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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Name of the project: Song Chay 5 Hydropower project.

Version of document: 02.1

Date of Completion: 29/03/2011

PDD history:

Version 01, 02/12/2010, Global Stakeholder Consultation version

Version 02.1, 29/03/2011, revision according to DOE CAR and CL

A.2. Description of the project activity:

The Song Chay 5 Hydropower project (hereafter refers to "the proposed project") is located in Ngan Chien and Then Phang communes, Xin Man district, Ha Giang province, Vietnam.

The proposed project will install 2 sets of generators and turbines to generate electricity, with the gross installation capacity of 16.0MW. The annual net power supply is estimated to be 59,258MWh with the operation hours of 3760h/y[1]. Same amount of power would be supplied by Viet Nam National Grid without the implementation of this project. The baseline scenario of the proposed project is the same with the scenario existing prior to the proposed project.

The proposed project will reduce GHG emission by using hydropower to generate electricity. It could substitute a part of power from Viet Nam National Grid, which is dominated by power from thermal power plants. It is estimated that the proposed project will generate 34,156 tCO_2e emission reductions comparing to the baseline scenario.

The proposed project will also contribute to the sustainable development for the host party country by means of:

- Supplying clean renewable energy to the Viet Nam National Grid and improving the local energy structure;
- Creating job opportunities during the project's construction phase and operation phase. Project investor will open training classes for local juniors and then hire qualified people to work for this project.
- Promoting local economic development by supplying stable power output to industry and domestic demand, contribute to industrialization and tourist service of this province,

[1] According to 35 years historical hydrological data (from 1973 to 2007), the annual operation hours are estimated to be 3760h; auxiliary power consumption is estimated to be 1.5% of the power generation according to the project FSR.

- Mitigating GHG emissions and emissions of other pollutants comparing to thermal power generation.

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)	Song Da 5 Investment, Construction and Development Energy Joint Stock Company	No
United Kingdom of Great Britain and Northern Ireland	Camco Carbon South East Asia Ltd	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Vietnam

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

Ha Giang province.

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

Then Phang and Ngan Chien communes, Xin Man 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 activity involves the construction of Song Chay 5 powerhouse which is located on the Chay River in Then Phang and Ngan Chien communes, Xin Man district, Ha Giang province of Vietnam. The geographical coordinates of proposal project are north latitude from $22^0$42’40’’ to $22^0$42’45’’ and east longitude from 104°31′45″ to 104°31′50″

The site of the project is shown in the Figure 1:

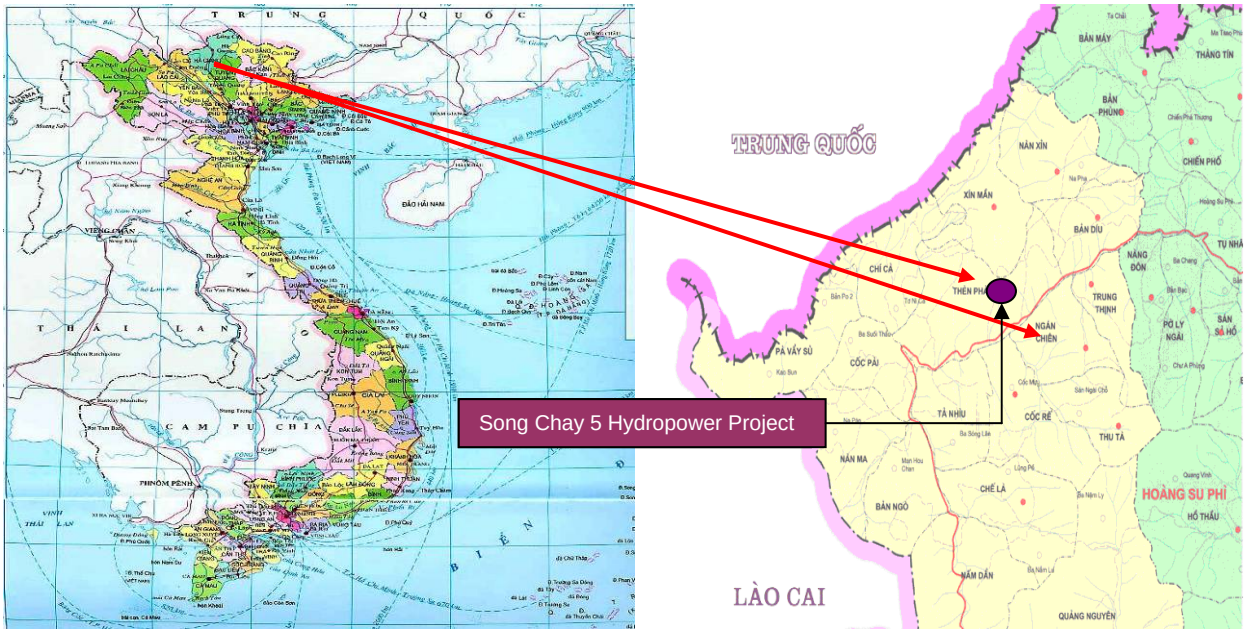

Figure 1: Map of the location of the project activity

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

Sectoral scope 1: Energies Industry (renewable-/non-renewable sources)

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

Prior to the implementation of the proposed project, there is no existing hydropower generation at the project location. Coal plant, oil plant and gas plant composed the main part of electricity in Viet Nam National Grid. Implementation of the proposed project could partly substitute the electricity provided by Viet Nam National Grid and therefore generate GHG emission reduction.

The project involves the construction of a new grid-connected hydropower plant and the installation of new hydro turbines and generators in order to convert potential flowing energy of water from Chay stream to electricity energy, which will be supplied to National electricity grid through 35kV transmission line. Since hydro power generation technology is a renewable electricity generation technology which displaces fossil fuel fired power generation technology to supply electricity to the grid, the implementation of this project activity will generate emission reductions.

Figure below shows the layout of the project.

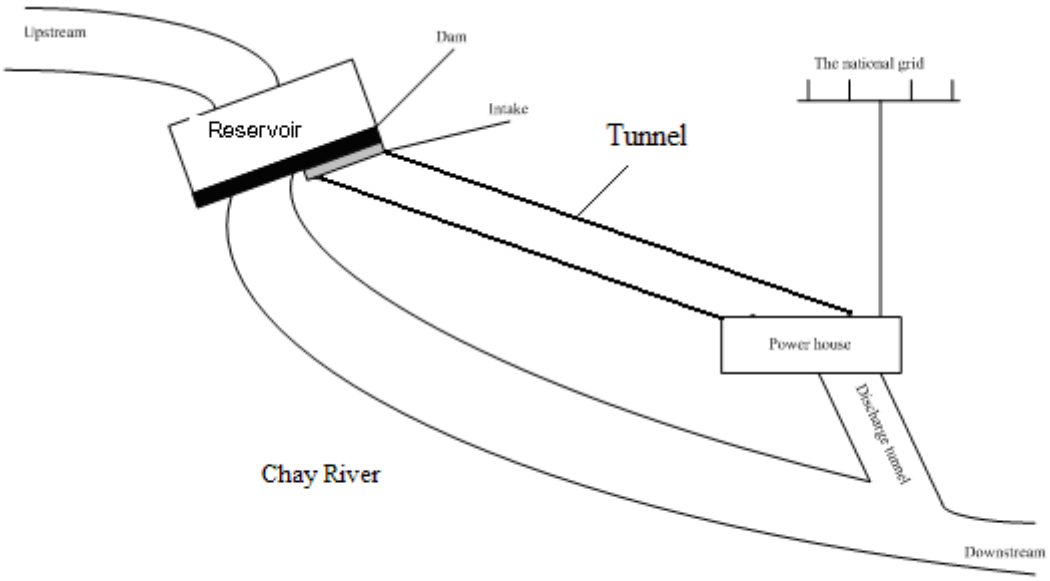

Figure 2: Project lay-out

The main equipments are imported from China. Main technical parameters of the proposed project are shown in Table 1.

Table 1: Main technical parameters of the proposed project activity[2]

Main parameters	Units	Values
1. Turbine		
• Type		Vertical shaft Francis
• Number of Turbine	Set	2
• Rated Output	MW	8.0
• Rated Revolution	r/min	477
• Efficiency	%	91.125
2. Generator		
• Number	Set	02
• Type		Synchronous, three phase
• Single-unit Capacity	MW	8.0
• Rated Voltage	kV	6.3
• Rated Revolution	r/min	250
• Efficiency	%	96.37
3. Transformer		
• Number	Set	2
• Type		3 phases, 2 windings
• Rated capacity	MVA	10
• Rated voltage	kV	6.3/38.5 ± 2 x 2.5% kV

[2] FSR Chapter 5

The annual operation hours for the project are expected to be 3760h[3], with the plant load factor of 42.92%. The project activity does not involve any greenhouse gas emissions or burning of any fossil fuels during the process of power generation, and the technology applied for the project activity is environmentally safe and sound.

