e as shown in Table A.3. The project will employ a renewable crediting period and the total emission reductions are estimated to be 285,025 tCO_2e for the first seven year crediting period.

Table A. 3. The annual emission reductions of the proposed project for the first crediting period

Years	**Estimation of annual emission reductions in tonnes of CO_2e**
01/04/2011 to 31/03/2012	19,885
01/04/2012 to 31/03/2013	44,190
01/04/2013 to 31/03/2014	44,190
01/04/2014 to 31/03/2015	44,190
01/04/2015 to 31/03/2016	44,190
01/04/2016 to 31/03/2017	44,190
01/04/2017 to 31/03/2018	44,190
Total estimated reductions (tCO_2e)	**285,025**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period	**40,718**

A.4.5. Public funding of the project activity:

There is no public funding for the proposed project.

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:

Methodology: ACM0002, Consolidated Methodology for Grid Connected Electricity Generation from Renewable Sources, Version 11

As the project's total installed capacity is 20 MW (above the 15MW CDM small / large scale project threshold) and employs a renewable source of energy (hydropower) to be exported to a national grid system, the proposed project should be considered under the above methodology and the accompanying tools:

- Tool for the demonstration and assessment of additionality (Version 5.2)
- Tool to calculate the emission factor of an electricity system (Version 1.1)

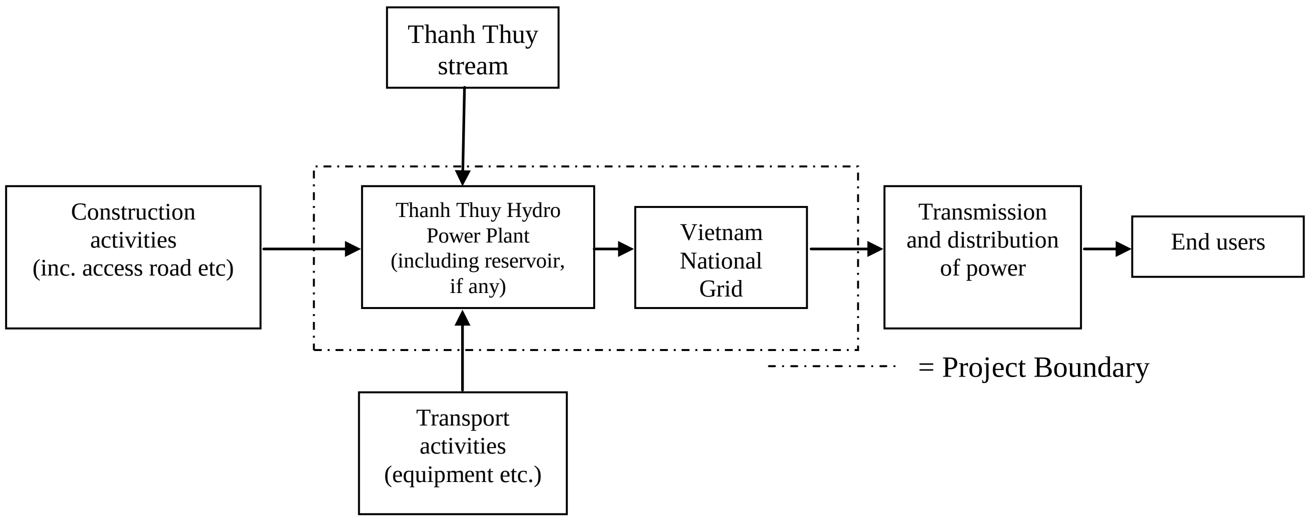
B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

	Applicability Criteria	Project Activity
1	The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity involves the installation of a new run-of-river hydropower project without reservoir.
2	The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002, is greater than 4 W/m2.	There are no reservoirs for the project.
3	The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.	This is the case, please refer to section B.4.

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

In the proposed project activity, the generated electricity of the project will be delivered to the Viet Nam national grid system. As per the guidance set out in ACM0002, the project boundary is therefore set at the extent of the Viet Nam national grid system which is mainly comprised of a range of thermal, gas, diesel oil and hydropower plants (please see section B.4.). This is represented diagrammatically in Fig. B.1.

Figure B.1. The project boundary



As per ACM0002/Ver 11, the following sources and gases are included the project boundary

Table B.1. Source and gases in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	
Project activities	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Excluded as per the guidance in the ACM0002 (Version 11
		CH_4	No	No reservoir
		N_2O	No	Minor emission source

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

As per the guidance of ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to Calculate the Emission Factor for an Electricity System".

The state-owned company Electricity of Viet Nam (EVN) dominates power production, transmission, and sales in Viet Nam. One of the key assumptions made in determining the baseline is to treat the whole grid system as one entity. The grid system is not divided into provincial sub-groups (as in China for example), the only distinctions made by the EVN as to categorising power stations are by type (coal,

gas, hydropower etc.), geographical location (North, Central and South) and ownership (state, independent power producer, "build-operate-transfer"). Over the period 2004-2008, total domestic generation increased from 44,935 MWh in the year 2004, to 71,470 MWh in 2008. In the same period, the contribution of fossil fuels grew from around 60% (27,043 MWh) to nearly 64% (45,499 MWh).[2]

Data Used to Determine Baseline Emissions

Data used to determine the Baseline Emissions were sourced from the Study, Definition of Viet Nam Grid Emission Factor prepared by the Department of Meteorology, Hydrology and Climate Change, Viet Nam. Salient extracts have been provided in Annex 3.

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):

With the implementation of the project activity, the emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. The project activity is *additional* and would have not occurred anyway due to the barriers identified below.

In compliance with the "Tool for the Demonstration and Assessment of Additionality", the investment analysis (step 2) has been selected as an appropriate method to demonstrate additionality:

Step 1. Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Sub-step 1a: Define Alternatives to the Project Activity

The following three scenarios are presented for consideration with respect to likelihood and credibility:

a. The proposed project activity undertaken without being registered as a CDM project activity;
b. Construction of a fossil-fuel fired power plant or any other energy renewable power plants with equivalent amount of annual electricity generation;
c. Continuation of the current situation (no project activity or other alternatives undertaken)

An analysis of the three options identified above to identify the most realistic and credible alternative is presented below:

- Alternative (a) is not a credible nor realistic alternative as, according to the investment analysis presented in section B.5 below, without the assistance of the CDM, the project is not a financially attractive for investment.
- Alternative (b) is also not realistic nor credible because, with respect to energy, the Viet Long Industry J.S.C only has experience in the field of hydropower project development and therefore a coal fired power station or wind farm is not an option.

