CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Project Title: Suoi Tan Hydropower Project
Version 2.1: Prepared for submission to CDM EB
Completed: 20/07/2009

A.2. Description of the small-scale project activity:

Project Entity and Purpose of the Proposed Project Activity

The proposed project is being developed by Suoi Tan Hydropower Joint Stock Company, a company set up solely for the purpose of developing the project. The project entity has no previous experience in the construction or operation of hydropower projects which is the purpose of the proposed activity. The Suoi Tan hydropower project, hereafter referred to as "the project activity", is located in Chieng Khoa Commune, Moc Chau District, Son La Province in the north of Vietnam. Moc Chau rural district is one of the poorest areas in Vietnam[1] (currently in the location of the project activity, only 70% of households have access to a reliable electricity supply). The project is a run-of-river type which will utilise neither an accumulation reservoir nor a run-of-river reservoir for water storage during times of low rain fall or water flow. Whilst this means a very environmentally friendly solution to growing energy demand, it leads to decreased profitability as no electricity can be produced during times of low rain fall or water flow. By producing power from a renewable source, the project will reduce greenhouse gas emissions by displacing electricity generated by more traditional methods (combustion of fossil fuels) which lead to anthropogenic emissions of carbon dioxide and other greenhouse gasses (the baseline scenario). Considering the anticipated annual operation of the plant, the project will in total generate 24,187 MWh/pa and therefore lead to emission reductions in the order of 15,076tCO_2/pa during the first crediting period.

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 order to quantify the sustainable development contribution of this project two approaches have been taken; the project owner has voluntarily agreed to donate 2.5% of the CER revenue from the project towards sustainable development initiatives and this PDD has employed a multi-attributive utility tool (MAUT[2]) to assign a value to the project's contribution to sustainable development against the baseline scenario. The outcome of the study of the proposed project using the MAUT was a 56.32% positive contribution to sustainable development compared to the baseline scenario. The project has positive impacts with respect to the environment (offsetting fossil fuel use and lowering greenhouse gas emissions), socially (providing jobs, development of a cultural house, ensuring reliable electricity supply, roads), technologically (technology transfer) and economically (satisfying growing energy demands to allow the country and region to develop and alleviate poverty).

[1] The province has been classified as Class C by Decree No.164/2003/ND-CP dated December 22, 2003 and hence eligible for highest tax exemption.

[2] Buron *et al,* 2007. Full results are available as an addendum to this project design document.

A.3. Project participants:

The project participants are as follows

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 Vietnam (host)	Private Entity: Suoi Tan Hydropower Joint Stock Company (as the project owner)	No
Switzerland	Private Entity: Vitol S.A.	No

Suoi Tan Hydropower J.S.C.: A company set up to develop the hydropower project, based in Hanoi, Vietnam.

Vitol S.A.: Oil and gas trader, one of the main suppliers of petrol to Vietnam's state owned PetroViet.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Socialist Republic of Vietnam

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

Son La Province

A.4.1.3. City/Town/Community etc:

Chieng Khoa commune, Moc Chau district

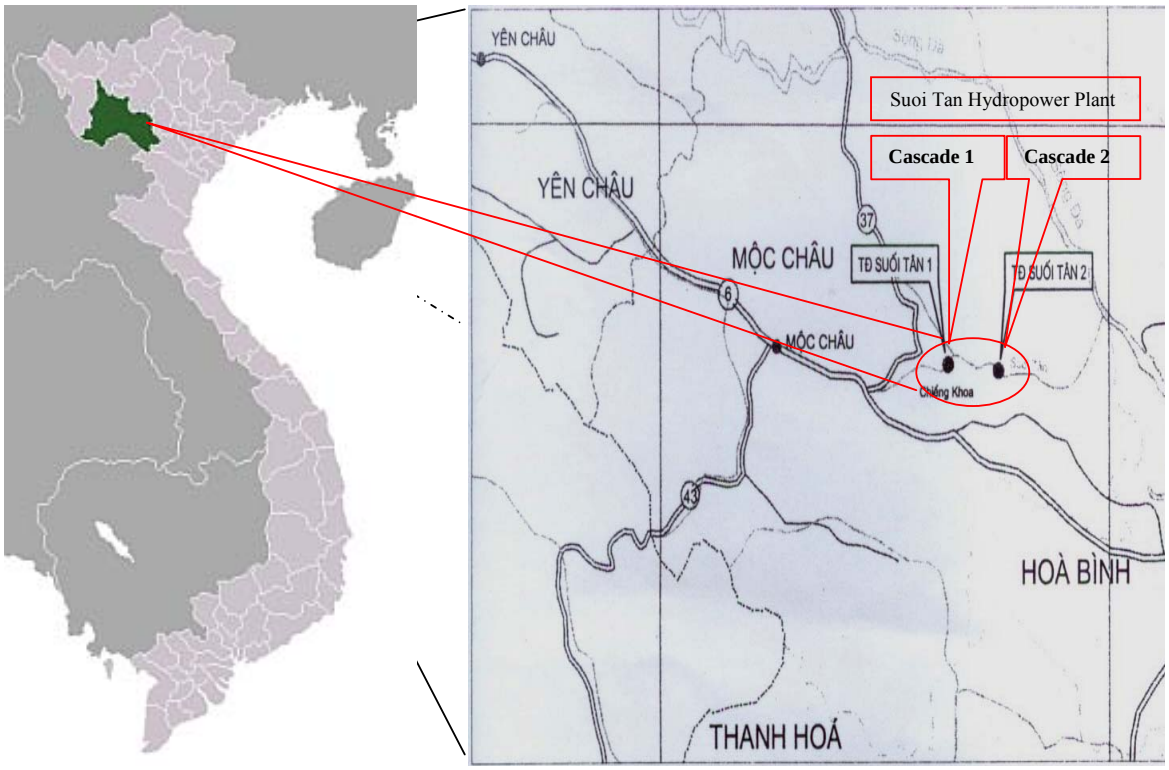
A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The proposed project is located on the right bank in the middle of the Suoi Tan Stream which belongs to a grade-1 branch of the right side of the Da River. It originates from Phu San Van area in the Moc Chau highlands at an altitude of 950m and runs into the Da River at the Hoa Binh reservoir. Its watershed area is about 316 km^2 with an average altitude of 756 m. Its length is approximately 36 km with incline degrees at the project site ranging from 20-72%. The nearest residential area is Na Ten village (2 km away) for cascade one and Chieng Le village (1.5 km away) for cascade two. The nearest major town and city are Moc Chau town (approx 20 km northern west) and Hoa Binh city (120km) respectively.

The co-ordinates of each cascade are as follows:

- Cascade 1: latitude of 20°50'36"N to 20°50'28"N and longitude of 104°49'17"E to 104°50'23"E;
- Cascade 2: latitude of 20°50'38"N to 20°50'15" N and longitude of 104°50'07'' to 104°50'37''

Figure A.2: shows the location of the project



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Type I: Renewable energy projects
Category I.D.: "*Grid connected renewable electricity generation*" (hereafter referred as AMS I.D.)

As the project's total installed capacity is 5.5 MW (below the 15MW CDM 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 small scale methodology AMS I.D.