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

Fixed crediting period is selected for the proposed project. The estimated emission reductions over the crediting period (Jan.1st, 2012-December.31th, 2021) are 341,560tCO_2e.

Unit: tCO_2/y

Year	Annual estimation of emission reductions in tonnes of CO_2 e
2012	34,156
2013	34,156
2014	34,156
2015	34,156
2016	34,156
2017	34,156
2018	34,156
2019	34,156
2020	34,156
2021	34,156
Total estimated emission reductions (tCO_2e)	**341,560**
Number of the fixed crediting years	**10**
Annual average over the crediting period of estimated reductions (tCO_2e)	34,156

A.4.5. Public funding of the project activity:

There are no public funds involved in 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:

Applied methodology:

- ACM0002 (Version 12.1.0): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Related tools:

- "Tool to calculate the emission factor for an electricity system" (Version 2.1)
- "Tool for demonstration and assessment of additionality" (Version 5.2)

[3] FSR Chapter3, page 14

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

The proposed project meets all the applicability conditions of ACM0002 (Ver.12.1.0), which is justified as follows:

	Applicability Criteria	Applicability	Project Activity
1	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;	Applicable	The proposed project is to construct a new hydro power plant
2	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on methodology ACM0002 (Version 12.1.0) page 10 to calculate the parameter $EG_{PJ,y:}$ the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no 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.	N/A	The proposed project is to construct a new hydro power plant
3	In case of hydro power plants: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density (installed power generation capacity divided by the surface area at full reservoir level) of the project activity, is greater than 4 W/m^2; or • The project activity results in new reservoirs and the power density of the power plant is greater than 4 W/m^2.	Applicable	The project activity results in new reservoir (48.2ha) with power density of power plant is 33.195W/m^2 , which is more than 4W/m^2

Therefore, ACM002 is applicable for the proposed project activity.

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

According to ACM0002 (Ver.12.1.0), the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM power plant project is connected to. For the proposed project, the project boundary includes the Song Chay 5 Hydropower plant and all the power plants connected to Viet Nam National Grid.

The flow diagram of the project boundary is shown in Figure 3 below.

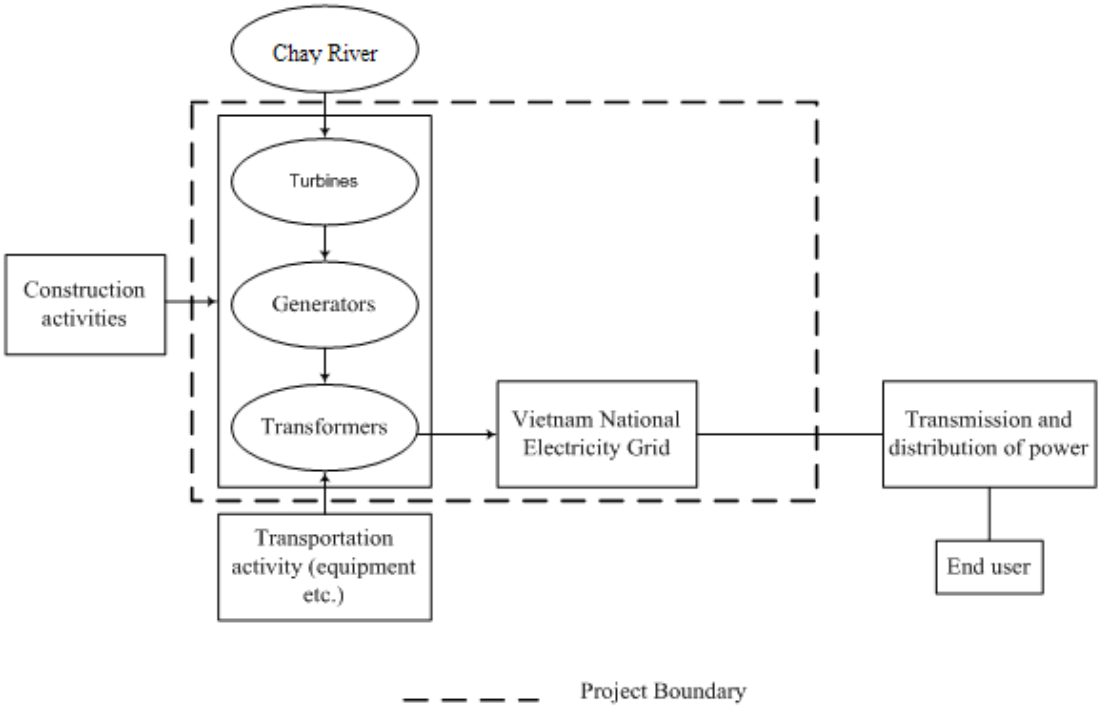

Figure 3: Project Boundary

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the Table 2 below.

Table 2: Sources and gases included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO2 emission from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative.
Project Activities	For hydro power plants, emissions of CH4 from the Reservoir	CO_2	No	Minor emission source. Excluded for simplification.
		CH_4	No	According to ACM0002 (Version 12.1.0), the power density of proposed project is greater than 10W/m^2, CH_4 emissions are neglected.
		N_2O	No	Minor emission source. Excluded for simplification.

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

As per ACM0002 (Ver.12.1.0), if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario should be as follow:

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 proposed project is to construct a new hydropower plant and power generation will be connected to Viet Nam National Power Grid, which is dominated by power from thermal power plants. Therefore, the baseline emission for the project should be calculated as the grid emission factor multiplying the net power supply. Detailed information sees also in part B.6.

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):

Prior consideration of CDM

CDM has been seriously considered by the project owners prior to the commencement of the construction, and a series of continuing actions have been taken by the project participants to secure CDM support throughout the planning and construction phases. The chronology for the proposed project is as follows:

Table 3: Timeline for the proposed project

Date	Work
01/2010	Completion of EIA
25/01/2010	EIA Approval
22/01/2010	MOU with Camco
02/2010	Completion of FSR
20/02/2010	CDM stakeholder meeting
23/04/2010	Investment License
26/04/2010	Board decision making to invest on the project and develop it as a CDM project
10/05/2010	Construction contract
08/09/2010	Signing CADPA contract with Camco
20/08/2010	Notification to Viet Nam DNA
23/08/2010	Notification to EB

Additionality

According to ACM0002 (Ver.12.1.0), the additionality of the project should be assessed using the latest version of the "Tool for the Demonstration and Assessment of Additionality" (in this case version 05.2, EB39).

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 as alternatives for the project activity with respect to credibility:

a) The proposed project activity undertaken not as a CDM project activity;

b) Construction of a fossil fuel power plant with equivalent amount of annual electricity generation;

c) Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation;

d) Continuation of the current situation: provision of equivalent electric power by Viet Nam National Grid.

The project location has no other renewable resources[4] for constructing a power plant. Therefore, alternative c) is not possible.

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

Alternative b) is not realistic. According to the Master Plan of Electricity Expansion for period of 2006-2015 with perspective to 2025 - EVN (Master Plan VI) approved by the Prime Minister in July 2007 which is the latest publicly information source listed all operated and planned power plants in Vietnam, there is not any fossil fired power plant with the equivalent and lower power output is constructed/under construction and/or planned in Vietnam or Ha Giang province. According to the Electricity Law, the investment in electricity generation must be complied with the Master plan. However, in the point of view for electricity development by Ministry of Industry and Trade, the common capacity of thermal power unit within next 10 years is 300 MW and in the future the higher capacity (600 MW and higher) will be chosen for reducing the investment cost. It shows that the investment and operation of such thermal power plants with the capacity equal and below 16.0 MW is not realistic in Vietnam.

Moreover, project owner only has experience on hydropower, they do not have plan as well as has no experience to invest in fossil fuel power plant. Thus, the construction of fossil fuel power plant by the project owner is not rational.

Outcome of Step 1: Option a) and Option d) are realistic and consistent with Mandatory Laws and Regulations.