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2 Study, Definition of Vietnam Grid Emission Factor, Department of Meteorology, Hydrology and Climate Change, Viet Nam (Table 3)

- Alternative (c), where there is a continuation of the current situation (no project activity or other alternatives undertaken) and electricity is provided from the Viet Nam national grid, is a credible and realistic scenario (hence it is the baseline scenario).

Sub-step 1.b: Consistency with Mandatory Laws and Regulations

The only identified alternative to the project proceeding with carbon revenue from the CDM is alternative (c) and this in compliance with all Viet Nam legal and regulatory requirements.

Step 2: Investment Analysis

Sub-step 2a: Determine Appropriate Analysis Method

This is a large scale project activity. Hence, additionality of the project has to be demonstrated as per the Additionality Tool Ver. 05.2. The tool for the demonstration and assessment of additionality provides three methods of analysis: simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III).

The simple cost analysis (option I) cannot be employed because the proposed project produces economic benefits other than CDM related income (through the sale of electricity). Therefore, the project developer has the choice of using either Option II - "investment comparison analysis" or Option III - benchmark analysis. Of the alternatives, the project developer has chosen option III- benchmark analysis to demonstrate the additionality of the proposed project activity.

Sub-step 2b: Option III. Apply Benchmark Analysis

Additionality Tool, version 05.2 stipulates that the project developer should identify the financial / economic indicator, such as IRR, most suitable for the project type and decision context. As prescribed by the Additionality Tool itself, the project developer has chosen project IRR to demonstrate the additionality.

The project IRR needs to be compared with a benchmark to prove the financial unattractiveness of the project. The Additionality Tool stipulates that the benchmark/discount rates shall be derived from *inter alia* "Government/official approved benchmark where such benchmarks are used for investment decisions";The 'Guidance on the Assessment of Investment Analysis', issued by EB in its 41st meeting, requires that "*In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE".* Hence, when the Additionality Tool and Guidance are read together, the selected benchmark should satisfy three conditions: it should be Government/official approved; it should be used for investment decisions; and it should be publicly available data source so that DOE can validate.

Guidance on the Assessment of Investment Analysis states that, "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". Keeping the above in view, the project developer has selected the commercial lending rate offered by commercial banks in Viet Nam at the time the decision making. The average prime lending rate over a period

preceding the decision was used with the legally mandated mark up[3] to arrive at the commercial lending rate of 12.54%.

- The lending rate of commercial banks is based on the State Bank of Viet Nam and hence it is *official rate*;
- The benchmark is *used* by commercial banks *to take a financing decision* in as much as a project which cannot service the interest does not merit consideration by bank; and
- The benchmark is *publicly available* data source and *verifiable by DOE*.

The benchmark chosen, therefore, fulfils all the criteria laid down by the Additionality Tool[4] and is considered conservative. The project developer has selected this rate as the benchmark as this covers the cost of the loan and also provides a return on equity (which is much riskier than term loan).

Sub-step 2c: Calculation and Comparison of Financial Indicators

The following input parameters were considered in making the projected income statement and IRR computation:

[3] State Bank of Viet Nam and Vietnamese civil law codes

[4] And also the *Guidance on the Assessment of Investment Analysis*, Point No.11 (page No.3)

Table B.3: Key Input Parameters

Parameters	Value	Basis
Installed capacity (MW)	20 (11 for first cascade 9 for second)	Feasibility Report
Plant load factor (%)	44.65 %	Computed
Annual power supplied to the grid (MWh)	76,665	From Feasibility Report
Auxiliary consumption (as percent of generation)	2%	General norm, transmission and distribution losses
Total Investment (million VND)	431,591,763[5]	Feasibility Report
Loan: equity ratio	70:30	Feasibility Report
Power tariff (Dong/ kWh)	675.27	Feasibility Report
O&M cost (as percent of project cost)	0.75%	EVN regulations 2014/QD-BCN
Insurance (as percent of project cost)	0.25	Estimate
Interest rate on term loan – in VND	12%	Feasibility Report
Loan repayment period (years)	10	Feasibility Report
Initial moratorium period (years)	2	Assumed and common practice for such loans in Viet Nam
Depreciation – Equipment	10%	Present practice in Viet Nam and Feasibility Report
-Civil works	5%	Present practice in Viet Nam and Feasibility Report
Natural Resource Tax (as percent of revenue)	2%	Ordinance on Natural Resource Tax
Enterprise Income Tax First four years Next nine years After thirteen years	 0% 12.5% 25%	Law No 14/2008/QH12 dt 03/6/2008 and Decree No. 124/2008/ND-CP dt. 11/12/2008
Life of the project (years)	30	Feasibility Report

Investment in the construction of electric power plants falls under List A domains and lines of business and hence is eligible for investment preferences as per the Decree No. 124/2008/ND-CP dated 11th December 2008. Moreover, the project activity is located in List C of geographical area with extreme socio-economic difficulties and hence is eligible for investment preferences by the said Decree. The line of activity and the location of the project, therefore entitles it to certain tax concessions, which have been duly accounted for in computation of tax. Moreover, it has been ensured that all the expenditures are allowable as charge on the profit and loss account as per the Decree.

The income statement and the project IRR corresponding to the 20 MW capacity project has been computed based on the above input parameters. In computing the project IRR, profit after tax,

[5] This cost corresponds to the cost of 18 MW, the capacity with which the project was originally registered. Although for changing the capacity post registration from 18 MW to 20 MW the cost have gone up, but the same is kept unchanged for the sake of conservativeness.

depreciation, interest on term loan and salvage value have been taken as cash inflow and the entire project cost as cash outflow as suggested by the Guidance on the Assessment of Investment Analysis. Although the IRR has been computed for a period of 30 years and the entire assets are fully depreciated, salvage value has been provided for. Based on the above, the project IRR works out to 9.31 % as against the benchmark return of 12.54%. Table B.4 presents the result of the IRR analysis in comparison with the bench mark identified in sub-step 2b.