Technology Description

The total installed capacity of the project is 5.5MW with total expected net electricity generation of 24,187 MWh per annum. The produced electricity will be delivered to the national grid via a 2.05 km new 35kV transmission line at the outgoing feeder-electricity column number 31/28/4 of Chieng Khoa

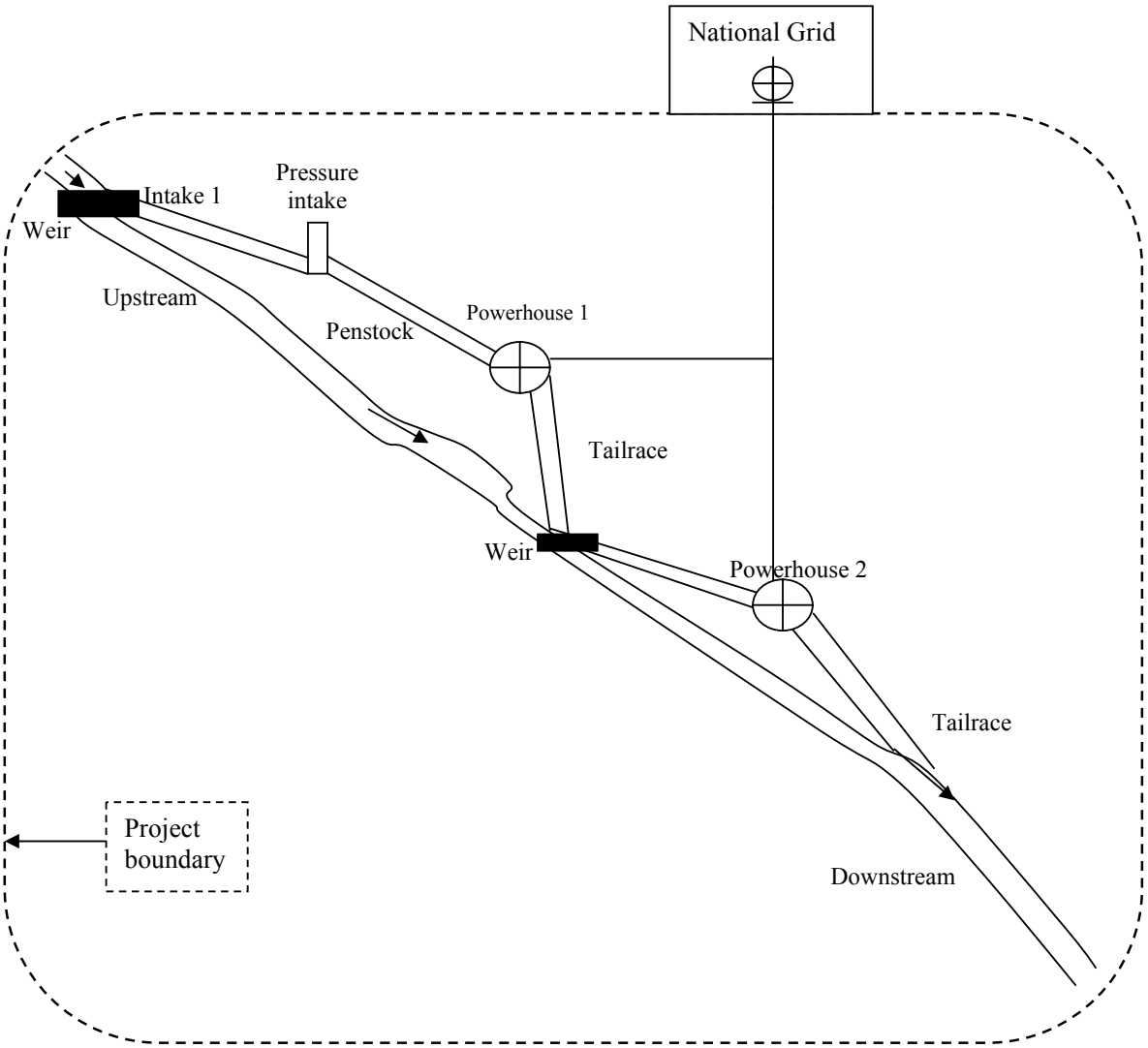
branch in the route 374E 17.1. The main construction structures of the project consist of intake point with gate, forebay/pressure tank, penstock and powerhouse containing turbines, generators and transformer as shown in Figure A3. There is no reservoir associated with the construction of the project, neither accumulation nor run-of-river type. The specific items of equipment employed are listed in Table A2. The technologies detailed in Table A2, along with the governors, valves, exciters and associated installation and commissioning services are imported from China and Japan. They therefore contribute to the sustainable development aspect of the project via technology transfer.

Table A2. Key technology parameters for each cascade of Suoi Tan Hydropower Plant

Key items of plant for cascade 1 (2.5 MW)			
Turbines	Quantity: 3	2: Francis, horizontal axis	1000 KW for each
		1: Inclined jet	500 KW
	Specification	Rated speed	1000 rpm
		Runaway speed	1800 rpm
	Supplier	Hong Ha Equipment Joint Stock Company	
Governors	For Francis turbines with horizontal axis	Model	Electricserco
		Supplier	Tanaka Suiryoku Co., Ltd (Japan)
	For inclined jet turbine	Model	CWT/2-2-4.0
		Supplier	Thah Hoa Company
Generators	Quantity: 3	2	Synchronous, 3 phases, horizontal axis (SFW 1000-6/1180)
		1	Synchronous, 3 phases, horizontal axis (SFW 500-6/850)
	Specification	Voltage	6.3 kV
		Power factor (Cosφ)	0.8
		Rated speed	1000 rpm
		Frequency	50 Hz
		Supplier	Chongqing Electric Machine Federation Ltd –CMF (China)
Key items of plant for Suoi Tan cascade 2 (3 MW)			
Turbines	Quantity	3	
	Type	Francis, horizontal axis 1MW for each generator	
	Rated speed	1000 rpm	
	Runway speed	1800 rpm	
	Supplier	Hang Chau Electricity Equipment Factory (China)	
Governors	Quantity	3	
	Model	YTK-1000 digital	
	Supplier	Vu Han Valve Factory (China)	
Generators	Quantity	3	
	Type	Synchronous, 3 phases, horizontal axis	
	Model	SFW 1000-6/850	
	Voltage	6.3	
	Rated speed	1000	
	Frequency	50 Hz	
	Supplier	Hang Chau Electricity Equipment Factory(China)	

The technology employed and the project activity itself is considered to be relatively environmentally safe as the hydropower plant is a run-of-river project with no 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 project. This is in addition to the fact that power is generated by a renewable resource and resulting in zero emissions.

Figure A.3. The layout of the proposed project



A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The annual emission reductions of the proposed project are estimated to be 15,076 tCO_2e. The project will employ a renewable crediting period and the total emission reductions are estimated to be 105,532tCO_2 for the first seven year crediting period, as shown in Table A.3.

Table A.3. Annual estimated emission reductions for the first crediting period.