Step 2: Investment Analysis

Sub-step 2a: Determine Appropriate Analysis Method

[4] National electricity development plan for 2006-2015 taking into account the prospect of 2025, chapter 6 "Assessment of primary energy resources, exploitability, export and import energy and diesel fuel price prediction"

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 applied because the proposed project produces economic benefits other than CDM related income (through the sale of electricity). The investment comparison analysis method (Option II) is applicable to projects whose alternatives are similar investment projects. The alternative baseline scenario of the project is Viet Nam National Grid providing equal amount of electricity rather than new investment projects. Therefore Option II is not an appropriate method. The project will use the benchmark analysis method (Option III) assuming that the benchmark IRR of the project is available.

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

Additionality Tool Ver. 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 benchmarks shall be derived from:

(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;

(b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;

(c) A company internal benchmark (weighted average capital cost of the company), only in the particular case referred to above in paragraph 5. The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same benchmark;

(d) Government/official approved benchmark where such benchmarks are used for investment decisions;

(e) Any other indicators, if the project participants can demonstrate that the above Options are not applicable and their indicator is appropriately justified.

Besides, the "Guidelines on the Assessment of Investment Analysis'' issued by EB in its 51st meeting requires 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. Required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented"*.

The project developer has selected 12% as the benchmark for the following reason:

1. At the time of decision making (April, 2010), the State Bank of Vietnam formulated prime interest rate was 8.0%5. The commercial lending rate is regulated by the Civil Code in Vietnam. As per the Civil Code, commercial lending rates may be 1.5 times the prime interest rate, which is equal to 12%.

2. According to publication of State bank of Vietnam on " Information on banking activities for first half of 2010'', it states that "The actual average lending rate in VND of the 4 state-owned commercial banks and 7 large-scaled joint-stock commercial banks was around 13.3%''[6]. In the website of State Bank of Vietnam published "Monthly Information on banking activities (April, 2010)", the lending rates is from 14%-15%[7]

3. Furthermore, according to Electricity of Vietnam Master 6 made by EVN, the internal rate of return for investment on hydropower projects should be beyond 12%[8]

In conclusion, the choice of benchmark 12% is conservative and it can meet the criteria of Additionality Tools.

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

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

Table 4: Key Input Parameters

Parameter	***Unit***	***Number***	***Source***
Total investment	mVND	*338,840*	*FS*
Cost on construction and equipment	mVND	*282,162*	*calculated*
Installed capacity	MW	16	*FS*
Operational hours	hours	3,760	*FS*
CER price	EUR/CER	14	*Estimated*
Exchange rate	EUR - mVND	0.025263	*http://www.oanda.com/currency/converter/*
Net power generation	MWh/y	59258	*calculated*
O&M cost (as percentage of fixed asset)		1.50%	*FS+ Decision 2014*
Auxiliary consumption rate		1.50%	*FS*
Power Tariff	mVND/MWh	0.718	Circular No 08/2010/TT-BCT
Insurance (as percent of fixed asset)		1%	*Decision 28/2007/QD/BTC*
Natural resource tax (as percentage of revenue)		2%	*Circular No. 124/2009/TT-BTC*

[5] http://www.sbv.gov.vn/wps/portal/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDFxNLczdTEwN_Fy9TA09_42AjXwtLYxMDU_2CbEdFAIC23HQ!/

[6] http://vietnambusiness.asia/information-on-banking-activities-for-first-half-of-2010/

[7] http://sbv.gov.vn/wps/portal/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDFxNLczdTEwN_Uw9TA09_cxPDUE9_w-AwI_2CbEdFAL4-9xg!/?WCM_PORTLET=PC_7_0D497F540O5H50IO741UIO1207_WCM&WCM_GLOBAL_CONTEXT=/wps/wcm/connect/sbv_en/sbv_en/en.sbv.news/sbv.en.news.7/6971ea80429777dfb9ceff8817f803c6

[8] Electricity of Vietnam Master 6

Benchmark		12%	*Average commercial bank lending rate*

Breakdown of total investment cost	***Unit***	***Number***	***Source***
Construction cost	mVND	172,285	*FS*
Equipment cost	mVND	109,877	*FS*
Project management cost	mVND	4,120	*FS*
Consultant cost	mVND	12,389	*FS*
Other cost	mVND	4,858	*FS*
Contingency cost	mVND	35,311	*FS*
Total Investment cost	mVND	**338,840**	*FS*

The IRR calculations were based on the following conservative assumptions:

- O&M cost does not include escalation
- Corporate tax is excluded from the calculation.
- Proposed project has not signed the Power Purchase Agreement (PPA) by the time of writing the PDD. According to Circular No 08/2010/TT-BCT on 24/02/2010 of Ministry of Industry and Trade providing 2010 electricity sale prices and guiding their application. In this circular mentions about average power price of companies sell to EVN is 718.1VND/kWh.
- The results of the IRR calculations are shown in table 5 below:

Table 5: IRR of Song Chay 5 Hydropower Project

Song Chay 5		
Project IRR	Without CDM	**10.0%**
	With CDM	**12.14%**
Benchmark	**12%**	

In accordance with the benchmark analysis if the financial indicators (such as the IRR) of a project are lower than the benchmark, the project is not considered to be financially attractive. From the table above, it could be found that the IRR for the proposed project (without CDM benefit) is 10.0%, which is lower than the selected benchmark (12%) and therefore the project is not financially attractive.

With the CDM revenue, the project IRR will be significantly improved and will exceed the benchmark. Therefore, the project with CDM revenue can be considered as financially attractive to investors.

Sensitivity analysis

For the proposed project, the following parameters were considered in the sensitivity analysis:

1. Total investment
2. O&M cost
3. Power tariff
4. Operation hours

The impacts on IRR of the proposed project are shown in the following table and figure:

Table 6:Sensitivity analysis of Song Chay 5 Project

Variation / Parameter	**-10%**	**-5%**	**0%**	**5%**	**10%**
Total Investment	11.20%	10.57%	10.00%	9.48%	9.00%
OM Cost	10.13%	10.07%	10.00%	9.93%	9.87%

Power Tariff	8.67%	9.34%	10.00%	10.65%	11.30%
Operation hours	8.67%	9.34%	10.00%	10.65%	11.30%
Benchmark	**12%**				

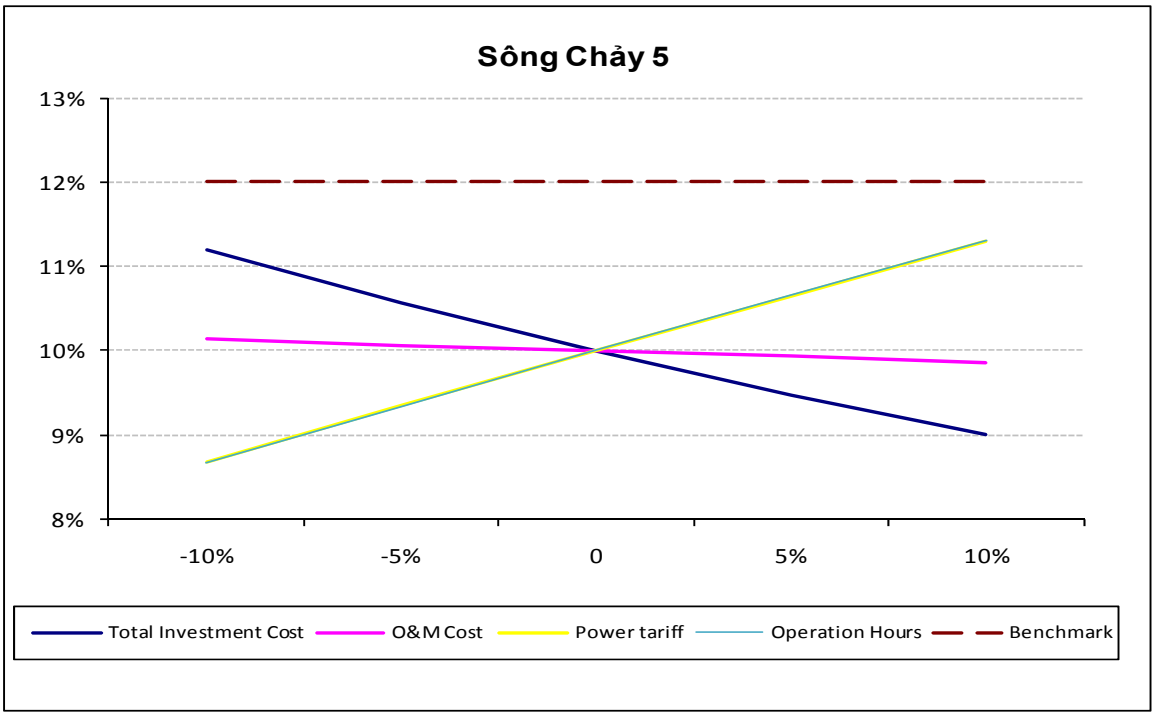

Figure 4: Sensitivity analysis of Song Chay 5 Project

The sensitivity analysis shows that even when the parameters vary by ±10%, IRR of Song Chay 5 project could not reach the benchmark and the conclusion that the Proposed Project is financially unattractive still holds.

