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:

Title: Nam Tha 3 Hydropower Project

Version 1.0

Date: 29/07/2011

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

The Nam Tha 3 Hydropower Project involves the construction and operation of a two-unit generator hydropower plant, which is located on Nam Tha stream in Nam Tha commune, Van Ban district, Lao Cai province, Vietnam. The installed capacity of this project and estimated annual gross power generation is 14.0 MW and 53.83 GWh[1], respectively. Main structures of the project activity consist of a reservoir, dam, water intake, penstock, powerhouse, pressured-well and discharge channel.

Prior to the implementation of the project activity, electricity in Vietnam is generated mainly from fossil fuel sources and is solely distributed to consumers via the unique national electricity grid.

The project's purpose is to generate and to supply renewable electricity to the national grid under the Power Purchase Agreement (PPA) signed with the Electricity of Vietnam (EVN). The net electricity generated from this project (annual estimated output of 53.0 GWh[2]) will be supplied to the national grid via transmission line, which connects the plant with transformer station.

The baseline scenario of the project activity is the same as the scenario existing prior to the start of implementation of the project activity.

The project activity will generate renewable power, which will displace part of the electricity otherwise supplied by fossil fuel fired power plants. The project involves the construction of a reservoir with an area of 2.5[3] ha and power density[4] of 560.0 W/m^2, accordingly. As the power density of this project is above 10 W/m^2, no GHG emissions from the reservoir need to be accounted in the project activity. Thus, GHG emission reductions can be achieved via this proposed project activity.

The project contributes to the sustainable development on the local, regional and national scale as follows:

General contributions towards national sustainable development:

- In recent years, Viet Nam has suffered a critical electricity shortage because of rapidly increasing demand and insufficient supply, thereby imposing negative impacts on economic growth as well as on daily lives of people. This project activity will be a contribution towards balancing the supply and demand gap. By exporting electricity directly to the grid, it will help to reduce electricity losses across the national grid and to lessen the risks of cascading national grid collapse due to overload.
- The project activity will generate renewable power without any GHG emissions, which will displace part of the electricity otherwise supplied by fossil fuel fired power plants. Thus, GHG emission reductions can be achieved. Total expected CO_2 emission reduction from the proposed project is estimated to the amount of 213,934 tCO_2 over the first seven years crediting period.

[1] FSR, Mar-2010, Feasibility Study Report
[2] The gross power generation subtracting 1.5% internal use and loss load
[3] FSR, Mar-2010, FSR.
[4] The calculation of Power density will be described in Section B.6.

- Modern and highly efficient turbines and generators are being used in the project and the power transmission will be at high voltage to ensure low losses. The project will accelerate the deployment of renewable energy technologies in Viet Nam.

Contributions towards local sustainable development:

a) Economic well-being

Once commissioning, this proposed project will increase the industrial share in the economic structure of Lao Cai province – a poor province in the North of Vietnam. This proposed project will pay annual enterprise's revenue tax[5], the natural resource tax[6] and CERs tax[7] to the state budget.

By supplying a stable electricity output, this project will facilitate the industrialisation process of the province and leverage the performance of traditional trade villages as well as tourism industry and services inside the province.

a) Social well-being

This project will directly contribute to improve the low-quality infrastructure systems of Nam Tha commune, where minority ethnics (such as Dao and H'mong) are predominant. The communes are categorised as remote communes with sparse population, less developed and autarky agricultural economy. The project will upgrade roads that then will be integrated into the traffic system of the commune. The project will construct a new transmission line together with a hydropower plant, which will contribute to reduce electricity losses and improve the electricity quality supplied in the region.

Besides, the project activity could result in the employment of the local people for the construction and operation later on. Therefore, this project activity will contribute directly to alleviate poverty in the region.

This demonstrates that the project activity will contribute positively towards sustainable development in Viet Nam.

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)
Viet Nam (host)	Phuc Khanh Energy Development and Construction Investment Joint Stock Company (Private Entity)	No
Viet Nam (host)	Energy and Environment Consultancy Joint Stock Company (Private Entity)	No
Sweden	Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon	No

[5] According to Circular No.134/2007/TT-BTC dated 23 November 2007 of the Ministry of Finance
[6] Circular No.42/2007/TT-BTC dated 27 April 2007 of the Ministry of Finance.
[7] According to Circular No. 58/2008/TTLT-BTC-BTN&MT issued by Ministry of Finance and Ministry of Natural Resource and Environment on 04 July 2008.