Years	Estimation of annual emission reductions in tonnes of CO_2e
January 1st 2009 – December 31st 2009	15,076
January 1st 2010 – December 31st 2010	15,076
January 1st 2011 – December 31st 2011	15,076
January 1st 2012 – December 31st 2012	15,076
January 1st 2013 – December 31st 2013	15,076
January 1st 2014 – December 31st 2014	15,076
January 1st 2015 – December 31st 2015	15,076
Total estimated reductions (tCO_2e)	**105,532**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period	**15,076**

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Annex 1 Parties for the proposed project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project participants confirm that there is no registered small scale project activity or an application to register another small scale CDM project activity:

- With the same project participants;
- In the same project category and technology / measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1km of the project boundary of the proposed small-scale activity at the closest point.

Given the above, and confirmation that the project is not part of a larger project activity, the project satisfies the requirements of Appendix C of the Simplified Modalities and Procedures for Small Scale CDM project activities and is not considered a debundled component of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title of the approved baseline and monitoring methodology: AMS-I.D. *"Grid connected renewable electricity generation"* (Version 13, EB36, 14th December 2007)[3].

B.2 Justification of the choice of the project category:

Table B.1. Applicability of small scale methodology AMS-I.D.

	Applicability Criteria	Project Activity
1	This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.	The proposed project is based on hydropower, a renewable energy generation source. The proposed project shall displace electricity from the national electricity distribution system that is being supplied by at least one fossil fuel fired generating unit.
2	If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel1, the capacity of the entire unit shall not exceed the limit of 15MW.	The project does not incorporate a mix of renewable and non-renewable components. This criterion is therefore not applicable.
3	Combined heat and power (co-generation) systems are not eligible under this category.	There is no combined heat and power component in the project activity. This criterion is therefore not applicable.
4	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The project activity does not involve the addition of renewable energy generation units at an existing facility. This criterion is therefore not applicable.
5	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	The project activity does not seek to retrofit or modify an existing facility. This criterion is therefore not applicable.

[3] Appendix B of the simplified modalities and procedures for small scale CDM project activities.

B.3. Description of the project boundary:

AMS-I.D describes the project boundary in the following way: *The project boundary encompasses the physical, geographical site of the renewable generation source.* The project boundary can therefore be considered as that represented in Figure A.3., excluding the Vietnam national grid.

B.4. Description of baseline and its development:

The baseline scenario is the continued generation of electricity from the Vietnamese national grid system which is partly composed of greenhouse gas intensive fossil fuel based power stations. What follows is a brief discussion with respect to the national grid system, and then a description of how the project's baseline emissions have been derived.

The state-owned company Electricity of Vietnam (EVN) dominates power production, transmission, and sales in Vietnam. 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 2001-2005, total capacity in power sources has increased from 6,192 MW in the year 2000, to 11,298 MW in 2005 and the greatest contributor to the total amount of electricity generated are fossil fuel fired plants.[4]

Baseline emissions are defined in methodology AMS-ID as the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner. They are calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'.

Data Used to Determine Baseline Emissions

The parameters required to calculate the emission factor of each power plant that serves the national grid system is as below.

[4] Source: Electricity of Vietnam

Table B.2. Data used to determine baseline emissions

Parameter	Detail	Source
Amount of fossil fuel consumed	Amount of fossil fuel consumed by the power plant in the year	EVN dispatch data
Net calorific value of fuel consumed	Energy content of the fuel used by the power plant	IPCC data
Net electricity generated and delivered to the grid	Energy generated minus electricity consumed by the power plant itself	EVN dispatch data
Emission factor of fuel consumed	The amount of carbon dioxide released as a result of	IPCC data
Date power plant was built	The power plant is considered to be built when it started to supply electricity to the grid	National Power Development Master Plan in the period 2006-15 and Outlook to 2015.

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 small-scale CDM project activity:

With the implementation of the project activity, the emissions of GHG by sources will be reduced below those that would have occurred in the absence of the registered CDM project activity. The project activity is additional and would not have occurred anyway due to the following barriers[5]:

This is a small scale project activity. According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, the project participants is required to demonstrate that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier, i.e., a financially more viable alternative to the project activity would have led to higher emissions;

b) Technological barrier, i.e., a less technologically advanced alternative to the project activity, though would involve lower risks due to the performance uncertainty or low market share of the new technology adopted by the project activity and so would have led to higher emissions;

c) Barrier due to prevailing practice, i.e., prevailing practice or existing regulatory or policy requirements would have led to the implementation of a technology with higher emissions;

d) Other barriers, i.e., without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

[5] According to the Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project.

The proposed project is subject to a number of barriers which CDM revenue will allow it to overcome. Without such assistance from CDM, the project would not proceed. Of the above, the project faces barriers faced by the project are described in detail in the following paragraphs:

d)1. Other Barriers: Financial Barrier

Though not applicable, as it is a small scale project activity, Additionality Tool Ver. 05 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" Besides, EB 41 Report Annex 45, "*Guidance on the Assessment of Investment Analysis",:* section 11 requires, *" 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.

Keeping the above requirements in view, the project developer has selected the interest rate on Vietnam Dong loan as offered by commercial banks as the benchmark. The domestic currency loan rate of 12.38% is used. This benchmark satisfies all the three conditions listed above:

- The loan is offered by commercial banks and hence it is an 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;
- The benchmark is publicly available data source and verifiable by DOE.

The commercial rate of interest in Vietnam is based on the State Bank of Vietnam's base rate. At the time of the decision to proceed with the project, the State Bank of Vietnam's base rate was 8.25% (decision 1894/QĐ-NHNN dated December 30th, 2005). According to the country's civil code[6] commercial banks may charge up to of 150% of the base rate when lending, i.e. 12.38%.

Though the benchmark works out to 12.38% (8.25 x 1.5), for the sake of simplicity, it was rounded off to 12% in the PDD web hosted for Global Stakeholder Consultation. During validation, DOE suggested the removal of rounding off as there was no basis. Consequently, the benchmark has been modified to 12.38% in the PDD submitted for registration. As could be noticed in the subsequent paragraphs, the additionality of the project does not change whether the benchmark is considered at 12.38% or 12%.

The project developer has selected this rate as the benchmark as this covers the cost of the loan described in the feasibility study, and also provides a return on equity (which is much more riskier than term loan) at 2% over the cost of loan. Should the interest rate as predicted in the feasibility study not be available to the project developer, they could at the least be assured of covering the cost of the loan. This consideration is quite valid as due to the remote location of the projects,, the lack of experience of the

[6] Civil law no. 33/2005/QH11, dated 25/12/2001

Project Proponent and the fact that specialised imported technology involved, the Project Proponent would be more likely to face interest rates toward the higher level that banks are allowed to charge rather than a prime lending rate.

Therefore the project developer has chosen 12.38% The inherent conservatism of the 12.38% benchmark is borne out by the data published by the International Monetary Fund, which places the nominal monthly compounded interest rate at 13.7% during the year when the decision to proceed with the project was taken[7].

In addition to the above, the EVN (State Utility) has also determined the internal rate of return for investment into hydropower projects should be over 12%[8]. The benchmark of 12.38 therefore fulfils all the criteria laid down by the Additionality Tool and conservative. The basic parameters used to calculate the IRR are shown in Table B.3.