Table 7 shows changes needed to reach benchmark 12%.

Table 7: Sensitivity analysis of change needed to reach benchmark of 12%

Parameters	Song Chay 5 Hydropower project
Total investment	-15.68%
O&M cost	-151%
Power tariff	15%
Operational hours	15.4%

In reality, these scenarios are highly unrealistic for the following reasons.

Construction investment

The project IRR will reach 12% when the construction cost decreases by 15.68%. It is not likely for the investment costs to decrease to the level required to meet the benchmark. Vietnam has been experiencing a period of inflation since 2007, consequently, the price of material, construction costs and relevant other costs are increasing. Thus decrease of construction investment is not realistic.

O&M cost

When the O&M cost of Song Chay 5 reduces 151%, the project IRR could touch benchmark, but it is impossible to decrease more than 100%, because O&M cost could not be a negative value.

Power tariff

The project IRR will reach 12% when the electricity tariff increases 15%. In Viet Nam, power tariff is strictly controlled by the government, and net increase of more than 10% for electricity price is impossible. The government only increases tariff rate due to the rise of PI of operation cost of power generation such as materials, labour costs and interest rate of the loan etc. In that case, the annual operation cost will also go higher, and there is no actual increase on power tariff.

Operational hours

The project IRR will reach 12% when the operation hours increase 15.4%. However, the annual operation hours is calculated according to historical hydrological data. With the proposed project activity, the annual operation hours were estimated based on 35 years of historic hydrological data as presented in the FSRs. Therefore it is highly unlikely that the annual net electricity supply would increase by so much to meet the benchmark.

Outcome of Step 2: It is concluded that the proposed project is not financially attractive without the additional revenue from CERs.

Step 3: Barrier analysis

Not applied

Step 4: Common practice

Sub-step 4.a: Analyze other activities similar to the proposed project activity:

According to Master Plan VI[9] and master plan of Ha Giang Province[10], operational hydro power projects with capacity between 5MW and 30MW (exclude registered CDM projects and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) in Viet Nam are as follow:

Table 9: Hydropower plants with capacity between 5MW and 30MW (exclude CDM projects)

Order	Plant	Capacity (MW)	Investor
1	Na Loi	9.3	Song Da Holdings
2	Ea Krong Rou	28.0	Central Hydropower Joint Stock Company
3	Phuong Do	23	Ha Giang Hydropower Investment and Minerals JSC

Sub-step 4b. Discuss any similar options that are occurring:

[9] Master Plan of Electricity Expansion for period of 2006-2015 with perspective to 2025- EVN

[10] Source from website: http://congthuonghagiang.gov.vn/News.aspx?cate=203

1. Na Loi Hydropower project was commissioned on May 7th, 2003, and it was invested and built by Song Da Holdings[11], which is a stated-own corporation, formed in 1961 and belongs to Ministry of Construction; Ea Krong Rou Hydropower project was invested and operated by MienTrung Power Investment and Development JSC, a subsidiary of Song Da Holdings[12]; Phuong Do hydropower project[13] was invested by Ha Giang Hydropower Investment and Minerals JSC started construction in May, 2007. The project also has other functions like supplying water for downstream in dry season and fishery in reservoir[14] other than power generation; Song Chay5 hydropower project is invested by a private company, and there are no supported funds from Government or Official Development Assistance (ODA). Song Chay5 has the only function for generating power, and the electricity revenue will be the only profit for the project, so the financial return is not so good as other projects.

2. The site selection of the proposed project is worse than other projects. It could be found in the Table 11 that the annual operation hour for the proposed project is obviously lower than other projects. The electricity sale revenue is the only revenue for the project, and the low power output will lead to the low financial return for the proposed project.

3. Furthermore, per MW investment for the proposed project is comparatively high. It could also be found in the Table 11 that per MW investment for the proposed projects is higher than other projects. Therefore the proposed will face more investment risks than other projects.

Table 11: Annual power output and total investment of proposed project activity and compared projects in the common practice analysis

Project Name	Installed capacity (MW)	Location	Annual Power output/KW (KWh/KW. year)	Total investment cost/MW (billion VND/MW)
Na Loi Hydropower[15]	9.3	Dien Bien district, Lai Chau province	4978	19.89
Ea Krong Rou Hydropower[16]	28	Ninh Hoa district, Khanh Hoa province	4286	14.36
Phuong Do hydropower project[17]	23	Ha Giang town	3767	16.96
Song Chay 5 Hydropower[18]	**16.0**	**Xin Man district, Ha Giang province**	**3760**	**24.94**

[11] http://www.naloi.com.vn/?page=introduce&et=news&category_id=5

[12] http://www.mientrungpid.com.vn/?page=13

[13] http://www.baohagiang.vn/?lang=V&func=newsdetail&newsid=1555&CatID=22&MN=2

[14] http://www.baohagiang.vn/?lang=V&func=newsdetail&newsid=1555&CatID=22&MN=2

[15] http://vietbao.vn/Xa-hoi/Xay-dung-nha-may-thuy-dien-Na-Loi/10715647/157/

[16] http://www.mientrungpid.com.vn/?page=13

[17] http://tintuc.xalo.vn/00607088676/khoi_cong_xay_dung_nha_may_thuy_dien_phuong_do_ha_giang.html

[18] Refer to Investment License

According to the above analysis, the existence of the other hydropower projects will not impact the additionality of the proposed project.

In summary, it is only through the inclusion of CDM revenues that the project becomes financially attractive and the intention to register the project under the CDM was a determining factor in the decision to proceed with the project. It is therefore concluded that the project is not the baseline scenario and is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The reduced emission is calculated in accordance with the approved consolidated baseline methodology ACM0002 (Version 12.1.0).

1. Project activity emissions (PE_y)

According to the methodology, for hydro project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, PE_y is equal to $PE_{HP,y}$:

a) If the power density of the proposed project (PD) is greater than 4W/m^2 and less than or equal to 10W/m^2

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000}$$ **Equation 1**

Where:

$PE_{HP,y}$	= Project emission from water reservoirs (tCO_2e/yr)
EF_{Res}	= Default emission factor for emissions from reservoirs of hydro power plants in year y (kg CO_2e/MWh)
TEG_y	= Total electricity produced by the proposed project, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

b) If the power density of the proposed project (PD) is greater than 10W/m^2:

$$PE_{HP,y} = 0$$ **Equation 2**

The power density of the proposed project (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **Equation 3**

Where:

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

2.Baseline Emission (BE_y)

Baseline emissions include only CO_2 emissions from electricity generation from fossil fuel fired power plants that are displayed due to the project activity, calculated as follows:

$$BE_y = EG_{PJ,y}.EF_{grid,CM,y} \quad \textbf{Equation 4}$$

Where:

BE_y	= Baseline emissions in year y (tCO2/yr)
$EG_{PJ,y}$	= Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	= Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

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

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

Where:

$EG_{PJ,y}$	= Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EG_{facility,y}$	= Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

Calculation of the emission factor (EF) of the national electricity grid

On 26th of March, 2010 Vietnam DNA has released the value as well the calculation way of Emission factor of Vietnam National Grid. This report was strictly based on *"Tool to calculate the emission factor for an electricity system"* version 2.1 issued in EB 60. In comparison with the newest version of this tool, version 2.1, the steps for calculation as well the justification of data are almost unchanged; hence the utilization of this report is reliable. Details specifications are described below:

Step 1: Identify the relevant electricity systems

The electricity generated by the proposed project will be delivered to the Viet Nam National Grid. Song Chay 5 power plant is physically connected to the national grid; hence this is the relative electricity system for the proposed project.

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

Option I: Only grid power plants are included in the calculation.

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

In Vietnam, the National grid is reliable and stable. Also, off-grid power plants just fulfil the minor own request of producer; hence they are not significant. In summary, Option I is chosen to calculate the proposed project's operating margin and build margin emission factor.