	Fund (NeCF)	
(*) 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		

The carbon purchaser is the Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF)

NEFCO Carbon Fund (NeCF)

NEFCO, the Nordic Environment Finance Corporation, is a multilateral risk capital institution financing environmental projects in Central and Eastern Europe, with an emphasis on the Russian Federation and Ukraine. Its purpose is to facilitate the implementation of environmentally beneficial projects in the neighbouring region, with transboundary effects that also benefit the Nordic region. Today, NEFCO manages funds in an aggregate of approximately €400 million. NEFCO is located in Helsinki, in conjunction with the Nordic Investment Bank (NIB).

The NEFCO Carbon Fund (NeCF) was established as a Public Private Partnership in April 2008, to provide financial assistance to concrete projects by purchasing emission reduction credits from projects under the JI and CDM mechanisms. The NEFCO Carbon Fund (NeCF) has the Danish Energy Agency, DONG Energy, the Industrialisation Fund for Developing Countries (Denmark), Ministries of Environment and Foreign Affairs of Finland, Etelä-Pohjanmaan Voima Oy (Finland), Kymppivoima Oy (Finland), Vapo Oy (Finland), the Norwegian Finance Ministry, Elektrabel SA/NV (Belgium) and NEFCO itself.

NEFCO is the Fund Manager of the NeCF, and has been authorised by the governments investing in the NeCF to participate on their behalf in actions leading to the generation, transfer and acquisition of CERs under Article 12 of the Kyoto Protocol.

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

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

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A.4.1.1. Host Party(ies):

Viet Nam

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

Lao Cai province

A.4.1.3. City/Town/Community etc:

Nam Tha commune, Van Ban district

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

The Nam Tha 3 Hydropower Project is located on Nam Tha stream, in Nam Tha commune, Van Ban district, Lao Cai Province, Vietnam. The project has geographic co-ordinates[8] as follows:

	Dam	Powerhouse
Northern latitude	$21^0 56'07"$	$21^0 56'25"$
Eastern longitude	104°23'18"	104°23'54"

The site of the project in the map is shown in Figure 1.