Table B.3. Basic Parameters of Financial Analysis

Parameters	Value	Basis
Installed capacity (MW)	5.5	Feasibility study
Plant load factor (percent)	51.23	Feasibility study
Annual power supplied to the grid (MWh)	24,187	Computed
Auxiliary consumption (as percentage of generation)	2.0	General norm due to internal use, transmission and distribution losses
Total investment (million VND)	99,467	Feasibility study
Loan : Equity ratio	70 : 30	Feasibility study
Power Purchase Agreement Price (VND/kWh)	595	Power purchase agreement
O&M cost (as percent of project cost)	1.5	EVN
Escalation in O&M cost (percent per annum)	3	Estimate
Insurance (as percentage of project cost)	0.25	Estimate
Interest rate on term loan	11.76%	Feasibility study
Loan repayment period (years)	8	Feasibility study
Initial moratorium period (years)	1	Feasibility study
Depreciation – Equipment	10%	Present practice in Vietnam
Civil works	5%	Present practice in Vietnam
Natural resource tax (as a percentage of revenue)	2.0	Ordinance on natural resource tax
Enterprise income tax	0-25%	Decree number 14/2008/QH12
Lifetime of the project (years)	30	

In this context, a few explanations are in order:

a) Plant Load Factor (PLF)/ Annual power supply to grid: This project consists of two cascades- Cascade 1 with a generating capacity of 2.5 MW and Cascade 2 with a generating capacity of 3 MW. Feasibility Study, had estimated the PLF at 49% for Cascade 1 and 52% for Cascade 2. The PLF stated in the PDD

[7] http://www.imf.org/external/pubs/ft/scr/2007/cr07386.pdf, p24

[8] Electricity of Vietnam Masterplan 6

web hosted for GSC was based on a simple average of two PLFs – [49 + 52] / 2 = 50.5. The annual energy supplied was computed based on the weighted average of two PLFs, i.e., [5.5 X 8760] X {[(2.5 X 49%)+(3 X 52%)]/(2.5+3.0)} = 24,397 MWh. After accounting for 2% auxiliary consumption, net export to grid has been arrived at as 23,909 MWh.

As this does not present the right PLF, during validation, the PLF was computed based on the net export to grid. The Feasibility Study has projected the generation from Cascade 1 at 10870 MWh (49.63% PLF) and 13810 MWh (52.55%) for Cascade 2, resulting in the total generation of 24680 MWh for both the cascades. The installed capacity of both the Cascades put together being 48180 MWh (5.5 X 8760), the PLF works out to 51.2% (24680 / 48180), which is used in the assumptions.

Accordingly, the projections were modified based on the total generation as projected in the Feasibility Study. Consequently, there is a small difference between the PLF given in the PDD web hosted for GSC and the final PDD now submitted for registration. The use of PLF given in the web hosted PDD would only bring down the IRR.

b) Investment Cost: The capital cost in the PDD web hosted for GSC included interest during construction of VND 6023 million, though it was not considered for computation of IRR. However, during validation, at the advice of the DOE, this cost was removed and presented accordingly in in the PDD submitted for registration,

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. 164/2003 dated 22nd December 2003. Moreover, the project activity is located in List C of geographical area with special 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. In addition, it has been ensured that all the expenditures are allowable as charge on the profit and loss account as per the Decree.

As per the Enterprise Income Tax provisions of Viet Nam, enterprises set up in certain specified locations and / or engaged in certain specified activities are exempt from Enterprise Income Tax for the first 4 years; thereafter for 9 years it has to pay tax at 50% of the normal tax rate (i.e., 50% of 25%) and pay tax at the stipulated rate (i.e., 25%) thereafter. The Tax provision also permit carrying forward unabsorbed depreciation/business losses and setting off the same against the future income, which has been taken care of in the calculations Consequent upon the carry forward and set off, tax liability occurs for the project only from 11th year, though as per Decree, the company is eligible for tax holiday for 4 years only. The concessional tax rate to which the company is entitled to has been taken care of as evident from the fact that tax has been computed at 12.5% for the years 11, 12 and 13 and at 25% thereafter, which is strictly as per the Decree.

As mentioned above, Son La province, where the candidate project is located, has been classified under List C – "Geographical areas meeting with special socio-economic difficulties, which are entitled to investment preferences". Moreover, the project activity is also classified as investment in development of specially important infrastructure facilities and power plant forms part of List A – "Branches, lines and domains eligible for investment preferences". Hence, under both the counts – by virtue of location and line of activity, the project is entitled for income tax concessions both under decree No. 14/2008/QH12 and Decree No. 164/2003-ND-CP. The main difference between the two decrees in so far as the tax exemption in Son La province is concerned is given in the following table:

14/2008/QH12		164/2003/ND-CP	
Issued on :	June 03, 2008	December 22, 2003	
Governing Article:	14.1	Governing Articles:	35.1 (e), 35.2 (a) and 36.9
First 4 years :	No Tax	First 4 years:	No Tax
Next 9 years:	12.5%	Next 8 years:	5.0%
After 13 years:	25%	Next 3 years:	10.0%
		After 15 years:	28.0%

In this context, it needs to be mentioned that whilst applying for the Letter of Approval, Vietnamese DNA wanted the PDD to be updated by applying the latest tax law (the request from the DNA has been furnished to the DOE). Accordingly, the latest tax law, viz., decree 14/2008/QH12 was used to compute the tax. Since the actual tax rate had come down, as a conservative measure, the latest tax rate was used. Use of older tax rate would only increase the tax liability bringing down the cash flow.

Table B.4 presents the result of the IRR analysis in comparison with the bench mark.

Table B.4. Comparison of project IRR with the benchmark

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	Project IRR	Benchmark
Values	9.96%	12.38%

The IRR estimate is quite conservative in the sense that the project cost does not include relocation cost, interest during construction or any of the administrative and operational expenses during construction. Likewise, the operating statement is also conservative as the escalation in O&M expenses has been taken only at 3% as against the inflation rate of over 15% and administrative salaries have not been provided. If provisions are made for this, IRR will come down.

As can be seen from the table above, the IRR for the project activity computed over a period of 30 years without CDM benefit is only 9.96%. The project promoter would not have gone ahead with the project activity in absence of the CDM benefit. As can be seen from the results of the IRR analysis, the CDM benefit (increase of IRR to 12.58%) would enable the Project Proponent to improve the return and make the project activity financially attractive.

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). Three factors have been identified as sensitive: project cost, plant load factor and O&M cost. 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 B.5. Sensitivity Analysis

Project IRR	-10%	0	10%
PLF	8.20%	9.96%	11.57%
Project cost	10.63%		9.30%
O&M cost	10.18%		9.73%
Benchmark	12.38%		

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 has been considered while preparing the income statement. Since it is dependent upon climatic conditions, higher PLF is a very remote possibility. O&M costs are 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 22 basis points when the O&M cost is brought down by 10%.

Reduction in project cost is also equally highly unlikely as the country is already experiencing more than moderate inflation. Though the inflation rate has touched 12.6% in December 2007[9] and had gone up further to 15.7% in February 2008[10]. 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 is locked in the 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, is not a business-as-usual scenario and given the above data is also 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 12.58%. It is in the above background, and the other barriers the project faces which are outlined below, that CDM registration is requested.

d)2. Other Barriers: Macroeconomic Conditions in Vietnam

The financing and construction phases of the proposed project are taking place during the period of the highest inflation rate Vietnam has experienced since 1996. The rate of inflation in Vietnam was recorded at 15.7% in February 2007, increased from 14.1% in January 2007.[11] This could result in escalation in the project cost. The CDM revenue will help in absorbing a part of this unforeseen additional cost burden.