Table B.4: Comparison of IRR with the benchmark rate of return

	Project IRR	Benchmark
Values	9.31%	12.54%

The IRR estimate is quite conservative in the sense that the project cost does not include any of the administrative and operational expenses during construction. Likewise, the operating statement is also conservative as no escalation in O&M expenses has been taken despite the inflation rate of over 25% and administrative salaries have not been provided. If provisions are made for this, IRR will come down further.

Sub-step 2d: Sensitivity Analysis

The robustness of the conclusion drawn above has been tested by subjecting critical assumptions to reasonable variations. Guidance on the Assessment of Investment Analysis defines critical assumptions as those which constitute more than 20% of total project costs or total project revenue and reasonable variation has been defined as a range of +10% and - 10% (item No 16 and 17 of the Guidance). Four factors have been identified as sensitive, viz., project cost, PLF, O&M cost and tariff. Though O&M cost does not account for 20% of total cost (total operating cost), it has been considered as interest on term loan and depreciation are not subject to variations as they are determined by project cost and loan documentation. Likewise, both civil works and equipment cost account for more than 20% of the total cost. Though non-tangible costs account for less than 20%, as they are eventually apportioned to tangible fixed assets, entire project cost has been subjected to reasonable variation as. The impact of a ‘reasonable variation’ in these three parameters on the project IRR have been worked out and the results are as follows:

Table B5: Sensitivity Analysis

Project IRR	**-10%**	**0**	**+10%**
PLF	7.98%	9.31%	10.62%
Project cost	9.92%	9.31%	8.76%
O&M cost	9.40%	9.31%	9.23%
Tariff	7.95%	9.31%	10.65%
Benchmark		12.54%	

It could be seen from the above that even under the most optimistic conditions, the project IRR will not cross the benchmark. The financial unattractiveness of the project is thus evident. Having said that, it needs to be mentioned that the PLF is based on the hydrological study and the most optimistic scenario is usually considered while preparing the income statement. Since it is dependent upon climatic conditions, higher PLF is a very remote possibility. O&M costs is not a very major assumption at all and the project

is absolutely insensitive to the change in the O&M cost as could be seen that project IRR goes up by only 9 basis points (0.09%) when the O&M cost is brought down by 10%.

Reduction in project cost is also equally highly unlikely as the country hits the highest inflation within a decade. Though the inflation rate has touched 15.7% in February 2008[6] and still had gone up further to 25.2% in May 2008. In the above background, the possibility of any reduction in project cost is highly unlikely. In fact, the costs associated with the project have risen significantly since the feasibility study whilst the power tariff will be locked in the power purchase agreement (PPA). In the above background, the most plausible scenario is only a reduction in the PLF and increase in project cost and not the other way round. Such an occurrence will undoubtedly worsen the project's IRR further and gives greater need for assistance from the CDM.

The project, therefore is not a business-as-usual scenario and hence additional. The CDM benefits will enable the project to improve its return and become viable, as evident from the fact that with CDM benefits, the project will earn a return of 16.13 %. It is in the above background, the CDM registration is requested.

Step 3: Barrier Analysis

As this step is optional, PP elects to use only the financial barrier to prove the additionality of the project.

Step 4: Common Practice Analysis

Setting up of hydro power projects of this size and that too in the private sector is not a common practice in Viet Nam. Most of the hydro power plants are owned by the State or benefit from State involvement at some level, most important in a country such as Viet Nam where contacts and government connections are key. Based upon an exhaustive research on the hydropower projects in Viet Nam, 121 hydropower plants (those seeking CDM registration or not yet started construction were not included in the study) were identified which included details of hydro power plants presently in operation[7], those that have permission granted to build power plants from 2006-2008[8] and those that fall into the build own operate (BOO) or build operate transfer (BOT) category of projects[9].

It is submitted that at the time of writing for global stakeholder consultation, this was the most comprehensive list of power plants in Viet Nam to have been submitted for global stakeholder consultation as it listed both Government owned plants and Independent Power Producers (IPPs). This was confirmed by letter from a senior official at the Ozone Layer Protection Centre (an institute under the Viet Nam Ministry of Natural Resources and Environment responsible for the calculation of Vietnam's grid emission factor).

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[6] http://www.atimes.com/atimes/Southeast_Asia/JC18Ae02.html, downloaded on 15/06/2010

[7] http://www.industcards.com/hydro-vietnam.htm, downloaded on August 14, 2008

[8] EVN Masterplan for Electricity production 2005-2015

[9] Overview of Policy Instruments for the Promotion of Renewable Energy and Energy Efficiency in Viet Nam, 2005: http://www.serd.ait.ac.th/cogen/62/reports/countries/vietnam.pdf

The results of this study have been furnished to the DOE and have been categorised into those, which are privately owned and those that benefit from some kind of state involvement. Examples of the latter may be power plants which are wholly owned by the EVN, are state owned IPPs or have the EVN as a shareholder / equity investor.

It can be seen from the study that:

- The majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (107 or 88% of projects listed).
- Of the hydro power plants with state involvement, the large majority are over 15 MW in size (87 or 81% of the 107 projects with state involvement).
- Of the plants that are considered privately owned (14 or 12% of identified projects), only one of them would cross the CDM large scale / small scale threshold of 15MW generation capacity as Thanh Thuy does (1 “similar” project).

The remaining project is not comparable with Thanh Thuy in that the plant, Suoi Vang, was built in 1943[10]. It does not compare with Thanh Thuy as it was constructed in a different financial climate.

From the above statistics and analysis, it is seen that there are no plants comparable to Thanh Thuy.

It can also be seen from the study that a vast majority of the hydropower projects which may be classified as large, are developed with state involvement (see below). The instances in which private developers undertake this kind of activity are also seen to be quite limited. Indeed, as it is demonstrated that only 1 from 121 plants are open to comparison with Thanh Thuy (over 15MW capacity and privately owned), it is therefore concluded that the construction of hydropower plants of the size of Thanh Thuy by private corporations is not a common practice in Viet Nam.

It should be noted that in the interest of conservatism that when carrying out the study, for those plants for which no information could be publically found (the market is not transparent), it has been assumed that they are privately owned. In fact therefore, the figures above could further demonstrate that the Thanh Thuy project is not common practice.