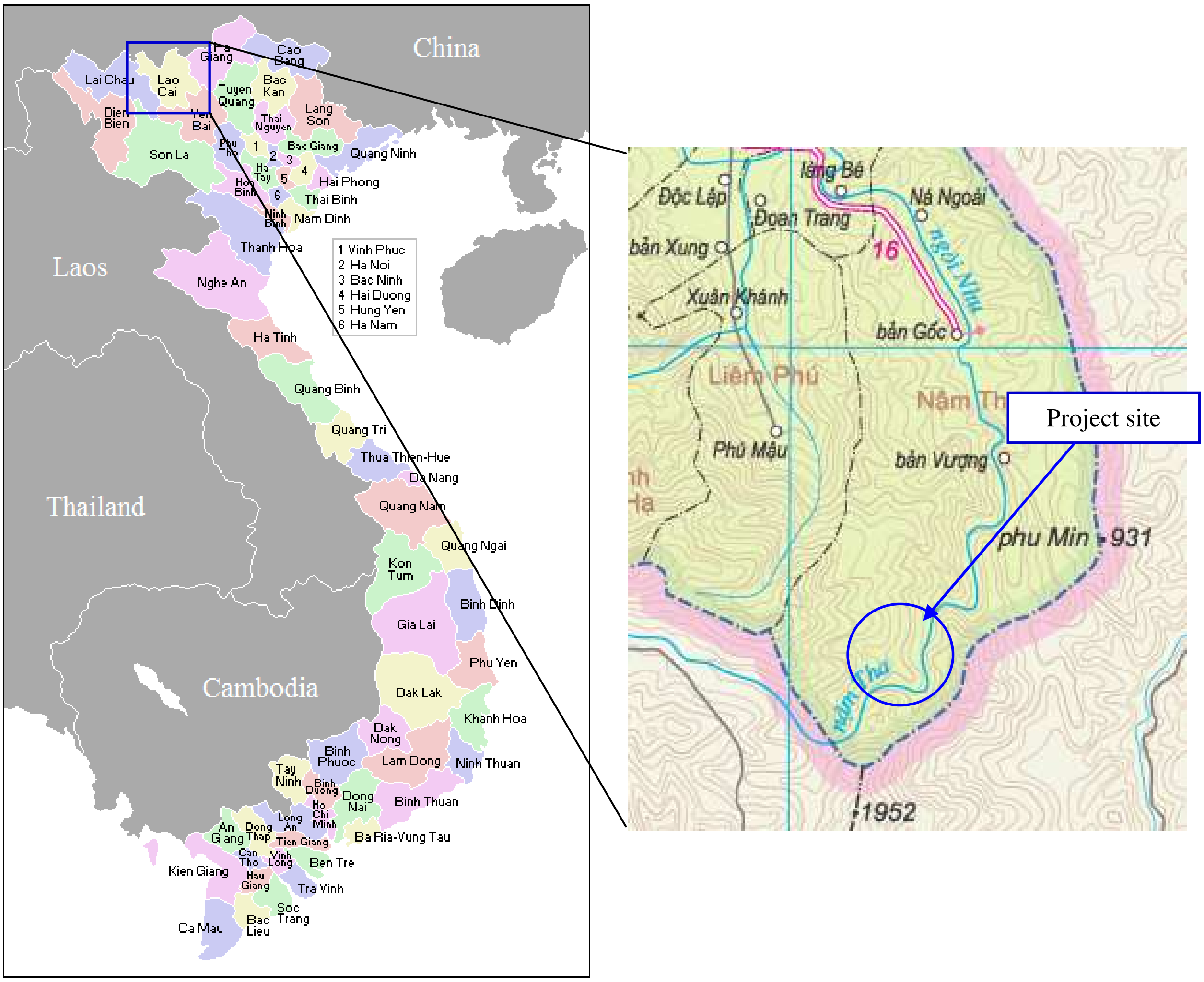

Figure 1. Project site on the map

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

A.4.2.1. Type and category

[8] The investment license.

Scale: Small-scale project
Type I: Renewable energy projects
Category I.D: Grid connected renewable electricity generation

A.4.2.2. Technology

The project involves the construction of a hydropower plant and installation of new hydro turbines and alternators in order to convert potential energy available in the river flow into clean electrical energy, which will be supplied to the national grid at the connection point through the transmission line. At the connection point, the power meter systems will be installed. They are digital and bi-directional type to measure the export and import electricity of Nam Tha 3 Hydropower plant.

Figure 2 shows the layout of the project.