Step 3: Select method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM

(b) Simple adjusted OM

(c) Dispatch data analysis OM

(d) Average OM

Option (a) - Simple Operation Margin can only be used if low-cost/ must- run resources is appropriate option to calculate the OM when low cost/must run resources constitute less 50% of the total power generation of the grid. Within the most recent 5 years for which data is available for power generation of Viet Nam Power (2004-2008), the proportion of power generated by low cost and must run resources was below 50% being 39.71%, 32.52%, 34.13%, 33.74%, and 34.72% in 2004, 2005, 2006, 2007 and 2008 respectively.

Table 10: Low cost/ must run resources

	2004	2005	2006	2007	2008
Low-cost/must-run	39.71%%	32.52%	34.13%,	33.74%	34.72%

Option (b) - the option of Simple Adjusted Operation Margin Emission Factor will require the power grid to provide annual Load Duration Curve. However, this option requires detailed running dispatch data of the connected-grid power plants. However, this data is not publicly available in Viet Nam so option (b) is not feasible.

Option (c) - Calculation of OM from grid dispatch data analysis can give the most reliable estimation of emission reduction since this method counts the actual portion of the baseline power which will be substituted by the output of the CDM project. For the same reason as Option (b), the project also could not gain the detailed dispatching data from EVN. Therefore, option (c) is also not feasible.

Option (d) - the average OM is suitable for power grids where low cost and must run[19]power plants constitute more than 50% of the total grid power generation. Since the proportion of power generated by low cost and must run resources was below 50% within recent 5 years, option (d) cannot be applied.

[19] Low-cost/must run resources based on electricity generation is typically hydropower generation in Viet Nam where the state owned EVN defines only hydropower as "low cost". Though in some situations coal can be considered as low-cost/must-run, in Viet Nam coal power constitutes less than a third of thermal generation and less than a fifth of total generation. Furthermore, none of the coal-fired power stations in Vietnam run at full capacity – there is a typical load factor of under 50%. Coal power stations function in response to variations in the seasonal load – in particular making up the shortfall in hydropower generation during the dry season – and therefore should not be considered as must-run.

As shown above, low cost/ must run power generation in Viet Nam constituted less than 50% of the total in the recent past, therefore, the project will use option (a) to calculate the Operation Margin.

The simple OM is calculated ex-ante using a 3-year's generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

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

The simple OM emission factor ($EF_{OM,Simple,y}$) is the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. It may be calculated:

- Option A: Based on net electricity generation and a CO_2 emission factor of each power unit; or
- Option B: Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system

Option A is selected to calculate the OM emission factor. Under this option 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:

Equation 5: $$\mathbf{EF_{grid,OMsimple,y}} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{\mathbf{m}} \mathbf{EG_{m,y}}}$$

Where:

EFgrid,OMsimple,y	= Simple operating margin CO2 emission factor in year *y* (tCO_2/MWh)
$EG_{im,y}$	= 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 plants/units serving the grid in year *y* except low-cost/must-run power plants/units
y	= The relevant year as per the data vintage chosen in step3

In the DNA report, data related to fuel consumption and electricity generation is available, the emission factor ($FEEL_{,m,y}$) is determined as follows:

Equation 6: $$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y}.NCV_{i,y}.EF_{CO2,i,y}}{EG_{m,y}}$$

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 relevant year as per the data vintage chosen in Step 3

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

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

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

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

In the report of DNA, it was found that the most recent constructed five units do not comprise 20% of the system generation; hence option b) was chosen. In this report, the list of power plants that comprise 20% of the generation i.e. over 16,514GWh is reported. 16 units are in the list, with the earliest one being commissioned in March 2004.

In terms of vintage of data, Option 1 (*ex-ante*) shall be chosen for the proposed project. Details are as follows: for the first crediting period, calculate the build margin emission factor 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. For the second crediting period, the build margin emission factor shall be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period shall be used. This option does not require monitoring the emission factor during the crediting period.

Step 6. Calculate the build margin emission factor (*$EF_{grid,BM,y}$*)

The build margin emission factor is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants identified above as follows:

Equation 7: $$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

EFgrid,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 (2008)

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) will be determined as per the guidance in step 4 for the simple OM, using option A1.

Step 7. Calculate the combined margin ($EF_{grid,CM,y}$) emissions factor

The combined margin emission factor $EF_{grid,CM,y}$ is calculated as follows:

Equation 8: $EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM}$

Where:

w_{OM} Weighting of OM emissions factor (%)

w_{BM} Weighting of BM emissions factor (%)

According to "Tool to calculate the emission factor for an electricity system (version2)" the following default values are used for the proposed project: *wOM* = 0.5 and *wBM* = 0.5 will be used for the fixed crediting period.

Based on above demonstration, DNA of Vietnam has released the emission factor for National grid on 26th March 2010. The calculated factor is **0.5764 tCO_2/MWh**[20].

Leakage

The potentially main leakage in the context of the proposed project is emissions arising due to activities such as power plant construction and land inundation. But according to ACM002, Version 12.1.0 these emissions are neglected.

Emission reductions

Emissions reductions are calculated as follow:

Equation 9: $ER_y = BE_y - PE_y$

Where:

ERy	= Emission reductions in year *y*
BE_y	= Baseline emission reduction in year y
PE_y	= Project activity emission in year *y*

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

[20] DNA reference document
http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_vnHe%20so%20phat%20thai.pdf .

Data / Parameter:	1.FC_i
Data unit:	Varies according to type of fuel
Description:	Amount of fuel i used to generate power in the Viet Nam National Grid used to calculate the OM
Source of data used:	Viet Nam DNA
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	No further comments

Data / Parameter:	3. NCV_i
Data unit:	GJ/ unit
Description:	Net Calorific Value (energy content) per mass or volume unit of fuel i used to generate power in the Viet Nam National Grid used to calculate the OM
Source of data used:	Viet Nam DNA
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	No further comments

Data / Parameter:	4. EF_i
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit energy of fuel i used to generate power in the Viet Nam National Grid used to calculate the OM.
Source of data used:	IPCC 2006
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission factor of fuels is not available in Viet Nam. As such IPCC default values must be used and considered the best approximation for Viet Nam.
Any comment:	No further comments

Data / Parameter:	5. $GEN_{j,y}$
Data unit:	GWh
Description:	The electricity generated by power plants by source j.
Source of data used:	Viet Nam DNA
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	

Any comment:	No further comments

Data / Parameter:	6. CAP_i
Data unit:	MW
Description:	Newly installed capacity of different fuel types in Viet Nam National Grid
Source of data used:	Viet Nam DNA
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	No further comments

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

Project emissions (PE_y)

The proposed project activity involves the construction of a new hydropower plant with capacity (Cap_{PJ}) of 16.0 MW with total surface (A_{PJ}) of 48.2 ha[21], thus A_{BL} = 0 and Cap_{BL} =0.

According to Equation3 in part B.6.1, the power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{16 \times 10^6 \text{ W}}{48.2 \times 10^4 \text{m}^2} = 33.195 \text{W/m}^2$$

The power density for the proposed project is greater than 10 W/m^2, thus the project emission is zero: $PE_y = 0 tCO_2e$

Baseline emissions (BE_y)

As shown in section B.6.1, Viet Nam National Grid emission factor is calculated to be 0.5764tCO_2/MWh.

According to the feasibility study report for the proposed project, the annual average power output of the proposed project, EG_y, is calculated to be 59,258MWh. Therefore, the baseline emissions in the year(s) "y" can be calculated as follows:

Baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 59258 MWh \times 0.5764 tCO_2e / MWh = 34{,}156 tCO_2e$$

Emissions reduction (ER_y)

According to Equation 10, emission reductions are calculated as follows:

$ER_y = BE_y – PE_y = 34{,}156\ tCO_2e – 0 tCO_2e = 34{,}156\ tCO_2e$

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

[21] Date source: EIA, page 59

The net emission reduction induced by the project activity in the crediting period (Jan.1st, 2012-Dec.31st, 2021) is estimated to be 34,156 tCO2e.

Year	Estimation of baseline emissions (tCO_2e)	Estimation of the project activity emissions (tCO_2e)	Estimation of emission reductions (tCO_2e)
2012	34,156	0	34,156
2013	34,156	0	34,156
2014	34,156	0	34,156
2015	34,156	0	34,156
2016	34,156	0	34,156
2017	34,156	0	34,156
2018	34,156	0	34,156
2019	34,156	0	34,156
2020	34,156	0	34,156
2021	34,156	0	34,156
Total emission reductions (tCO_2e)	341,560	0	341,560

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	59,258
Description of measurement methods and procedures to be applied:	Power meters comply with local industry standards. The electricity will be measured continuously and monthly report will be generated. The meter is bi-direction meters, which could compensate the imported electricity during maintenance period and repairing period. Net power supply (exclude the off grid power) will be measured by using these meters.
Monitoring frequency:	Continuously measurement and at least monthly recording
QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity
Any comment:	Data shall be archived for 2 years following the end of the crediting period.