Also, the companies that have been identified as having solely private investors have been found to be large corporations. Viet Long JSC, the developer of the Thanh Thuy project, is incorporated by individuals and hence mobilisation of capital resources is not an easy task.

It is not only that the EVN has monopolized all the large power plants; it is also proposing to enter into small scale hydro power projects as well. A news report on the Vietnam Chamber of Commerce and Industry website reveals that “the State-owned Electricity of Viet Nam Group (EVN) plans to build 37 small hydropower plants with the total investment of VND3.1 trillion (US$193.75 million) in the Viet Nam-China border by 2010”[11]

[10] http://vietnamnews.vnagency.com.vn/Domestic-Press-Highlights/154982/Nations-oldest-hydropower-plant-gets-facelift.html

[11] http://www.vccinews.com/news_detail.asp?news_id=13060 (last retrieved on 27/07/2010)

The fact that setting up of hydro power plants such as Thanh Thuy by the private sector is not a common practice places the project in a disadvantageous situation with respect to those developed by the government or EVN. The involvement of state owned companies in a country like Viet Nam helps the project significantly, as in the power purchase agreement, permit application and People's Committee approval processes they can use their Government contacts to help project progress (as noted in interview with the PP). Indeed, in "*A study on project success factors in large construction projects in Viet Nam (2004)"* by Nguyen *et al*, the authors conclude that the top three critical success factors for developing projects of this kind are (in order):

1) Competent project manager;
2) Adequate funding;
3) Multi-disciplinary / competent project team.

As a privately developed project, Thanh Thuy is at a disadvantage when compared to stated owned / state involved projects when it comes to considering two of the top three criteria: access to adequate funding and human resources. Government backed projects are more likely to have adequate funding as even through the recent global financial crisis, the government carried on spending and increased its debt levels[12] while project developers throughout the world found access to capital a barrier to implementation. In terms of resources, the state is much more likely to be an employer in a country such as Viet Nam than another comparably sized economy due to its Socialist nature and high levels of state ownership (as evidenced by the figures below, the state does own or have a stake in 88% of the hydroelectric projects that are not seeking CDM sponsorship in Viet Nam).

Another significant consideration is that the other projects listed in the dataset have not been subject to the recent surge in inflation during the construction phase as Thanh Thuy has. As normal, with inflation, interest rates have also risen sharply and this has led to a large number of hydropower plants' development being perpetually delayed. The CDM will enable the Thanh Thuy hydropower plant to be developed despite this, and ensure emission reductions take place.

A further examination of the statistics reveals the following:

- The vast majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (107 or 88% of projects in the data set).
- Of those 107 projects, 86 (80%) are 20MW or over.

This demonstrates that the common practice is in fact the development of large scale hydropower by the state, and not by private enterprise.

Besides the reasons for state involved projects to be more likely to succeed as identified by Nguyen *et al*, by virtue of the fact that the State projects are large in size as revealed in the above statistics, the economies of scale work in favour of those projects and render them more profitable and hence safer. The Thanh Thuy hydropower project is located in a very remote part of one of the poorest provinces in Viet Nam and employs a relatively small run-of-river reservoir. Hence, the project has to confront more

[12] http://vietnambusiness.asia/government-debt-increase-exceeds-allowable-ceiling-level/ and http://vietnambusiness.asia/vietnam-listed-among-countries-with-highest-public-investment-rate/ (last retrieved on 20/09/2010)

barriers than even a similar sized project if it is set up by the State Utility. The CDM registration will therefore enable the Thanh Thuy hydropower plant to overcome the barriers and contribute its mite to the global emission reduction effort.

The PDD's common practice analysis is also supplemented following the publishing of new data since the global stakeholder consultation period. The new data comes in the form of a Grid Emission Factor study, recently made available by the Vietnamese DNA, which contains data to calculate build margin.

The newly available data confirms which projects were built in Vietnam since 2005. This is a very important year as it is when two of the most important items of Vietnamese Government policy with respect to energy infrastructure development were published and updated. The two policy documents are:

Table B6

Policy Document	Description
The Electricity Law 2005	The Electricity Law governs all entities involved in electricity activities, which include planning and investment in electricity development, generation, transmission, distribution, wholesale and retail electricity sales, and the monitoring and regulation of the electricity market[13].
National Power Development Plans	Power Developments Plans (PDPs) are the main strategic planning tool for the power sector. A PDP includes the following: (i) an Electricity Demand Forecast to predict the capacity (MW) and energy (GWh) demand in the future, and (ii) a Least Cost Expansion Plan giving the infrastructure needed to meet that demand at all times for the forecast period and at the lowest possible cost, while maintaining system reliability and quality of supply, (iii) a Transmission Expansion Plan to transmit the generated electricity to the costumers, (iv) a Fuel Supply Assessment to determine the national energy resources (coal, gas, oil) that would be available for energy generation, (v) a Rural Electrification Program for electricity supply to remote areas that cannot be covered by the national grid, and (vi) an Investment Program on how to finance the future investments in the energy sector.[14]

It is submitted that any hydroelectric plants which came into operation after 2005 are therefore not comparable with the proposed project as they were developed and constructed in a different political framework than those that came before.

Of the hydroelectric plants identified in the report, the following differences were observed (Table B7) when compared with the proposed project (CDM projects not included in build margin calculation):

[13] http://www.mekongresearch.com/doc/Briefing%20on%20Vietnam's%20Electricity%20Law%202005.pdf

[14] http://www.gms-eoc.org/CEP/Comp1/docs/Vietnam/Scoping/VN_ScopingReport.pdf

Table B7

Project Name	Date of Commissioning	Differences with the Proposed Project
A Vuong	2008	EVN owned and developed power station
Srok Phu Mieng	2006	Developed by IDICO, a state involved IPP
Se San 3a	2006	EVN owned and developed power station
Tuyen Quang	2008	EVN owned and developed power station
Dai Ninh	2008	EVN owned and developed power station
Se San 3	2006	EVN owned and developed power station
Quang Tri	2007	EVN owned and developed power station

The picture painted by the DNA's data (of a lack of hydroelectric power coming online in Viet Nam since 2005), is borne out by the fact that the share of hydropower in Viet Nam to the overall generation mix has fallen from 39.7% in 2004 to 34.7% in 2008 (please see table B9).