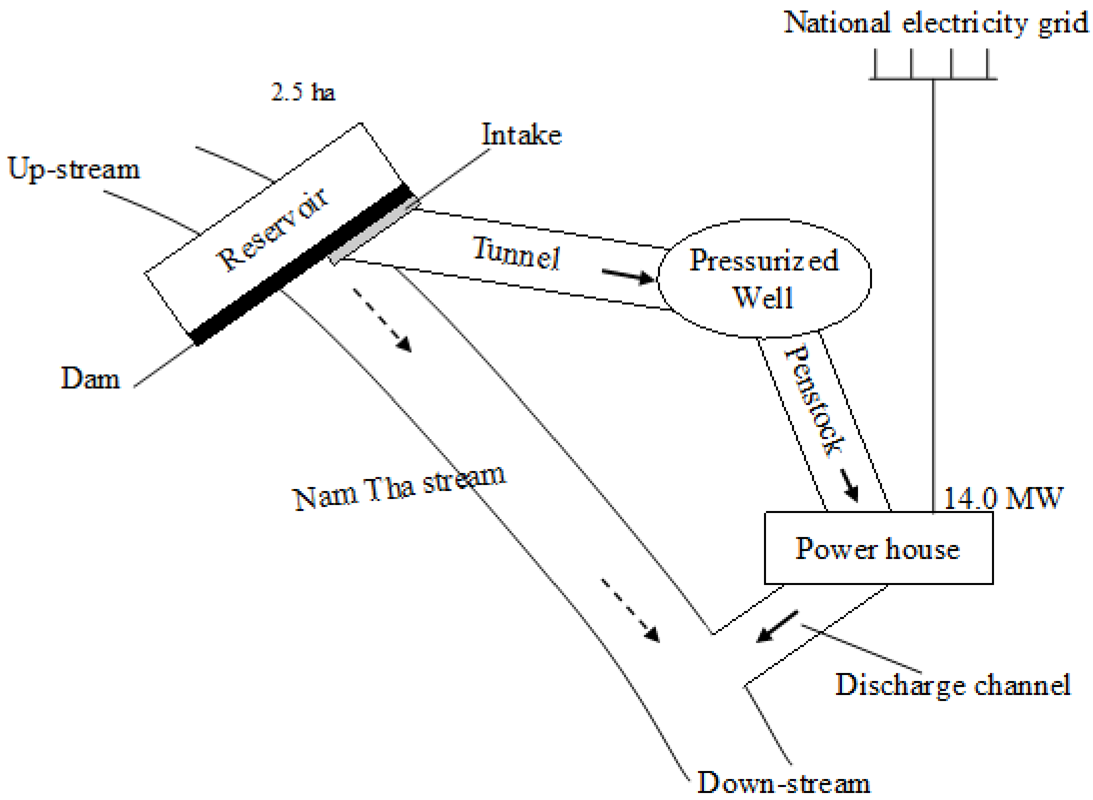

Figure 2: Project lay-out

The main technical parameters of the Nam Tha 3 Hydropower Project are shown in Table 1.

Table 1. Main technical parameters of the proposed project activity[9]

Main equipments	Units	Values
1. Turbine		
• Type		Vertical shaft

[9] FSR, Mar-2010, Concept design

• Number	set	02
• Rated capacity	MW	7.0
2. Generator		
• Number	set	02
• Type		Synchronous, 3 phases, vertical axis
• Rated voltage	kV	6.3
• Rated capacity	MW	7.0
3. Transformer		
• Type	kV	6.3/35
4. Load factor[10]	%	44.0
5. Annual river flow	m^3/s	2.88

The main equipment utilized in this project will be imported. The project owner will choose suppliers via tender. The tender documents have set criteria for supplier to ensure that the turbines and alternators shall be environment safe and sound technology.

The technicians and engineers from the equipment supplier will train the operational staff of the proposed project and provide usage manual on the monitoring procedures, operation regulations, maintenance procedures and other relevant operational knowledge before operating the hydropower plant. Furthermore, there will be regularly internal training courses on monitoring and operation for the staff during the operation period. So the foreign technology would be transferred to the host country.

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

Estimated emission reductions of the proposed project over the chosen crediting period are given in Table 2.

Table 2. Emission reduction of the proposed project over the chosen crediting period

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2014 (From September to December)	10,187
2015	30,562
2016	30,562
2017	30,562
2018	30,562
2019	30,562

[10] The Plant load factor (PLF) for this proposed project was determined by the annual electricity output and the capacity which were provided by the third party contracted by the project owner. So it is in line with the EB 48 annex 11 "*The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company)*"

2020	30,562
2021(From January to August)	20,375
Total estimated reductions (tonnes of CO_2 e)	**213,934**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (tCO_2e)	30,562

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

There are no public and/or ODA funds from Annex I countries involved in this project.

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

According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities (FCCC/CP/2002/7/Add.3), a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale 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 1 km of the project boundary of the proposed small-scale activity at the closest point.

This project is not a component of any large project. It is a stand-alone project, which is private-owned enterprise by Phuc Khanh Energy Development and Construction Investment Joint Stock Company, which has not registered another project in the region within 1 km surrounding the project boundary.

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:

Project Type:	I. Renewable energy project
Project Category:	I.D. Grid connected renewable electricity generation - Version 17 (I.D./Version 17, Sectoral Scope: 01, EB 61)
Reference:	Appendix B of the Simplified Modalities & Procedures for small scale CDM project activities (FCCC/KP/CMP/2005/8/Add.1)

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

The details of how the proposed project is complied with the applicable requirements of AMS-I.D, are presented in the Table below:

Table 3. Applicability of small scale methodology AMS-I.D.

	Applicability Criteria	Project Activity	Applicability criterion met?
1	This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generated unit shall apply AMS I.F.	The proposed project is based on hydropower, a renewable energy generation source to generate electricity that is supplied to the national grid.	Yes
2	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The proposed project involves the installation of a new hydropower plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity.	Yes
3	The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2	The project activity results in new reservoir and the power density of the power plant, as per definitions given in the Project Emissions section, is 560.0W/m^2 which is greater than 4 W/m^2.	Yes
4	In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant	The project activity involves the construction of a hydropower plant. This criterion is thus not applicable.	Not applicable
5	If the new unit has both renewable and non-renewable components (e.g.,. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project does not incorporate a mix of renewable and non-renewable components. This criterion is therefore not applicable. The total installation capacity of the proposed project is 14.0 MW, which is within the limit of 15 MW stipulated for the chosen (small-scale) methodology.	Not applicable

6	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.	Not applicable
7	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.	Not applicable
8	In case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15MW.	The project activity does not involve the retrofit or replacement of (an) existing unit(s). This criterion is therefore not applicable.	Not applicable

B.3. Description of the project boundary:

According to methodology AMS I.D, version 17 the boundary for this project type is delineated by:

- Geographical site: the area, the project is constructed.
- Physical boundary: the national power grid, the project is connected to it.