[9] http://www.iht.com/articles/2008/01/28/business/dong.php, downloaded on August 15, 2008

[10] http://www.iht.com/articles/ap/2008/02/28/business/AS-FIN-ECO-Vietnam-Inflation.php, downloaded on August. 15, 2008

[11] Financial Times, 28th February 2008

d)3. Other Barriers: Geological Conditions

d)3a. The project is located at a site where geological phenomena could lead to unexpected sitatutions in the project. The Feasibility Study states that *"one of disadvantages of the Suoi Tan 1 HPP is that the project proponents can not create a regulated reservoir. Areas along National Road 6, some 20 km wide lasting from Moc Chau-Yen Chau-Son La-Thuan Chau-Quynh Nhai are characterised by a layered limestone mass area. Inserted between these layers is sandstone and shale hills. The karst* ["Karst" is descriptive of a type of terrain that results from the erosion of bedrock types, which are particularly soluble in water. Karst landscapes is lead to ground level holes and subterranean caves. Karst landscapes lead to a lack of surface water streams] *phenomenon develops strongly. There are water caves on the mountains, and underground streams. This makes surface water scarce in the dry season. However, the flow distribution in the limestone areas is extremely severe: very large flow in the rain season and very small in dry season. So if there is no good method for selecting rationally installed capacity as well as generator's quantity, the ability to use this stream to generate electricity is not high"*. In conclusion, this area is a risky area to develop hydropower plants.

d)3b. The feasibility study highlights that the Suoi Tan hydropower plant is located in the Song Da fault zone, which experiences earthquakes with an intensity reaching 8 on the MSK scale (maximum 12, equivalent 5-6 on the Richter scale).

d)4. Other Barriers: Construction Barriers

d)4a. As part of an international co-operation agreement between the Socialist Republic of Vietnam and Japan, a small hydropower plant, the Na Cha HPP was built in the year 2000. The project is small, at 120 kW with a net head of 48m and a designed flow of 0.33 m^3/s. The plant is located 3km downstream from Suoi Tan cascade one and 160m upstream of Suoi Tan cascade two – between the two cascades. As the water flow of the stream is not sufficient for both Suoi Tan cascade 2 and the Na Cha HPP, the project proponents have paid ¥9,520,000 (VND1.3bn) in order to manage and operate the Na Cha HPP**.** The project owner has agreed to supply electricity from this hydropower plant to the local community at a discount rate in order to promote sustainable development. Carbon revenue is envisaged to offset the additional project cost.

d)4b. The area in which the HPP is to be built is known for risk to flooding. In addition to the weak geological base described above, this presents construction hazards to the project as well.

d)4c. Due to the remote mountainous location of the project, the project proponent has had to make provision for investing in the creation of new roads to the site. This cost of building roads in the region has been estimated at VND650,000,000. Whilst this would benefit the local community, it increases the project cost with resultant impact on the profitability of the project.

d)5 Policy Barrier

Private investment has only been possible in Vietnam since relatively recently and the EVN does not have any policies in place to promote the development of small scale hydropower plants, e.g. through preferential tariffs. Neither are there any preferential policies for projects which are located in remote areas and to those which do not employ reservoirs. There is however a policy in place to promote the use of accumulation reservoir projects (Ministry of Industry issued Decision No. 3837/QD-BCN on 22/11/2005). Whilst these projects may be able to generate electricity on a larger scale, their development is more often than not associated with deforestation, resettlement and flooding. Also, the development of

small scale hydropower projects in areas such as the one where the project is located is highly remote and classified as Category "C" for maximum income tax benefits to attract the entrepreneurs. In fact EVN states, "some works are located in the areas difficult to exploit and far from the power consumption center so they will not be developed in the short-term period"[12]. Further, due to the state owned EVN's monopoly position, the negotiation of a power purchase agreement can be difficult for the independent project developer where there is no state involvement in the project (it is still common for the state to take a shareholding position, for example) as the market is far from transparent.

Therefore, given the above background, the approval and registration of the project as a CDM activity will enable the project proponent to overcome these barriers.

Prior Consideration of the CDM

That the CDM benefits are imperative for the project was realised by the Board of Directors as soon as the project was conceived is evident from the resolution passed by the Board of Directors on 15h January 2006. The resolution not only reveals that the PP was aware of the CDM benefits but that CDM was a decisive factor in the decision to proceed with the project. The project activity started with Project Proponent committing to significant expenses related to project development, which was equipment purchase in September 2007. Please refer to table B6 for further details.

[12] Development Plan For National Electricity, Period 2006-2015, EVN, June 2006

Table B.6. Timeline of Events

Action	Date	Document(s)
Recommendation that the CDM is imperative to procudure with project	5-Jan-2006	Letter of 5th January
Minutes of meeting say proceed with CDM and appoint consultant	15-Jan-2006	Board resolution document dated 15th January 2006
Suoi Tan project identified by the Vietnamese DNA and Japanese Government as a CDM project under development	14-Mar-2006	Please refer to the link below[13]
Proposal from consultant	5-Jun-2006	Carbon Asset Management agreement
Construction contract signed	6-Jun-2006	So 01/HD-XD
Revised proposal	16-Jan-2007	Revised simplified proposal of 16th January 2006
Agreement for PDD services and authorisation to negotiate emission reduction credits sales signed with consultant	27-Feb-2007	Carbon Asset Management agreement
First major equipment purchased	30-May-2007	Invoice no. Suoi Tan1 116

As evident from the above, the Project Proponent was aware of the CDM benefits and the CDM benefits were the decisive factor in the decision to go ahead with the project. The chronology of events given above reveal that the Project Proponent had taken parallel action to implement the project and to get the project registered as a CDM activity; the two conditions stipulated by EB41 Annex 46 related to the serious consideration of CDM benefits are fulfilled.

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 AMS-ID is used in conjunction with the "Tool to calculate the emission factor for an electricity system (Version 01)". Below is a description of how the three types of emission (baseline, project and leakage) are calculated, along with key assumptions and rationale for methodological choices.

13 http://www.meti.go.jp/policy/global_environment/kyomecha/investorsforum/060315forum2nd/presentations/Vietnam_public01.pdf

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 Vietnam national grid is identified as the relevant electric power system.

Step 2: 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 state owned EVN defines only hydropower as "low cost" and does not make any reference to "must run" power stations in its documentation. 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 that 50% of the grid's input (please refer to table B5). Therefore the "Simple Operating Margin" can be calculated for the purpose of deriving the grid emission factor as per Step 2 of the tool to calculate emission factor from an electricity system.

Table B.5. Contribution of low cost and "must run" sources to overall power generation in Vietnam[14]

Year	2003	2004	2005	2006	2007	Average
Percentage share of low cost and "must run" power stations	46.5	32.0	27.5	30.3	31.5	33.5

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 time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period . The years used are therefore 2005-7 inclusive.

Step 3: Calculate the Operating Margin Emission Factor According to the Selected Method

In the case of Vietnam, some information regarding the output of the state owned EVN is private and confidential and / or unavailable for consideration. As such, Option B under Step 3 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:

[14] Source: Electricity of Vietnam Masterplan 6 and expert interview

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

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).