As per the reasons discussed above, Government and State-involved projects benefit from their ownership structure in a way that privately developed hydropower projects cannot, and so they are not comparable.

As no projects constructed since 2005 (when the Electricity Law came into force and the latest National Power Development Plan was issued) are considered comparable, the same conclusion is reached as in the original analysis: development of the proposed project by private industry is not a common practice, in fact the common practice is large scale hydro development by the State.

Prior Consideration of the CDM

The CDM benefit was identified by the Board of Directors of the Thanh Thuy hydropower plant project as imperative to make the project financially attractive. A resolution to this effect was passed by the Board of Directors on 20 April 2008. After the Board accorded approval, a contract was signed with CDM consultant on 26th June 2008. The construction contract has been signed on 08 December 2008. And following the guidelines from EB on prior consideration of the CDM, the Notification from the project owner has been acknowledged on 06 May 2009 (please refer to Table B.8).

Table B.8

Action	Date	Source
First presentation from CDM consultant	01/04/2008	Interview
Board of Directors meeting to decide to proceed with Than Thuy project as CDM revenue makes project feasible	20/04/2008	Board resolution
Contract for CDM	26/06/2008	Carbon Asset Management Agreement
First contract for civil construction signed*	08/12/2008	No. 05/HD-XD
Prior Consideration of CDM	06/05/2009	No. 16/TB-CT

*Taken as project start date

It could be seen from the above that the PP had taken simultaneous action to secure CDM status with the implementation of the project. Therefore, the project activity fulfils both the conditions stipulated by EB vide annex 22 in its 49th meeting.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

In order to calculate the baseline, project and leakage emissions and hence emission reductions, methodology ACM0002 is used in conjunction with the "Tool to calculate the emission factor for an electricity system (Version 2)" including the following steps:

1. Calculation of baseline emissions;
2. Calculation of project emissions;
3. Calculating leakage emissions;
4. Calculating emission reductions.

1. Baseline Emissions

Step 1: Identify the Relevant Electric Power System

As per section B.4., the identified business as usual scenario is the continued generation of power by the Vietnamese national grid system, and baseline emissions are those produced as a result of this. Therefore, the Viet Nam national grid is identified as the relevant electric power system.

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

This step is skipped as only grid connected power plants are considered.

Step 3: Select an Operating Margin (OM) Method

In this case, the Simple Operating Margin has been calculated. In order to use the Operating Margin, assumption has been made with respect to "low cost" and "must run" resources. These are defined as "as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants."

The report by the Department of Meteorology, Hydrology and Climate Change (GEF report) defines only hydropower as "low cost" and "must run" power stations. As the contribution of hydropower to the grid's supply capacity is well below 50%, it is safe to assume that "low cost" and "must run" power stations do not make up more than 50% of the grid's input (please refer to table B9). Therefore the "Simple Operating Margin" can be calculated for the purpose of deriving the grid emission factor as per Step 3 of the tool to calculate emission factor from an electricity system.[1]

Table B.9. Contribution of low cost and "must run" sources to overall power generation in Viet Nam[15]

Year	2004	2005	2006	2007	2008	Average
Percentage share of low cost and "must run" power stations	39.71	32.52	34.13	33.74	34.72	34.77

The emission factor using the Simple Operating method has been calculated using a three year generation-weighted average, based on the most recent data available at the preparation of the GEF report, without requirement to monitor and recalculate the emissions factor during the crediting period. The years used are therefore 2006-08 inclusive.

<u>Step 4: Calculate the Operating Margin Emission Factor According to the Selected Method</u>

As per the GEF report, Option A under Step 4 of the tool to calculate grid emissions is employed. Here the Simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \qquad (1)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating 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)
m = All power units serving the grid in year *y* except low cost / must run power units
y = The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex ante* option).

Furthermore for each power unit *m* as data on fuel consumption and electricity generation were available, the emission factor ($EF_{EL,m,y}$) were determined as follows (Option A1):

$$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}} \qquad (2)$$

[15] EVN data and interview with EVN generation expert, attended by the DOE

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power unit m in year *y* (Mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)

$EF_{CO2,I,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

m = All power units serving the grid in year *y* except low-cost / must-run power units

I = All fossil fuel types combusted in power unit *m* in year *y*

y = The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex ante* option) or the applicable year during monitoring (*ex post* option), following the guidance on data vintage in step 2

Step 5. Identify the Cohort of Power Units to be Included in the Build Margin

It was found that the most recent set of power plants which generate 20% of the country's electricity generated more power (MWh) in 2008 than the five most recently built power stations. As such, the weighted carbon emissions from the former were used to calculate the build margin.

For the first crediting period, the build margin emission factor will be calculated *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation (Option 1).

Step 6. Calculate the Build Margin Emission Factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EC_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4)$$

Where:

$EF_{grid,BM,y}$ = 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)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) will be determined as per the guidance in step 3 (a) for the simple OM, using options B1 and B2, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

<u>Step 7. Calculate the Combined Margin Emissions Factor</u>

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (5)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

The weightings used are as follows: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period.

<u>Calculate of the Baseline Emission *(BE_y)*</u>

The baseline emissions (BE_y in t CO_2e) are the product of the baseline emission factor (EF_y in tCO_2e/MWh) multiplies with the electricity supplied by the project activity to the grid EG_y in MWh)

$$BE_y = EF_y \times EG_y \quad (6)$$

In addition to the guidelines in the "“Tool to calculate the emission factor for an electricity system”, ACM0002 states:

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

Where:

BE_y = Baseline emissions inyear *y*($tCO_{2/}$yr)

$EG_{PJ,y}$ = Quantitiy of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y*(MWh/yr)

$EF_{grid,CM,y-}$ = Combined margin CO2 emission factor for the 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)

The result is the same; baseline emissions multiplied by the amount of electricity supplied to the grid by the project equate to emission reductions

2. Project Emissions

From the Reservoir

There is no reservoir associated with this project. Therefore, the project emissions from the project activity are considered to be zero.

3. Leakage

As per methodology ACM002, version 10, the project owner does not need consider leakage.