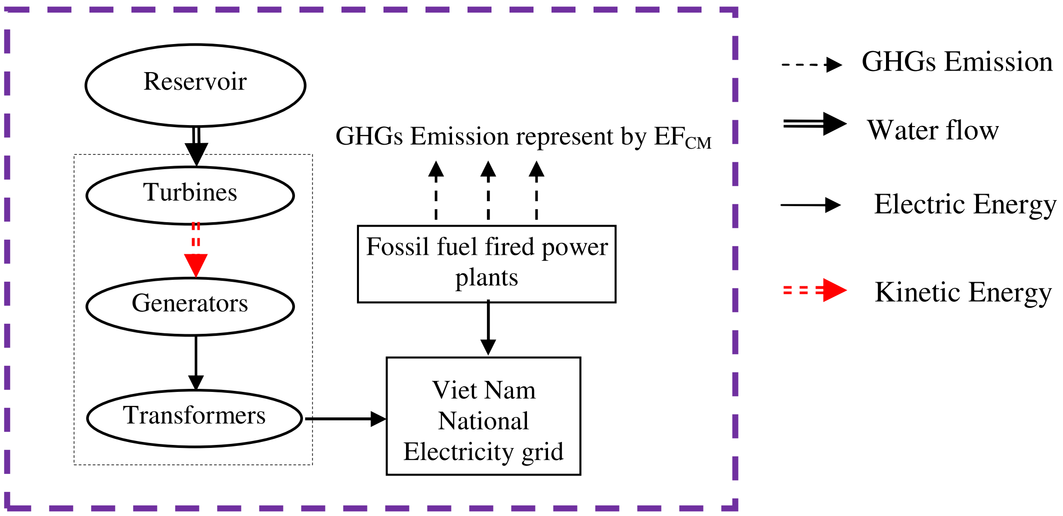

Figure 3: Project boundary

The GHGs and emission sources included in the project boundary are shown in Table below.

Table 4: Sources and gases included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emission from electricity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source

	generation in fossil fuel fired power plants that is displaced due to the project activity	N_2O	No	Minor emission source
Project Activity	For hydro power plants, emissions of CH_4 from the Reservoir	CO_2	No	Minor emission source
		CH_4	No	Main emission source. However, as the power density of the project is greater than 10 W/m^2 CH_4 emissions are neglected.
		N_2O	No	Minor emission source

B.4. Description of baseline and its development:

The project activity is the installation of a new grid-connected renewable power plant; therefore, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$BE_y = EG_{BL,\,y} * EF_{CO2,grid,y}$$

Where:

BE_y	*Baseline Emissions in year y (t CO_2)*
$EG_{BL,\,y}$	*Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)*
$EF_{CO2,grid,y}$	*CO_2 emission factor of the grid in year y (t CO_2/MWh)*

The Emission Factor can be calculated in a transparent and conservative manner as follows:

(a) 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'.

OR

(b) The weighted average emissions (in tCO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used

Option (a) is used for calculation of the emission factor.

The Viet Nam national electricity grid, which is operated and monopolized by the EVN and is the unique transmission and distribution line, to which all power plants in Viet Nam are physically connected to is the project electricity system. Thus the baseline scenario of the proposed project is the delivery of equivalent amount of annual power output from the Viet Nam national grid to which the proposed project is also connected. The database for calculating the baseline is published by the DNA of Viet Nam.

The development of the baseline will be described in section 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 small-scale CDM project activity:

The major milestones in developing the investment project and CDM application are summarized in the below table.