Data / Parameter:	CAP_{PJ}
Data unit:	W
Description:	Installed capacity of Song Chay 5
Source of data to be used:	FSR & FSR approval
Value of data applied for the purpose of	16,000,000

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Determine the installed capacity based on equipment specification and nameplate
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-
Any comment:	Data shall be archived for 2 years following the end of the crediting period.

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Reservoir area for Song Chay 5
Source of data to be used:	EIA report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	482,000
Description of measurement methods and procedures to be applied:	The reservoir area is determined on the basis of topographic data by measuring the water level when the project starts commissioning. The design institute of proposed project will provide the topographic data of the area for the reservoir.
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-
Any comment:	Data shall be archived for 2 years following the end of the crediting period.

B.7.2. Description of the monitoring plan:

The monitoring plan aims to ensure that all the emission reductions can be successfully realised during crediting period, and will be implemented by the project owner

1. Monitoring organization

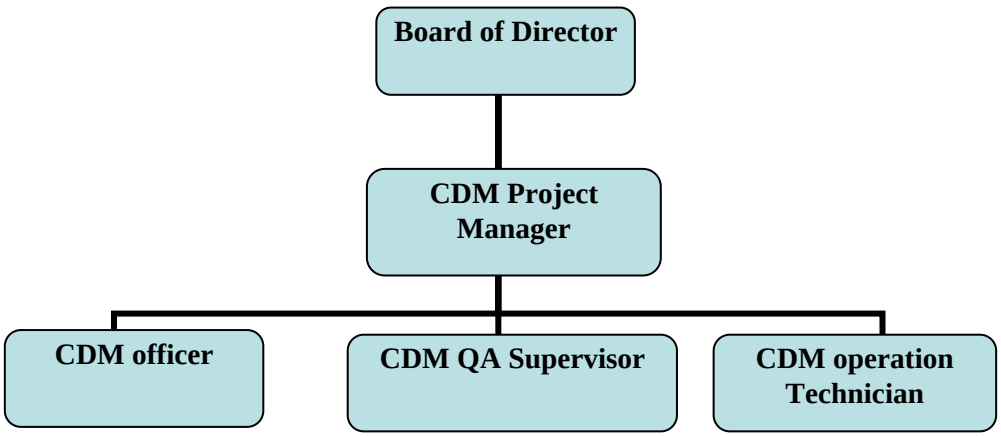

Figure 5: CDM Organization Structure

- CDM Project Manager will be appointed by the Board of Director of Company (Project Owner). The CDM Project Manager is responsible for the overall project management, in full charge of issues related to CDM projects, keeping communication with EB, DNA and related agencies, supervising the project operation status.

- CDM officer is responsible for the whole process of CDM project operation. CDM officer will calculate the CERs and prepare the monitoring report based on the operation data from CDM QA supervisor and CDM operation technician, prepare all relative documentations. He (She) is also responsible for archiving operation data and documents, such as calibration report.

- CDM QA supervisor will verify the operation data collected by CDM operation technician, gather the electricity invoices of sale or other financial receipts, and cross-check the net electricity supplied to the grid.

- CDM operation technician will maintain and calibrate the monitoring equipments to ensure their correct functioning, collect the operation data from the site.

2. Monitoring equipment and installation

2.1 Baseline emission

According to the methodology, following parameter needs to be monitored for baseline emission:

- Net electricity supplied by Song Chay 5 hydropower project ($EG_{facility,y}$)

Monitoring net electricity supply to the power grid ($EG_{facility,y}$)

The net electricity supply to the power grid should be the difference between electricity supply to the power grid and the backup line electricity consumption. Meter P1, and P2 are installed to measure the electricity supply to power grid (P3 and P4 are installed as backup meters), meter P is installed on the backup line to measure the electricity consumed by the power plant during maintenance period. The accuracy of the electricity meters installed for the project will be 0.5 (see also in 6).

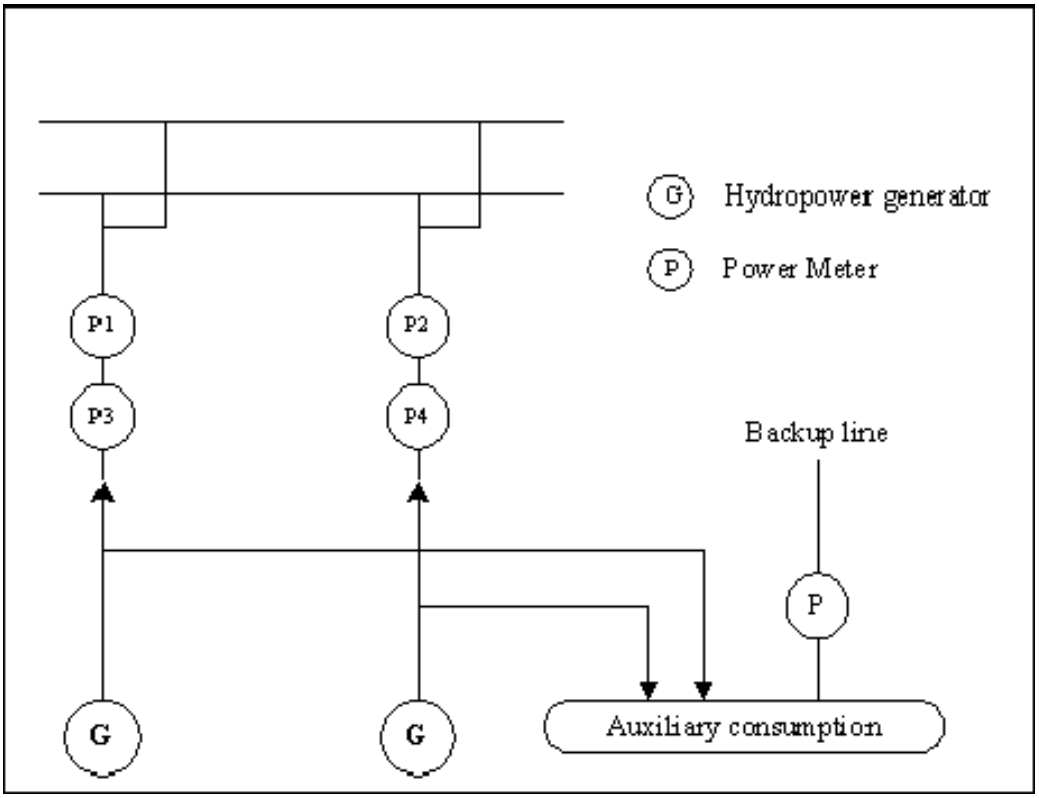

Figure 6: Power Monitoring System

2.2 Project emission

According to the methodology, following parameters need to be monitored for baseline emission:

- Installation capacity ($Cap_{PJ,}$)
- Reservoir area (A_{PJ})

Monitoring installation capacity (Cap_{PJ})

Installation capacity of the proposed project activity will be checked according to the equipment nameplate.

Monitoring reservoir area (A_{PJ})

The reservoir area is determined on the basis of topographic data provided by a qualified third party before the first verification.

3. Calibration & Maintenance procedures

Procedures should be implemented in accordance with national standards, industrial standards or the manufacture's instructions. Guidelines of the calibration procedures are available in the Monitoring Manual.

All power meters of monitoring system will be calibrated according to the national calibration standard, and the calibration reports will be available for DOE Check.

4. Error Handling Procedure and Corrective Actions

If the reading of the measure meters is not precise, out of allowed ranges, or if the function of meter is abnormal, the amount of electricity that is connected to the grid will be back-up as follows:

(1) First, read data from the back-up meter, calculate the amount of project-generated electricity connected to the grid, except if either Party believes that the back-up meter is not precise after checking;

(2) If the back-up meter is not acceptable, the project owner and power grid company should design a reasonably conservative method to estimate the reading together, and explain how it's reasonable and conservative to the DOE during the Verification site visit.

If the backup line meter does not calibrate in time, the error will be applied in a conservative manner according to "Guidelines for assessing compliance with the calibration frequency requirements".