Therefore:

$$LE_y = 0 \tag{8}$$

4. Emission Reductions

Emission reductions are calculated as follows

$$ER_y = BE_y - PE_y - LE_y \tag{9}$$

Where:

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

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

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	The combined margin emissions factor for the Viet Nam national grid (for 2008).
Source of data used:	Study, definition of the Viet Nam Grid Emission Factor by the Department of Meteorology, Hydrology and Climate Change, Viet Nam
Value applied:	0.5764
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value been calculated as per the “Tool to calculate the emission factor of an electricity system (Version 1.1)” as specified by the applicable methodology (ACM0002 Version 11). It also represents the latest available data at the time of submission of the project for validation.
Any comment:	

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

Based on the proposed project’s feasibility study, the annual electricity generated and supplied to the grid is 34,499 MWh with the first cascade increasing to 76,665MWh with the second cascade. Therefore, according to formula (6) and (9), repeated below for convenience, the annual emission reductions in the first crediting period can be calculated as follows:

$BE_y = EF_y \times EG_y$ (6)

$ER_y = BE_y - PE_y - LE_y$ (9)

First year:

ER_y = (34,499 x 0.5764 – 0 – 0) = 19,885 tCO_2e

Subsequent years:

ER_y = (76,665 x 0.5764– 0 – 0) = 44,190 tCO_2e

Thus the annual emission reductions attributable to the proposed project activity are 40,718 tCO_2e.

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

Year	Project Activity Emissions (tCO_2e)	Baseline Emissions (tCO_2e)	Leakage (tCO_2e)	Overall Emission Reductions (tCO_2e)
01/04/2011 to 31/03/2012	0	19,885	0	19,885
01/04/2012 to 31/03/2013	0	44,190	0	44,190
01/04/2013 to 31/03/2014	0	44,190	0	44,190
01/04/2014 to 31/03/2015	0	44,190	0	44,190
01/04/2015 to 31/03/2016	0	44,190	0	44,190
01/04/2016 to 31/03/2017	0	44,190	0	44,190
01/04/2017 to 31/03/2018	0	44,190	0	44,190

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data to be used:	Site measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Forecasted data based on design: 34,499 / 76,665 Actual data will be monitored during the project operation period.
Description of measurement methods and procedures to be applied:	Electricity meters, continuous measurement and at least monthly recording
QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity

B.7.2. Description of the monitoring plan:

A final monitoring plan will be prepared prior to the start of the crediting period based on the as-built project activity. It will address the following aspects:

1. The CDM monitoring team and allocation of responsibility to ensure compliance with the monitoring requirement of the methodology is given here below:

Position	Responsibilities
Operational staff	• Ensure meter readings are captured in standard format
Site Supervisor	• Ensuring monitoring takes place • Initial check for anomalies (e.g. Significant changes against previous readings or expected values) • Site record management • Communication of meter readings to Project Director • Attendance at annual verification
Project Director	• Collation of metered data from the project site • Collation of confirmation records from EVN (see Annex 4) • Monthly cross-check of confirmation records against metered data

	Tasks description	Operator	Supervisor	Project director	CDM Consultant
Monitoring activity					
1	Recording of monitored data	✓			
Quality Assurance & Quality Control					
2	Verification of data monitored (consistency and completeness)		✓		
3	Ensuring adequate training of staff		✓		
4	Ensuring adequate maintenance		✓		
	Ensuring calibration of monitoring instruments		✓		
5	Data archiving: ensuring adequate storage of data monitored (integrity and backup): 2 years after the end of the crediting period			✓	
6.	Identification of non-conformance and corrective/preventive actions and monitoring plan improvement		✓		
7	Emergency procedures		✓		
8	External audit				✓
Calculation of GHG emission reductions and reporting					
9	Processing of data and calculation of emission reductions			✓	
10	Monitoring report: management review of monitoring report (internal audit)			✓	

2. Monitoring point

- Net electricity generation of the project will be measured and monitored through the use of on-site metering equipment at the outgoing feeder the hydropower plant.
- There are two systems, one main and the other one is the backup system.

Additional information is available at Annex 4.

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):

26/02/2010.

Mr. David L. Shaw
Kyoto Energy Pte. Ltd.
80 Raffles Place
UOB Plaza 1, Level 36-01
Singapore 048624

Tel.: +65 6248 4728	Fax: +65 6248 4531	Email: info@kyotoenergy.net

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:

As per the guidance of EB41 meeting report, the project activity started on 08/12/2008 when the project proponent signed the construction contract.

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

30 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:

Upon commercial operation date, currently planned for 01/04/2011 or date of registration – whichever is 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

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

Preparation and Construction

In the preparation and construction stages, the project will cause environmental impacts, however they are only temporary and considered relatively small.

Impacts on Air Quality (Including Noise) During Construction

During construction, Dust, Exhaust gases and Noise generated from the following activities:

- Land clearance, concrete mixing, exploitation, temporary road construction and a considerable amount of transport activity ;
- Dust: As such, during this stage, airborne dust may increase remarkably unless effective mitigation measures are taken. The two main type of dust are rock dust and cement dust. No toxic or hazardous dust will be generated. The diffusion of dust is largely caused by excavation and backfill. Besides, the unintended leakage of refuse during transport may also increase the amount of dust in the air.
- Exhaust gases from transport activities and other motorized as activities such as: bulldozing, excavation, drilling, concrete mixing, etc.

Impacts on Water Quality During Construction

- The construction of Thanh Thuy Hydropower shall not lead to significant lasting change to the flow and quality of river water. Water quality may be temporarily affected as a result of excavating and land clearance activities, the washout of rock, sand and grit from dump site during construction. When the construction is complete, the quality of water will revert to normal.

Solid Waste During Construction

- Solid waste will be generated from human activities and land clearance.

Impact on soil environment during construction:

During construction phase, due to the excavation of rock and soil for the construction of foundation and road, the administrative building and site hut, hydropower plant at the project site etc. Therefore, the regolith with vegetation at the construction site may disappear entirely, leading to a number of negative effects such as:

- Changing the discharge channel of surface water may form concentrated flow areas which cause marked erosion
- Forming the bend, increasing the probability of landslide on the downhill slope

Operation

Following construction, the hydropower plant will inevitably lead to some environmental impacts, but again, the environmental assessment regards these as relatively low:

Impact on air quality (including noise) during operation:

- When coming into operation, Thanh Thuy Hydropower plant will help forming ideal weather and fresh air. No noise and dust, solely the noise from machine which is relatively insignificant and affect only within the sphere of the plant.