Table 5: Major milestones in developing the investment project and CDM application

Development of the hydropower project	Activities taken to achieve CDM registration	Time
Finalizing the Feasibility Study Report		Mar-10
	Achieving minutes of meeting to consult public opinions on the social and environmental impacts of the hydropower project in the order to develop it as a CDM activity	25-Dec-10
	Issuing the Decision of Board of Directors for investing and constructing Nam Tha 3 Hydropower Project as a CDM Project	23-Dec-10
	Notifying the project activity to the DNA and EB	23-Mar-11
Signing the first construction contract (Contract for construction of main dam)		Expected in Dec-11
Singing Credit contract		Expected in Feb-2012

According to Attachment A to Appendix B to the simplified Modalities & Procedures for small-scale CDM project activities, which has listed various barriers, at least one barrier listed shall be identified due to which the project would not have occurred any way.

The main barrier identified by the project owner at the date of decision making was the financial barrier and the project owner therefore made the decision to implement the project as a CDM project activity. The existence of the barrier is demonstrated in the following by benchmark analysis.

As the project generates financial benefits other than CDM related income, investment comparison analysis or benchmark analysis needs to be used to demonstrate additionality. As there are no other credible and realistic baseline scenario alternatives other than electricity supply from the grid, benchmark analysis is chosen to proof additionality. In the following, the project internal return rate (project IRR) was compared to a benchmark. This benchmark represents the minimal required the project IRR of the project to be economically attractive.

In the following, Project IRR is used to demonstrate the Additionality of the project. As indicated in paragraph 12, Annex 05, EB 62: Guidelines on Assessment of Investment Analysis, Version 05, "*Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR*", the project participant applies the local lending rates available at the time of making the investment decision as the benchmark.

This benchmark is derived from the average long-term lending rates available from the beginning of calculated year up to the date of decision making. All data is sourced from weekly reports published by the State Bank of Vietnam on its official website (www.sbv.gov.vn/en/).

The benchmark of 14.03% at the date of making the investment decision is a standard value[11].

Calculation and comparison of financial indicators:

The key assumptions used to calculate the Project IRR of the proposed project are presented in Table 6:

Table 6: Key assumptions to calculate the project IRR

No	Parameter	Unit	Value	Source
1	Gross capacity	MW	14.0	The Feasibility Study Report for Nam Tha 3 Hydropower Project prepared by a third party in March 2010 (FSR)
2	Annual net electricity generation	GWh	53.0	The gross power generation subtracts 1.5% for parasitic and loss load
3	Total investment cost	billion VND	313.639	FSR
4	Total annual O&M cost	billion VND	4.704	Decision No. 2014/QD – BCN issued by the Ministry of Industry provides temporary guidelines for conducting the economic, financial and investment analysis and providing the purchasing-selling price frame for power generation projects.
5	Preparation and construction period	year	3	FSR
6	Period of financial assessment	year	30	Decision No.2014/QD-BCN
7	Electricity price	VND/kWh	790.84	Avoided cost of tariff in decision No. 73/QD-DTDL dated 30 December 2009 was issued by Electricity Regulatory Authority of Vietnam

[11] Calculation of benchmark is indicated in the excel sheet

8	Resources tax	%	2	Circular No. 45/2009/TT-BTC issued on 11 March 2009 by Ministry of Finance, the resource tax will be calculated as the net electricity outputs supplied to the national electricity grid x 2% x average electricity price in Decision No.588/QĐ-BTC issued by Ministry of Finance on 22 March 2010.
9	Parasitic and loss load	%	1.5	FSR
10	**Pre-tax project IRR**	**%**	**9.73**	

This table shows that the IRR of the project was lower than the benchmark at the time of decision making on the proposed project.

All financial data are available to the DOE for Validation.

Sensitivity analysis:

A sensitivity analysis of the project activity has been conducted to test the robustness of the above calculations. Although the O&M cost accounted less than 20% of total investment cost that could be disregarded in the sensitivity analysis as regulated under the guidance in EB 62, Annex 05, paragraph 20, which states that" only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenue should be subjected to reasonable variation", this parameter is still considered in the analysis below. The following parameters are used in the sensitivity analysis of the project activity:

- Annual amount of electricity exported to the national grid
- Total investment costs
- Electricity price

Table below shows the impact of variations in key factors on the Project IRR considering a ±10% variation in the parameters.