If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows (Option B1):

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

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

If for a power unit *m* only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows (Option B2):

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \cdot 3.6}{\eta_{m,y}}$$

(3)

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type i used in power unit m in year y (tCO_2/GJ)
$\eta_{m,y}$ = Average net energy conversion efficiency of 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)

Step 4. 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 2007 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 5. 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.

Step 6. Calculate the Combined Margin Emissions Factor

The combined margin emissions factor is calculated as follows:

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

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.

Leakage

As per methodology AMS-ID, leakage emissions are considered as zero for the proposed project as:

- No equipment is transferred from another activity
- Biomass residues are not required by the project to generate electricity.

Therefore:

$$LE_y = 0 \quad (6)$$

Project Emissions

Methodology AMS-ID does not require the calculation of project emission reductions so these will not form part of the emission reductions calculation.

Emission Reductions

Emission reductions are therefore, in the absence of leakage and project emissions, equal to the electricity generation of the grid in year *y* multiplied by the emission factor derived from the calculation above:

$$ER = EG_y \text{ x } GEF \quad (7)$$

Where:

ER_y = Emission reductions realised in year *y* (tCO_2)
EG_y = Energy generated by the national grid system in year *y* (MWh)
GEF = Grid emission factor (derived from the calculations above, tCO_2/MWh)

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

Data / Parameter:	NCV_i
Data unit:	TJ per mass or volume of fuel
Description:	Net calorific value (energy content) per mass or volume unit of a fuel *I*
Source of data used:	IPCC default values
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is collected from the IPCC as national and / or local data is unavailable.
Any comment:	

Data / Parameter:	***Fi,j,y***
Data unit:	10^4t,10^8m^3
Description:	The quantity of fuel *i* (by mass or volume) consumed by the relevant power source *j,* in year(s) *y.*
Source of data used:	Report on the Operation of Vietnam National Electricity System in Years 2005-7: EVN/National Electricity System Dispatching Centre - Department for Electricity System Operation, Hanoi.
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data are used from Electricity of Vietnam (EVN), the only source for such information.
Any comment:	

Data / Parameter:	**Installed Capacity**
Data unit:	MW
Description:	Installed capacity of power plants serving the Vietnamese national grid system
Source of data used:	Masterplan 6, EVN
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data are used from Electricity of Vietnam (EVN), the only source for such information.
Any comment:	

Data / Parameter:	**Electricity Generated**
Data unit:	MWh
Description:	Electricity generation attributable to power source *j*
Source of data used:	Report on the Operation of Vietnam National Electricity System in Years 2005-7: EVN/National Electricity System Dispatching Centre - Department for Electricity System Operation, Hanoi.
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data are used from Electricity of Vietnam (EVN), the only source for such information.
Any comment:	

Data / Parameter:	**Internal Electricity Consumption**
Data unit:	%
Description:	The internal power consumption of power source *j*
Source of data used:	Report on the Operation of Vietnam National Electricity System in Years 2005-7: EVN/National Electricity System Dispatching Centre - Department for Electricity System Operation, Hanoi.
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data are used from Electricity of Vietnam (EVN), the only source for such information.
Any comment:	

Data / Parameter:	**$EF_{CO2,i}$**
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel *i*
Source of data used:	IPCC default values
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is collected from the IPCC as national and / or local data is unavailable.
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 24,187MWh. Therefore, according to formula (7), repeated below for convenience, the annual emission reductions in the first crediting period can be calculated as follows:

$ER_y = EG_y \times GEF$ (7)

$ER_y = 24,187 \times 0.635447 = 15,076tCO_2$

Thus the annual emission reductions attributable to the proposed project activity are $15,076tCO_2$

In this context, it may be stated that the grid emission factor used in the PDD web hosted for GSC was based on the data made available to the Project Proponent at the time of preparing the PDD. This data obtained by the Project Proponent did encompass power plants owned by the State, but not that of independent power producers (IPPs) subsequently - a recent development in Vietnam. Numerous attempts were made by the Project Proponent and CDM consultant to acquire this data, but the attempts were not successful. Grid emission factor data (required for determining the emissions) is very difficult to obtain in Viet Nam. This was confirmed to DOE in the interview with a power generation expert from the EVN.

The full set of data got published finally in June 2008 and made available to the Project Proponent and CDM consultant sometime in September 2008. Since by that time the PDD was already web hosted for Global Stakeholder Consultation, the Project Proponent in consultation with DOE corrected the data in the PDD. Hence there is a difference between the PDD web hosted for GSC and the PDD submitted for registration.

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)
January 1st 2009 – December 31st 2009	0	15,076	0	15,076
January 1st 2010 – December 31st 2010	0	15,076	0	15,076
January 1st 2011 – December 31st 2011	0	15,076	0	15,076
January 1st 2012 – December 31st 2012	0	15,076	0	15,076
January 1st 2013 – December 31st 2013	0	15,076	0	15,076
January 1st 2014 – December 31st 2014	0	15,076	0	15,076
January 1st 2015 – December 31st 2015	0	15,076	0	15,076

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{y,net}$**
Data unit:	MWh
Description:	Net electricity exported to the national grid system from the project
Source of data to be used:	Electricity sales receipts for electricity to the EVN (Vietnamese state owned electricity company) and on-site metering systems.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	24,187
Description of measurement methods and procedures to be applied:	The data is directly measured by kilowatt hour meters at the project site and collated according to the organisation plan shown in Section B7.2. These meters are to be calibrated by the relevant authority in accordance with Article 6.3 of the Power Purchase Agreement. As part of the measurement process: ✓ Hourly measurement and monthly recording will take place ✓ Data is electronically archived during the crediting period and 2 years later ✓ Two metering systems shall be used: one main and one backup
QA/QC procedures to be applied:	The data from electricity sales receipts will be cross checked against meter readings taken at the project site. A second backup metering system will be installed which can be used in the event of failure of the first. In addition to the calibration requirement described above, the data shall be kept in electronic form and sent to the project developer's offices for archiving (to be used in the event of on site computer failure).
Any comment:	

B.7.2 Description of the monitoring plan:

Quality assured monitoring is key to obtaining and verifying real, measurable data in order to quantify the emission reductions due to the project activity. The monitoring plan is described as follows:

1. Monitored Data

The monitored data is the net electricity quantity delivered to the national grid.

2. Monitoring Organisation

Roles and responsibilities are defined as follows:

Position	Responsibilities
Operational staff (site based)	Ensure monthly meter readings are captured in standard format
Site Manager	Ensuring monthly 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 Manager Attendance at annual verification
Project manager	Collation of metered data from the project site Collation of confirmation records from the EVN purchasing subsidiary (see Annex 4). Monthly cross-check of confirmation records against metered data

3. Metering System and Measurement Equipment

A Power Purchase Agreement (PPA) between the project developer and the EVN defines the metering arrangements and necessary quality control to measure electricity exported from the proposed project.

3a) Description of the metering system

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

3b) Main items of measurement equipment

Electronic meters with a precision of 0.5%

4. Data Collection and Management

- The electricity supplied by the project to the grid will be automatically monitored by the two meter systems (main and backup).
- The data is measured on a half-hourly basis and monthly reports are generated.
- All the data in both systems is remotely and automatically monitored and read.
- All records of electricity generation output will be archived in paper form for at least two years after finishing the seven year crediting period.
- Paper invoices are collated by the Project Manager and archived for at least two years beyond the end of the crediting period.