<u>Impacts on Water During Operation</u>

- There will only be a negligible affect on water quality due to domestic wastewater from workers who are in machine operation and maintenance.

<u>Impacts on Ecosystems</u>

- Small negative impacts on Ecosystem during operation shall be negligible.

Preventative, Mitigation and Compensation Measures

The project proponent has committed to the following measures in order to mitigate and prevent environmental impacts as a result of the project:

- Using modern facilities and equipment to reduce noise and limit the quantity and potency of emissions.
- Spraying water to decrease the magnitude of airborne dust.
- Implementing construction in the dry season to minimize landslide as happened in almost other constructions.
- No rock or solid waste shall disposed of to the river bed. Proper landfill sites shall be managed properly at each construction phase. While implementing the road construction, it is essential to avoid levelling off the rock and earth in the vicinity of river bank. As for refuse dump, there must be a discharge channel so as to avoid the risk of contamination of water source. Earth from land clearance is used for land filling in the project site.
- Oil used in the transformer will be replenished and removed in a safe manner by a third party contractor with the necessary experience and developed handling procedures required for the task. Staff onsite will however be trained so they are aware how potentially damaging to the environment the transformer oil can be.
- Afforestation to keep the water clean, recovering the eco-system after impounding
- Regular water samples to be taken so as to test the quality of water (by concerned authorities)
- Building the toilet according to set standard.
- Waste water will be treated to meet the Viet Nam Environmental Standards before discharging to the environment.
- Stringently examine the discharging of organic substances. Waste will be collected, buried or incinerated as regulated.
- Committing to monitor the environment as required by Vietnamese law.

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 environmental impacts of the project are not considered significant by the Vietnamese authorities and hence the EPC (Environmental Protection Commitment) was approved by the People's Committee of Vi Xuyen district on June 30th 2008.

SECTION E. Stakeholders' comments

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

The stakeholder meeting for Thanh Thuy Hydropower project was conducted in the Administrative Building of Thanh Thuy Commune People's Committee, Vi Xuyen District, Ha Giang Province, Viet Nam at 08:30 am on July 28th, 2009. Viet Long Industry JSC., held this meeting in collaboration with the CDM consultant. Personal invitations were sent to community leaders, the local People's Committee representatives, Media etc. and public notices of the planned consultations were placed in the Ha Giang Newspaper which is widely published and read in the provinces. During the consultation, presentations were made by the project owner and consultant outlining the planned project activities in a non-technical manner (including environmental, social and technological considerations), climate change, the role of the Clean Development Mechanism and annual emission reductions potential. In addition, questionnaires were circulated and filled in by the attendees to gauge their views on and concerns regarding the project. There were 26 attendees including experts from Vi Xuyen Department of Natural Resources and Environment, Ha Giang Power Company, Vice Chairman of Thanh Thuy Commune People's Committee, Chairman of Thanh Duc Commune People's Committee and representatives of households near the project site.

Fig.E. 1 – Picture of the local stakeholder consultation meeting on 28 July 2009

E.2. Summary of the comments received:

The attendees demonstrated keen interest in the Thanh Thuy project activities. After the presentations were done, they filled in the questionnaires and provided their comments. A summary of the feedback to which a majority of the participants agreedis presented below:

- 60% of participants believed that the project would result in accident risks during construction and operation phase; in particular the excavation phasephase while 45% of those said that there is a possibility of landslide in the project site which would affect the socio-economic status of the project.

- 75% of attendants agreed that the project would create new transport routes and infrastructure inside or around the local area - providing convenient transportation of local residents. Slightly more than 30% of those highly appreciated the job creation that the project represents.

- 65% of participants expressed the concern that the project partly used farm land and would thus have some negative impact..

Apart from the above views, a small proportion of participants were concerned about the risk of hazardous, toxic or noxious substances contaminating land or surface water or groundwater which might pose threat to human health.

After finishing the presentations of both owner and consultant, the representatives asked the following questions verbally:

- Which projects in Viet Nam received revenue from CDM? And How to calculate the amount of emissions?
- How many projects have been registered up to now in Viet Nam?
- How will the fines of developed countries be used if the amount of emissions surpass the emission standards?

In general, the project received positive response from the local community. They foresaw positive impacts on social, economic and environmental aspects because of the project. Moreover, all concerns about environmental aspects have been addressed by the project owner prior to the implementation of the project.

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

The project owner answered and explained in detail each comment from attendants in stakeholder meetings.

- About the noise and risk in construction, or landslide, the project owner pointed out that the impact is temporary during the construction and the company would apply the mitigating methods as defined in approved EIA report.
- Replying to the comment on land use, project owner said the impact would be minor and confirmed that the company had complied with the Vietnamese law and regulations on compensation for any agricultural land used for the project.
- About the comment that the construction of the project might lead to releases of substances which might be pollutant, hazardous, toxic or noxious, the project owner confirmed that they would follow the relevant law and regulations on construction and operation of hydropower plant.

Answering for the questions raised by the attendants on CDM, the CDM consultant gave answers on behalf of the project owner. For example, in order to answer the last question, the consultant gave England as a developed country. If a certain company were to be fined for non-compliance to emission limits, the fine money either would either go to the government’s budget for energy proficiency or help the poorer developing countries to undertake sustainable development.

The project owner assured that:

- The project's construction and operation would be in line with the environmental and health and safety laws of Viet Nam;
- As the project is run-of-river and does not employ a reservoir, it's environmental impact is relatively low;

In addition, participants were informed of the voluntary pledge of 2% of CER revenue to be specifically donated to sustainable development which could include:

- Construction of new infrastructure including new roads, healthcare centre, cultural centre, etc.
- Supply of consistent power at a reasonable retail price.
- Sponsorship of local community events

Annex 1

CONTACT INFORMATION OF PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	Francois Gigante
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Neither public nor ODA funding from an Annex 1 country was applied for by the project proponent for the project.