Table 7: Sensitivity analysis

No	Parameter	Variation[12]	Project IRR	Likelihoods to happen
1	Annual amount of electricity exported to the national grid	+10%	10.89%	Lower than the benchmark
		-10%	8.51%	Lower than the benchmark
2	Total investment costs	+10%	8.76%	Lower than the benchmark
		-10%	10.87%	Lower than the benchmark
3	Electricity price	+10%	10.92%	Lower than the benchmark

[12] ±10% is selected according to the Decision No. 2014/QĐ – BCN issued by the Ministry of Industry, dated 13 June 2007 to provide temporary guidelines for conducting the economic, financial and investment analysis and providing the purchasing-selling price frame for power generation projects. It is also common-practice for sensitivity analysis for additionality demonstration. Furthermore, ±10% is also a common practice rate for sensitivity analysis of a CDM project

		-10%	8.48%	Lower than the benchmark

The sensitivity analysis shows that there is unlikely any case in which the variation of a parameter can make the project IRR without CDM reach the benchmark.

In conclusion, the proposed CDM project activity is unlikely to be financially attractive.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

I. Project emissions *(PE_y)*

The project emissions for the project activity are calculated as follows:

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

Where:

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

The proposed project is a hydro power plant that neither uses fossil fuel nor operates geothermal power plants (i.e. $PE_{FF,y} = 0$; $PE_{GP,y} = 0$); therefore, the above equation can be shortened as follows:

$$PE_y = PE_{HP,y}$$

$PE_{HP,y}$ Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The emissions from the reservoir ($PE_{HP,y}$)

For hydropower project activity that results in new reservoirs and/or the increase of existing reservoirs, the power density (*PD*) of the project activity shall be calculated as follows:

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

Where:

PD	Power density of the project activity, in W/m^2.
Cap_{PJ}	Installed capacity of the hydro power plant after the implementation of the project activity (W).
Cap_{BL}	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

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

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

If the *PD* is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

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

Where:

$PE_{HP,y}$ Emission from reservoir expressed as tCO_2e/year

EF_{Res} the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e /MWh.

TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

If *PD* is greater than 10 W/m^2, then:

$$PE_{HP,y} = 0$$

II. Baseline emissions *(BE_y)*

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

$$BE_y = EG_{BL,y} \cdot EF_{CO2,grid,y}$$

Where

BE_y Baseline emissions in year *y* (tCO_2/yr).

$EG_{BL,y}$ Quantity of net electricity generation supplied by the hydropower plant to the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr).

$EF_{CO2,grid,y}$ CO_2 Emission Factor of the grid in year y (tCO_2/MWh)

<u>Calculation of the emission factor (EF) of the national electricity grid</u>

The Version 2.2.0 of “Tool to calculate the emission factor for an electricity system” determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the “operating margin” and “build margin” as well as the “combined margin”, including 6 steps as follows:

STEP 1. Identify the relevant electric power system.

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

STEP 3. Select a method to determine the operating margin (OM)

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

STEP 5. Calculate the build margin emission factor.

STEP 6. Calculate the combined margin emissions factor.

Step 1. Identify the relevant electricity systems

This hydropower project will be connected to the national electricity grid of Vietnam, which is operated and monopolized by the EVN. This national electricity grid is the unique transmission and distribution line, to which all power plants in Vietnam are physically connected. Hence the national electricity grid is the project electricity system.

There are electricity imports to the national electricity grid from China - another host country, thus the China Power Grid is the connected electricity system and the emission factor for the imported electricity is zero tons CO_2 per MWh by default.

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

There are 2 options in the tools to choose, including:

- 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.

Because only the data of grid connected power plants is available, Option I will be chosen for calculating the grid emission factor.

Step 3. Select a 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.

The method (a) can be used in the project because low-cost/must-run resources in Vietnam is 34.77 % that constitute less than 50% of total grid generation in average of the five most recent years (details see the table below).

Table 8: Rate of low cost/must-run sources based on generation[13]

Year	2004	2005	2006	2007	2008	Average Value for 2004-2008
Hydro power (MWh)	17,858,651	16,365,438	19,508,244	22,385,232	25,933,762	102,051,327
Total power (MWh)	44,974,169	50,330,468	57,160,493	66,348,589	74,689,636	293,503,355
Low-cost/ Must-run ratio	39.71%	32.52%	34.13%	33.74%	34.72%	34.77%

The data vintage which is used to calculation the Simple OM emission factor is the Ex-ante option of a 3-year generation-weighted average (2006, 2007 and 2008) that is the most recent data available at the time

[13] Data sources from DNA Viet Nam

of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

Step 4. Calculate the OM emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants units.