5. Data management

The management of data records should be undertaken as follows: All data collected shall be kept both in soft copy and archived at the end of every month, and printed and saved as hard copy documents. All electricity sell/purchase invoices shall also be kept. Other hard copy documents, such as maps, forms, the EIA report, etc., should be used to support the monitoring plan to check the authenticity of data. In order to expediently obtain the relevant documentation and all project information for the Verification DOE, the project owner shall provide an index of relevant materials and monitoring reports. All hard copy data and information should be kept in the archives by the CDM group, and all documents should have one copy as back-up. All data should be saved for 2 years after the crediting period.

6. Training

Training includes technical training and CDM training. The technical training focuses on principles and basics of maintenance and repair, power generation operation. CDM training includes an introduction to the CDM and its reporting requirements and procedures.

All staff involved in any of the procedures related with the proposed project will be trained before the start of the crediting period in order to perform the tasks specified in the monitoring plan.

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

Date of completion: 02/12/2010

Name of persons determining the baseline study and monitoring methodology:

Contact Information of the responsible person	**Is organisation a Project Participant *Yes/No***
Cui Junlian, Pham Diep Camco Carbon South East Asia Ltd Floor 14, Lucky Tower A, No. 3 North Road, East 3rd Ring Road, Chaoyang District, Beijing, China 100027 Tel: (86 10) 8448 1623 Fax: (86 10) 8448 2432	Yes

email:cui.junlian@camcoglobal.com. Pham.Diep@camcoglobal.com Website: www.camcoglobal.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:

10/05/2010 [22]

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

40 years[23]

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

C.2.1. Renewable crediting period

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/01/2012 or the effective date of registration, whichever is later.

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

According to the national environmental protection rules and regulations, the project has completed an environmental assessment report. This was ratified by Ha Giang Provincial People's Committee on 25/01/2010 and the implementation of the proposed project was approved. The environmental assessment report emphasizes the following points:

1. Environmental impacts

A summary of the environmental impacts identified during the assessments for the EIA which have been

[22] The construction contract signing date for proposed project is considered to be the starting date of the proposed project.

[23] Refer to FSR, page 30

approved by the relevant local authority, is presented in Table 12.

Table 11: Environmental Impact Assessment

No	Environmental parameters	Period	
		Construction phase	Operation phase
I	**Natural Environment**		
1	Soil		
1.1	Loss/occupied land	-	0
1.2	Landslides, sedimentation	0	0
2	Water		
2.1	Water quality	-	-
2.2	Underground water	0	+
3	Fauna-flora		
3.1	Flora	-	+
3.2	Diversity	-	+
4	Micro-climate	-	++
II	**Social-Economic Environment**		
1	Economic Impacts		
1.1	Agriculture	-	+
1.2	Forestry	-	+
1.3	Aquatic	-	++
1.4	Transport	0	+ +
1.5	Tourism	0	++
1.6	Commerce	0	++
2	Cultural-Social Impacts		
2.1	Living Standard	-	++
2.2	Community	+	++
2.3	Health	0	+
2.4	Culture	0	+

Note:
-: *Temporary or very small negative impact*
- -: *Long and strong negative impact*
+ : *Small and temporary positive impact*
++: *Long and strong positive impact*
0 : *Negligible or neutral*

In summary: There is no emigration, resettlement by the construction of proposed project. The total land occupied is 58.13 ha, of which, the agriculture land is 12.8 ha account for 22%. All prevention and mitigation measures have been planned in feasibility study period to reduce negative impacts down to the lowest level. The construction of proposed project is an imperative need; it meets economic, technical and environmental requirements in Vietnam.

2. Measures to mitigate the environmental impacts

Project is expected to have long-term environmental and social benefits. Measures will be taken to

mitigate any negative impacts on the environment as a result of the project construction and operation and the project will meet all Vietnamese national requirements for environmental safety.

Construction Phase

a) Soil erosion

During the construction period, there are two aspects that will induce soil erosion: the construction will change the landscape and destroy the primary land and vegetation, which will debase the capability on water and soil conversion; the naked excavation surface and loose slag heap formed in the construction period are prone to induce soil erosion. The construction company will establish proper and effective schemes to prevent soil erosion, and they will resume the vegetation and the natural sight by engineering measures and biologic measures.

b) Waste water

Waste water discharged during the construction period mostly comes from construction process and daily life. All necessary measures will be taken to prevent water pollution during the construction works. This includes collection and disposal of generated waste, collection and disposal of lubricants and control on illegal waste disposal at soil and rock excavation sites. Following dam completion, regular checks of water quality will be performed.

c) Ecological effect

It is expected that the dam's construction will damage the vegetation to some degree. On the other hand, the vegetation damaged will mainly be without any botanical value, being mainly, secondary shrub woodlands and weeds. In order to prevent deforestation and soil erosion, local varieties of trees will be planted in the areas adjacent to the project site after the end of construction works. So the variety of plants and animals in the project area will not be affected or even improved.

d) Air pollution

Air pollution will occur mainly during construction phases of the project due to land movement and vehicles. The constructing companies will take appropriate measures to ensure that emissions of pollutants are minimised during construction. The constructing corporation should choose machines and appliances in accordance with the national standard, reduce the exhaust emission and install additional air cleaners if the exhaust is not in line with the emission standard. Dust collectors will be installed at the workplace of drilling machine; wet operation method will be taken on drilling and blasting to decrease the dust quantity. During the construction period, workplace, rich-dust materials, dump sites and road will be watered to debase dust.

The project's impact on atmosphere will be limited within the construction period, and the impacts will be zero after construction.

e) Solid waste

Solid waste produced in the construction period mainly comes from construction waste and living waste of construction workers. All kinds of living waste will be collected in time by installing garbage bins in the living area, so it will not affect much on surrounding environment. Dumping sites will be set up, and residue soil from the construction will be transported to dumping sites in time. The dumping site will be constructed in the concave and closed area, at the same time, the run-off pollution-proof in dumping sites during the construction period will also be cared. After the dumping sites have been eliminated, the area will be renovated and the vegetation will be recovered. Therefore, the solid waste produced during the construction period affects a little on environment.

Operation Phase

Aquatic animals and plants

This project will construct a new reservoir, and after the reservoir constructed, the primary ecological balance of the natural river will be impaired until a new balance induced by the environmental change is reached.

Solutions for impact on terrestrial animals and plants

The construction area of proposed project is not designated natural reserves area. There are no endangered animal species in the area; and the impact on local birds and small animals (such as civet, fox, etc) is expected to be minimal.

Due to the small decrease of fields and woodland area due to the reservoir construction, the population in the remaining terrestrial areas will comparatively increase, which will consequently affect the terrestrial animals, birds and plants to some extent. However, the proposed project will not substantially affect the types, amount and composition structure of the wildlife in the reservoir area.

In conclusion, environmental impacts arising from the proposed project are not considered significant.

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:

According to the report of environmental impact assessment and the ratification of the relevant government departments, the project's environmental impacts are not considered significant.

SECTION E. Stakeholders' comments

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

The project owners conducted stakeholder consultation meetings with the help of the CDM consultant to collect opinions and comments for proposed project. Local communities, NGOs, state government and governmental agencies, employees, local residents, contractors and consultants/ advisors were identified as the most important stakeholders in the proposed CDM project activity. The stakeholder meeting has been carried out on 20 February, 2010 at the People's committee office of Then Phang commune, Xin Man district, Ha Giang province.

The meeting agenda was as follows:

1. Welcome address to the representatives by Chairman of Commune People's committee
2. Introduction of the project by project owner;
3. Open discussion on the merits of the project;
4. Summary of the concerns expressed by the stakeholder groups and the commitments to address the concerns made by the Chairman
5. Preparation and circulation of draft Minutes of the Meeting and signing of the MOM.