5. Maintenance, Calibration and Accidence Treatment for Measurement Devices

- The measurement devices have to be initially and periodically calibrated by the relevant authorities Meters shall be calibrated annually, whilst voltage and current transformers shall be calibrated once every five years.
- One of the parties concerned (i.e. Project proponent or EVN) can require an extra calibration any time during the interval period between two calibrations
- In the event that the metering system suffers any failure, damage or unexpected problems, or if any errors in the main metering system are detected during calibration, the electricity exported will be identified as follows:
  - Using the results of the backup system
  - Should the backup system also suffer a breakdown, the electricity exported will be proposed by reconstructing data by means of trend analysis (taking a conservative approach).
- Any non-conformities of monitoring system detected shall be immediately reported and corrective actions taken.

6. Verification and Monitoring Report

- The project owner will prepare, arrange, and make available data for verification by an accredited Designated Operational Entity.
- An annual report describing electricity exported and emission reductions shall be generated from monthly recorded meter and invoice data.
- The Site Manager will be available to attend annual verification.

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

Mr. D. L. Shaw
KYOTOenergy Pte. Ltd
No 19 Jalan Dua
Off Jalan Chan Sow Lin
55200
Kuala Lumpur

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 is deemed to have started on 30/05/2007 as this is when the project proponent committed to expenditures related to the implementation of the project activity (equipment purchase).

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:

1st January 2009 or registration date which ever is the latest

C.2.1.2. Length of the first crediting period:

7 years, January 1st 2009 – December 31st 2015

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

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

The project will reduce the environmental impact associated with the production of electricity substituting fossil fuels with water as a fuel supply. According to Vietnamese law, hydropower plants need to have their environmental impacts assessed with either an Environmental Impact Assessment (EIA), Environmental Impact Evaluation (EIE) or Environment Protection Commitment. The requirement as to which is required depends on the specific project (generally determined due to its size). For the Suoi Tan project, it has undergone an Environmental Protection Commitment (sometimes referred to as an EIA report in the project documentation). This EPC (EIA) has been approved by the relevant local authorities, Son La Provincial Department of Natural Resources and Environment, dated 17th May 2005 for cascade 1; and Moc Chau District Department of Natural Resources and Environment for cascade 2, dated on 20 September 2007.

The environmental study for each cascade has been conducted at the feasibility study stage. In general, the EPC concludes that for the project, negative environmental impacts are negligible because it is a run-of-river type. Moreover, it is situated in a remote area and does not require significant land clearing. Environmental impacts from the project have been clearly stated and approved by the local environmental authorities as described below.

Environmental Impacts During Construction

It is at this stage that the impact to the environment is the most significant. The first work is land clearance for the project. Because the land area needed for the project is relatively small (no reservoirs) and the forestry areas are mainly bush or barren, the clearance works are relatively straight forward. Parallel to the construction of the project, reforestation is required to prevent land erosion. The environmental impacts from the construction phase of the project and their mitigation measures are as follows:

- Ecosystems: impacts on ecosystems are very negligible because the forest and aquatic ecosystems are already quite poor. Moreover, these impacts are temporary and relatively small. For cascade 1, the agro-forestry land occupied is around 1.5 hectares which is comprised of paddy fields (0.3 hectares), perennial trees (0.6 hectares), production forests (0.2 hectares), tea growing land (0.3 hectares). For cascade 2, the forest land occupied is approximately 2 hectares. However, the company has made a reforestation plan to address the impact to ecosystems as a result of the project activity.

- Exhaust gasses: these arise mainly from mobile vehicles used for purposes such as road construction. Firstly, selecting modern machines to carry out the necessary works, then arranging for works to occur at specified times to avoid the impacts on the rest time of local communities. Finally using sprayed water to prevent dust and covering vehicles carrying materials.

- Noise: generated from mine explosions (with a 1km impact radius). Also from vehicles (0.2 km impact radius). This impact is temporary, and quite far from the local residents. Employees will take appropriate health and safety precautions.

- Wastewater: Domestic wastewater is collected and treated before discharging into the water body, no waste is directly discharged to the environment. For disposal of oil, degreaser etc, they will also be collected and treated. Especially, during construction, earth falling into the stream should be avoided as this causes water pollution. During the preparation, construction and operation stages, the company needs to take water samples to test, as per Vietnamese Environmental Standards. In the case that the water quality does not meet the requirements of these standards, it will be treated.

- Solid wastes: those generated from land clearance and domestic waste will be collected and disposed of in suitable areas.

- In order to prevent fire and explosion risk, flammable and explosive items will be stored specially as required. The constructor needs to have the equipment and the tools for preventing these accidents. Training with respect to safety regulations for all workers is also required.

Environmental Impacts During Operation

The impacts are considered to be very negligible at this stage.

- The main area where there could be risk to the environment and therefore attention is required are fire and explosion hazards that are present in all electricity generating projects. Such risks would be managed by a health and safety plan.

- Planting trees is necessary to recover the cleared poor forest area. It is also paid attention to at this stage in order to create a nice landscape and protect the environment (e.g. from land erosion).

- Domestic waste will be properly treated before discharging into the environment.

- 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.

In general, the summary of the environmental impacts due to the project activity are presented as in Table D1.

No	Environmental parameters	Impact Factor	
		Construction phase	Operation phase
I	***Natural Environment***		
	Soil		
	• Loss/occupied	-	0
	• Landslides, sedimentation	0	-
	Water		
	• Water quality	-	0
	• Underground water table	0	+
	Fauna-flora	-	+
	Micro-climate	0	+
II	***Social-Economic Environment***		
	Economic Impacts		
	• Agriculture	-	++
	• Forestry	-	+
	• Aquatic	0	+
	• Transport	-	++
	• Commerce-Tourism	0	++
	Cultural-Social Impacts		
	• Living Standard	-	+
	• Community Health	0	+
	• Culture	0	+

Note: where
- : *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*

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:

There are no significantly negative environmental impacts arising from the project. All environmental impacts have been clearly stated in the environmental impact assessment reports which has been approved by the Moc Chau district People's Committee on 20 Sept 2007, document number 11/GXN-UBND.

SECTION E. Stakeholders' comments

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

Two stakeholder meetings were conducted due to the remote, mountainous location of the proposed project. Having two stakeholder consultations, one in Hanoi and one in the location of the proposed project, offered the chance to national organisations in Vietnam (national newspapers, university representatives, NGOs) who might not have otherwise been able to attend the provincial meeting to put forward their views, concerns and questions on the proposed project. All participants at the first meeting in Hanoi were also invited to attend the second provincial consultation in Son La province.

The first meeting was held at 63 A Ly Thai To Street, Hoan Kiem, Hanoi, Vietnam on Monday 10th March 2008 and was attended by the project owner, CDM consultant, and the national organisations described above and in the attendance list (see Annex 8). The second consultation meeting was in the People's Committee Building, Chieng Khoa Commune, Moc Chau District, Son La Province, Vietnam at 0900hrs on March 11th 2008. Personal invitations were sent to community leaders, local People's Committee representatives, media etc., and public notices of the planned consultations were placed in *National Resources and Environmental Newspaper* which is widely published and read in provinces. Across the two consultations, presentations were made by the project owner and consultant who outlined the planned project activity 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. In all across the two consultation meetings, there were fifty-eight participants ranging from University Professors to local inhabitants.