ANNEX 3 - BASELINE INFORMATION

Table AN.1 Amount of consumption, emission and power generation in the most recent 3 years (2006, 2007, 2008)

Power plants	**Fuel consumption** Coal, oil: kton Gas: mm^3)	**Power generating to the grid** (MWh)	**Emission** (t CO_2)
2006			
Coal thermal power plants	5,645.86	8,989,230	11,823,610
Gas turbines		26,543,028	12,479,558
Gas turbine using gas	5,743,235.28	18,838,764	12,244,632
Gas turbine using oil	70.14	1,308,583	234,927
Add-on	0	10,073,917	0
Diesel thermal power plant	397.65	1,043,991	1,327,593
Diesel power plant using FO	16.60	80,000	51,642
Diesel power plant using DO	6.39	25,000	20,495
Imported power		937,000	0
Total		37,618,249	25,702,898
2007			
Coal thermal power plants	6,386.09	9,836,406	13,272,897
Gas turbines		29,474,917	13,116,062
Gas turbine using gas	5,910,941.84	20,023,590	12,570,669
Gas turbine using oil	163.27	557,880	545,394
Add-on	0	8,893,446	0
Diesel thermal power plant	614.06	1,834,408	2,046,368

Diesel power plant using FO	25.15	104,626	79,867
Diesel power plant using DO	9.16	42,000.00	29,087.81
Imported power		2,629,000	0
Total		43,921,357	28,544,283
2008			
Coal thermal power plants	6,483.99	10,055,394	13,378,811
Gas turbines		33857134.85	14716799
Gas turbine using gas	6,839,114.84	22,396,231	14,535,266
Gas turbine using oil	54.35	183,088	181,533
Add-on	0	11,277,816	0
Diesel thermal power plant	534.59	1,481,880	1,784,825
Diesel power plant using FO	22.48	90,465	71,385
Diesel power plant using DO	3.73	15,000.00	11,878.75
Imported power		3,220,000	0
Total		48,719,874	29,963,699

Table AN.2 Total emission and power generation of the most recent 3 years

	2006	**2007**	**2008**	**Total**
Total power generation (MWh)	37,618,119	43,921,501	48,719,874	**130,259,494**
Total emission (tCO2)	25,702,918	28,544,283	29,963,699	**84,210,900**

Table AN.3 Result of OM emission factor in 2008

Year	**Total power generation (MWh)**	**Total emission(tCO_2)**	**OM $_{2008}$** (tCO_2/MWh)
	A	B	(∑B/∑A)
2006	37,618,119	25,702,918	
2007	43,921,501	28,544,283	
2008	48,719,874	29,963,699	
Total	**130,259,494**	**84,210,900**	**0.6465**

Table AN.4 Calculation of BM emission factor in 2008

Power plant	COD year	Fuel consumption (Coal, oil: kton Gas: mm^3)		Power generated to the grid (MWh)	Emission (t CO2)
The set of 5 power plants most recently constructed					
A Vuong	2008	Hydropower		168,103.50	
Tuyen Quang	2008	Hydropower		1,136,112.18	
Dai Ninh	2008	Hydropower		1,145,108.50	
Nhon Trach	2008	Gas	166.38	544,808.60	378,023
Ca Mau 1&2	2007	Gas	647.24	2,106,807.24	1,431,048
		Add-on		2,728,872.00	
Total				**7,829,812.02**	
The set of power plants most recently constructed contributes 20% of total power generation					
A Vuong	2008	Hydropower		168,103.50	
SROC Phu Mieng IDICO	2006	Hydropower		241,556.00	
Se San 3A	2006	Hydropower		394,895.70	
Tuyen Quang	2008	Hydropower		1,136,112.18	
Dai Ninh	2008	Hydropower		1,145,108.50	
Se San 3	2006	Hydropower		1,131,614.00	
Quang Tri	2007	Hydropower		250,804.40	
Uong Bi 2	2007	Coal	281,759	532,000.00	581,018
Na Duong	2005	Coal	532	627,930.00	883,846

Cao Ngan	2007	Coal	526	708,693.00	1,081,145
Formosa	2004	Coal	495	560,295.00	1,291,302
Nhon Trach	2008	Gas	166.38	544,808.60	378,023
Ca Mau 1&2	2007	Gas	647.24	2,106,807.24	1,431,048
		Add-on		2,728,872.00	
Phu My 2.2	2004	Gas	1,159.75	4,141,980.00	2,510,751
Phu My Nitrogen	2006	Gas	56.15	4,716.00	133,868
CAI LAN - VINASHIN	2007	FO	22.48	90,465.01	71,385
Total				**16,514,761.12**	**8,362,386**

Result of BM emission calculation (BM)	
Total emission	8,362,386.08 (tCO_2)
Total power generation	16,514,761.12 (MWh)
BM_{2008}	**0.5064 (tCO_2/MWh)**

Table AN.5 Calculation of Combined Margin

A	Estimated operating margin emission rate	tCO2/MWh	**0.6465**
B	Estimated build margin emission rate	tCO2/MWh	**0.5064**
C	Estimated baseline emission rate	tCO2/MWh	**0.5764**

Annex 4

MONITORING INFORMATION

1. **Power purchasing company name**: Electricity of Viet Nam (EVN)

2. Connection point details*:* The electricity generated by the project will be delivered to the Vietnam national grid initially via a new 35 kV transmission and subsequently a 100 kV line.

3. Project Director: Pham Hai Ha

4. Site Supervisor: Nguyen Chi Ton

5. Operational Staff: Various (to be determined)

The monitoring methodology involves the monitoring of the kWh by using energy meter(s).

The purpose of the monitoring procedure will be to direct and support monitoring of project performance project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions. The project employs latest state of art monitoring and control equipment that measure, control and record key parameters continuously.

Ensuring adequate maintenance and calibration of monitoring instruments

- Specific maintenance, repair or replacement of monitoring equipment will be recorded and will describe the time and action undertaken.
- The calibration will occur at intervals determined on the basis of instrument manufacturers' recommendations, stability, purpose, usage and history of repeatability. Recalibration should be performed whenever an event occurs that places the accuracy of the instrument in doubt.
- Energy meters are delivered with a certificate of conformity and are not calibrated after installation. They will be calibrated at least every three years after the first year of service.
- Last calibration certificates and next calibration date will be provided during periodic verification
- Defect, repair or change of monitoring equipment will be recorded.

Data archiving

The monitored data will be kept for a minimum of 2 years after the end of the crediting years by using paper documents and electronic files.