Figure 7: Stakeholders meeting of Song Chay 5 Hydropower project

Questionnaires were also distributed and collected. The questionnaire included the following contents:

- Do you think the proposed is important? (Very important; Important; Not important; No idea)
- Do you support the Project? (Yes; No; Unconcerned)
- Which aspects of the proposed project do you think will affect your life: (Air pollution; Water pollution; Noises; Insignificant affect)
- What do you think about the proposed project's impacts on the local area's ecological environment (Improvement; Destruction; No impact)
- What do you think about the proposed project's impact on the surrounding environment: (Improvement; Destruction; No impact)
- Are you satisfied with the outlined environmental impact reduction measures: (Satisfaction; Dissatisfaction; uncertain; incomprehension about the measurement)
- What do you think will be the proposed project's impacts on the local area's economic development? (Meaningful; Meaningless; No impact)
- What do you think about the proposed project's impacts on employment in the local area? (Significant; Insignificant; No idea)

E.2. Summary of the comments received:

There are 50 questionnaires distributing to local residents with 100% feedback return. The analysis results are summarized as following table:

Criteria	The number of respondents (percentage)
1. Is proposed project important?	+ Very important: 50 (100%) + Important: 0 (0%) + Not important: 0 (0%) + No idea: 0 (0%)
2. Do you support the project?	+ Yes: 50 (100%) + No: 0 (0%) + Unconcerned: 0 (0%)
3. Which aspects affect to your life?	+ Air pollution: 7 (14%) + Water pollution: 0 (0%) + Noise: 2 (4%) + Insignificant affect: 41 (82%)
4. The impact of project to ecological environment?	+ Improvement: 33 (66%) + Destruction: 0 (0%) +No Impact: 17 (34%)
5. The impact of project to surrounding environment?	+ Improvement: 29 (58%) + Destruction: 0 (0%) + No impact: 21 (42%)
6. Are you satisfied with measures to reduce negative impact?	+ Satisfaction: 45 (90% + Dissatisfaction: 0 (0%) + Uncertain: 5 (10%) + Incomprehension about the measurement: 0 (0%)
7. The impact to local economic development?	+ Meaningful: 50 (100%) + Meaning less: 0 (0%) + No impact: 0 (0%)
8. The impact to employment in local area?	+ Significant: 45 (90%) + Insignificant: 5 (10%) + No idea: 0 (0%)

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

The local government and residents support the proposed project. According to the collected comments from local stakeholders, it is not necessary to make any adjustment to the current design, construction plan and operation of the proposed project.

For the ecological impacts of the proposed project, the project owner has made a detailed analysis in environmental impact report on the current environmental situation in the construction zone and of the environmental impacts in the construction phase and operation phase, and has made corresponding measures to minimise the ecological impact of the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity

Annex 3

BASELINE INFORMATION

Baseline information released by Vietnam DNA can be referred at the following web address:

http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_vnHe%20so%20phat%20thai.pdf

The main data used in this report to calculate emission factor of Vietnam national grid are given below:

Table 8: CO_2 Emission factor of fossil fuel type I used in power unit m in year y ($EF_{CO2,m,,i,y}$)

Type of fuel	Default carbon oxidation factor	Emission factor (tCO_2/TJ)		
		default value	95% confidence interval	
			Lower	Uper
Diesel Oil	1	74.1	72.6	74.8
Fuel Oil	1	77.4	75.5	78.8
Anthracite coal	1	98.3	94.6	101
Bituminous coal	1	94.6	89.5	99.7
Natural gas	1	56.1	54.3	58.3

Table 9: Electricity generation of Viet Nam National Grid (2004-2008)

	2004	2005	2006	2007	2008
Hydro	17859	16365.438	19508	22385	25934
Coal	6500	7872	8989	9836	10055
Gas	19053	24017	26543	29475	33857
Oil	1379	1612	1044	1834	1482
FO	68	50	80	105	90
Diesel Oil	43	16	25	42	15
Bagasse	34	26	34	42	36
Import	39	373	937	2629	3220
Total Power Generation	44936	49958.438	56223	63719	71469
Total Power Generation (include imported electricity)	44975	50331.438	57160	66348	74689
low cost/must run	39.71%	32.52%	34.13%	33.74%	34.72%

Table 10: Fuel consumption, emission and electricity generation in recent 3 years (2006, 2007, and 2008)

Fuel Type	Fuel consumption (1000t or 1000m^3)	Power Generation (MWh)	Emission factor (tCO_2/TJ)	NCV (TJ/t or TJ/Nm^3)	Oxidation Rate	GHG Emission (tCO_2)
Year 2006						
Bituminous coal	5645.86	8989230	**94.6**	0.022137514	1	11823610
Gas		26542978				12479578
Natural Gas	5743235.28	18838764	**56.1**	3.80038E-05	1	12244651
Natural Gas	70.14	233582	**56.1**	0.059704121	1	234927
Tail gas	0	7470632			1	0
Bituminous coal	397.65	1043991	**94.6**	0.03529172	1	1327593
Fuel Oil	16.6	80000	**77.4**	0.040193331	1	51642
Diesel Oil	6.39	25000	**74.1**	0.043284146	1	20495
Eelctricity imported		937000			1	0
Total		**37618199**				**25702918**
Year 2007						
Bituminous coal	6386.09	9836548	**94.6**	0.02197048	1	13272897
Gas		29474918				13116063
Natural Gas	5910941.84	20023591	**56.1**	3.79087E-05	1	12570669
Natural Gas	163.27	557880	**56.1**	0.059544424	1	545394
Tail gas	0	8893447			1	0
Bituminous coal	614.06	1834409	**94.6**	0.035227497	1	2046368
Fuel Oil	25.15	104626	**77.4**	0.041028763	1	79867
Diesel Oil	9.16	42000	**74.1**	0.04285487	1	29088
Eelctricity imported		2629000			1	0
Total		**43921501**				**28544283**
Year 2008						
Bituminous coal	6483.99	10055394	**94.6**	0.021811425	1	13378811
Gas		33857135				14716799
Natural Gas	6839114.84	22396231	**56.1**	3.78844E-05	1	14535266
Natural Gas	54.35	183088	**56.1**	0.059537854	1	181533
Tail gas	0	11277816				0
Bituminous coal	534.59	1481880	**94.6**	0.035292602	1	1784825
Fuel Oil	22.48	90465	**77.4**	0.041026994	1	71385
Diesel Oil	3.73	15000	**74.1**	0.042978657	1	11879
Eelctricity imported		3220000			1	0
Total		**48719874**				**29963699**

Table 11: Calculation of simple OM emission factor of Viet Nam National Grid

Year	Total electricity generation (MWh)	Total Emissions (tCO_2)
2006	37618199	25702918
2007	43921501	28544283
2008	48719874	29963699
$EF_{grid,OM,y}$	**0.6465**	

Table 12: Calculation of simple BM emission factor of Viet Nam National Grid

Power Plant	Year	Type	Fuel consumption (1000 ton or 1000m^3)	Power Generation in 2008 (MWh)	Emission factor (tCO2/TJ)	NCV (TJ/t or TJ/Nm3)	Oxidation Rate	GHG Emission (tCO2)
A Vuong	2008	Hydro		168103.5				
Tuyen Quang	2008	Hydro		1136112.18				
Dai Ninh	2008	Hydro		1145108.5				
Nhon Trach	2008	Natural Gas	166.38	544808.6	56.1	0.0404999	1	378023.00
Ca Mau 1&2	2007	Natural Gas	647.24	2106807.24	56.1	0.0394118	1	1431048.00
				2728872.00				
Total				**7829812.02**				
A Vuong	2008	Hydro		168103.50				
SROC Phu Mieng IDICO	2006	Hydro		241556.00				
SE SAN 3A	2006	Hydro		394895.70				
Tuyen Quang	2008	Hydro		1136112.18				
Dai Ninh	2008	Hydro		1145108.50				
SE SAN 3	2006	Hydro		1131614.00				
Quang Tri	2007	Hydro		250804.40				
Uong Bi 2	2007	Anthracite	281.759	532000.00	98.3	0.0209777	1	581017.63
Na Duong	2005	Anthracite	532	627930.00	98.3	0.016901	1	883846.37
Cao Ngan	2007	Anthracite	526	708693.00	98.3	0.0209096	1	1081145.84
Formosa	2004	Anthracite	495	560295.00	98.3	0.0265381	1	1291302.96
Nhon Trach	2008	Natural Gas	166.38	544808.60	56.1	0.0404999	1	378023.07
Ca Mau 1&2	2007	Natural Gas	647.24	2106807.24	56.1	0.0394118	1	1431047.61
		Tail gas		2728872.00				
Phu My 2,2	2004	Natural Gas	1159.75	4141980.00	56.1	0.0385901	1	2510751.14
Dam Phu My	2006	Natural Gas	56.15	4716.00	56.1	0.0424977	1	133868.48
CAI LAN- VINASHIN	2007	Fuel Oil	22.48	90465.01	77.4	0.041027	1	71384.99
Total				**16514761.13**				**8362388.09**
Total Power Generation in 2008				74689635.97				
20% of Total Power Generation in 2008				14937927.19				
$EF_{rid,BM,y}$				0.5064				

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

$EF_{grid,OM,y}$	0.6465	ω_{OM}	0.5
$EF_{grid,BM,y}$	0.5064	ω_{BM}	0.5
$EF_{grid,CM,y}$	0.5764		

Annex 4

MONITORING INFORMATION

No additional information.