Fig.E. 1 – Picture of the local stakeholder consultation meeting for Suoi Tan project

E.2. Summary of the comments received:

Stakeholder Consultation Meeting in Hanoi

The representatives asked the following questions verbally:

- Would there be substantial negative environmental impacts as a result of the construction and operation of the hydropower plant?
- Is there a threat to biodiversity (e.g. Fish life)
- Would there be resettlement necessary?
- How are emission reductions derived?
- How long does the registration with the UNFCCC take?
- From what date can carbon credits be claimed?

The questions were addressed by the project owner and the consultant. All attendees also filled in the questionnaires and provided their comments as follows:

- One half of attendees raised concerns that the construction of the hydropower plants could affect aquatic ecosystems. After considering the EPC (EIA) of the project, there are no threatened aquatic fishes, mammals or other living creatures living in the stream. One reason is because hydropower plants need to be located on a significant slope, and the project does not have a reservoir. Thus, basically this impact is very small to negligible.

- Nearly haft of attendees raised concerns over potential impacts that could be caused by the construction of the project (noise, vibration etc). These impacts are unavoidable but they are temporary. The project owner committed that they would apply many measures (see above) to mitigate these impacts. Some attendees were also concerned that there might exist risks of accidents. Again, accidents cannot be ruled out but steps to reduce their likelihood are described above.

- Almost all attendees agreed that the projects would lead to social changes such as creating jobs.

- Many of the attendees commented that they had not been to the project site before so that do not know whether the project in a location where it is likely to be highly visible to many people or not. The project owners stated that whether they are highly visible or not they will apply measures to mitigate this such as enhancing and reforesting around the project and covering the construction site by suitable measures.

- 30% of attendees said that the projects can be affected by dynamic geological activities such as landslides and earthquakes.

Stakeholder Consultation Meeting in Son La

- Attendees raised concerns that the project can affect transport routes or facilities in or around the project location which are used by the public for access to recreation or other facilities. This was because they thought vehicles serving the project would cause traffic problems. However, the project owner clarified that a) the number of vehicles necessary to construct the project was small and b) the company has also built new roads to access the project site, so this problem would not happen.

- As the project is located near a transport route, the project owner has committed to cover the project site by suitable measures and by planting more trees.

- Attendees also raised concerns with respect to change of land-use. This is an unavoidable impact. To mitigate it, the project owner has implemented consistent compensation (VND218,085,200 for cascade one; VND577,000,000 for cascade 2). All concerned people were satisfied with this compensation.

- A few stakeholders raised concerns with respect to the potential contamination of water and soil. However, this impact will be mitigated by suitable measures as proposed in the EPC (EIA) study.

In general, the project received many positive responses from stakeholders. They are generally expecting positive impacts with respect to the social, economic and environmental aspects of the project.

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

The project owner assured that:

- The project's construction and operation would be in line with the environmental and health and safety laws of Vietnam;
- As the project is run-of-river and does not employ a reservoir, it's environmental impact is relatively low;
- That reforestation of the relatively small amount of land will take place.

In addition, the meeting was informed of the voluntary pledge of 2.5% of CER revenue to be specifically donated to sustainable development and cultural projects such as:

- Building facilities and infrastructure for the local community i.e. children's playground or a recreational park.
- Educational assistances for employees or their dependents by scholarships.
- Donating for the schools to buy reference books, upgrading libraries, and constructing bus-stops.
- Sponsoring for local community events such as sports activities, traditional festivals etc.
- Constructing new roads.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vitol S.A.
Street/P.O.Box:	P.O. Box 384
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Direct tel:	
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Organization:	Suoi Tan Hydropower JSC.,
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Represented by:	Mr. Pham Ngoc Luong
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Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Neither public funding nor ODA funding was applied for by the project proponent.

ANNEX 3 - BASELINE INFORMATION

Operating Margin		A	B	C	D	E
		Fuel Consumption 2005-7	Emission Factor	Carbon Dioxide Per Annum	Annual Output 2005-7	tCO2 / MWh
		TJ	tCO2/TJ	tCO2 (= A * B)	GWh	(= C / D)
Coal		301,193	98.3	29,607,273	28,529	1.038
Fuel Oil		22,425	77.4	1,735,713	1,892	0.917
Diesel Oil		54,391	74.1	4,030,366	5,503	0.732
Natural Gas		840,675	56.1	47,161,860	78,388	0.602
Import from China		0	0	0	3,979	0.000
				82,535,212	**118,290**	**0.698**

Build Margin		A	B	C	D	E
	Commercial Operation Date	Fuel Consumption 2007	Emission Factor	Emissions	Generation (2007)	Emissions Rate
	Year	TJ	tCO2/TJ	tCO2/y	GWh	tCO2 / MWh
				tCO2 (= A * B)		(= C / D)
Option 2. Additions represents 20% of the system generation						
Quang Tri (Hydroelectric)	2007	0	0	0	64.0	0.000
Ca Mau 1 (Natural Gas)	2007	6,634	56.1	372,145	691.0	0.539
Uong Bi MR 1 (Coal)	2007	4,800	98.3	471,840	520.0	0.907
Cai Lan (Diesel)	2007	748	74.1	55,404	81.0	0.684
Se San 3A (Hydroelectric)	2006	0	0	0	345.0	0.000
Cao Ngan (Coal)	2006	4,108	98.3	403,786	445.0	0.907
Srok Phu Mieng (Hydroelectric)	2006	0	0	0	252.0	0.000
Se San 3 (Hydroelectric)	2006	0	0	0	1,128.9	0.000
Dam Phu My (Natural Gas)	2006	1,440	56.1	80,784	150.0	0.539
Formosa (Coal)	2004	10,274	98.3	1,009,919	1,113.0	0.907
Na Duong (Coal)	2004	6,868	98.3	675,094	744.0	0.907
Phu My 2.2 (Natural Gas)	2004	48,038	56.1	2,694,954	5,004.0	0.539
Phy My 4 (Natural Gas)	2004	24,011	56.1	1,347,005	2,032.7	0.663
Can Don (Hydroelectric)	2004	0	0	0	312.0	0.000
Phy My 3 (Natural Gas)	2004	37277	56.1	2,091,228	3,883.0	0.539
		144,197		**9,202,160**	**16,765.6**	**0.549**

Vietnam Electricity Grid Emission Factor

A	Estimated operating margin emission rate	tCO2/MWh	**0.697735**
B	Estimated build margin emission rate	tCO2/MWh	**0.548872**
C	Estimated baseline emission rate*	tCO2/MWh	**0.623304**

ANNEX 4
MONITORING INFORMATION

Power purchasing company name:	Power Company No.1
Connection point details:	Connection via 35kV transmission line at electricity column number 31/28/4 of Chieng Khoa branch in the route 374E 17.1
Project Manager Name:	Pham Ngoc Luong
Site Manager Name:	Tran Van Hung

Please refer to Section B.7.2 for further details of the monitoring plan.