There are 2 Options proposed, including:

Option A: Based on data on the net electricity generation and a CO2 emission factor of each power unit, or

Option B: Based 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.

Because the necessary data for Option A is available, Option A "*Calculation based on average efficiency and electricity generation of each plant"* is used and then the simple OM emission factor is calculated as follows:

$$EF_{grid,OM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OM,y}$	is the Simple operating margin CO_2 emission factor in year *y* (tCO_2/GWh)
$EG_{m,y}$	is the net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (GWh)
$EF_{EL,m,y}$	is the CO_2 emission factor of power unit *m* in year *y* (tCO_2/GWh)
m	All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units
y	Either 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)

Because the data on fuel consumption and electricity generation of power unit *m* is available, the emission factor ($EF_{EL,m,y}$) should be determined as **Option A1** :

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

Where:

$EF_{EL,m,y}$	is the CO_2 emission factor of power unit *m* in year *y* (tCO_2/GWh)
$FC_{i,m,y}$	Amount of fossil fuel type *i* consumed by power plant/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 electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year *y*
y	The relevant year as per the data vintage chosen in Step 3

Table 9: OM emission factor in 2008

Year	Total output (MWh)	Total emission (tCO2e)	OM 2008 (tCO2e/MWh)
	A	B	(ΣB/ΣA)
2006	37,618,199.00	25,702,918.00	
2007	43,921,501.00	28,544,283.00	
2008	48,719,874.00	29,963,699.00	
Total	**130,259,574.00**	**84,210,900.00**	**0.6465**

So $EF_{grid,OMsimple,y}$ is derived as follows:

$$EF_{grid,OMsimple,y} = 0.6465\ tCO_2/MWh$$

Step 5. Calculate the BM emission factor

In terms of vintage of data, One of the following two options can be chosen:

Option 1: 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 should 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 should be used. This option does not require monitoring the emission factor during the crediting period, or

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The most recent information on units already built for sample group *m* is available, so Option 1 shall be chosen for the proposed project.

The sample group of power units *m* used to determine as per the following procedure, consistent with the data vintage selected above:

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

In 2008, the set of five power units that have been built most recently ($SET_{5\text{-units}}$) is indicated in Annex 3 has annual generation ($AEG_{SET\text{-}5\text{-units}}$) of 7,829,812.02 MWh.

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

The total output of Vietnam electricity grid (AEG_{total}) in 2008 is 74,689,635.97 MWh then 20% of the total output of Vietnam electricity grid in 2008 is 14,937,927.19 MWh.

Most recent-built power plants ($SET_{\geq 20\%}$) addition in the electricity system that comprise 20% of the system generation in 2008 is shown in the annex 3 have annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$) of 16,514,761.12 MWh.

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

The comparison carried out by the project participants shows that the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) that have been built most recently has the larger annual generation (14,937,927.19 MWh) than the set of five power units that have been built most recently in 2008 does (7,829,812.02 MWh), and hence it is employed and SET_{sample}.

There is no plant in SET_{sample} is started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

The BM 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. It is calculated as follows:

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

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

Then $EF_{grid,BM,y}$ is derived as follows:

$EF_{grid,BM,y}$ = 0.5064 tCO_2/MWh

Step 6. Calculate the combined margin (CM) emissions factor

The CM emissions factor is calculated as follows:

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

Where:

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

For the proposed project, the following default values are used: w_{OM} = 0.5 and w_{BM} = 0.5 in the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 in the second and third crediting period.

So in the first crediting period, the CM emission factor is derived as follows:

$$\boldsymbol{EF_{grid,CM,y} = 0.5 \times 0.6465 + 0.5 \times 0.5064 = 0.5764\ tCO_2/MWh}$$

The baseline emission factor EF shall be fixed for the crediting period.

III. Leakage *(LE_y)*

As the project acitivity does not involve the energy generating equipment transfer to or from another activity, leakage is not to be considered, therefore ***LE_y* = *0.***

IV. Emission reductions *(ER_y)*

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y	Emission reductions in year *y* (tCO_2/y)
BE_y	Baseline emissions in year *y* (tCO_2/y)
PE_y	Project emissions in year *y* (tCO_2/y)
LE_y	Leakage emissions in year *y* (tCO_2/y)

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

Data / Parameter:	**Cap_{BL}**
Data unit:	MW
Description:	Installed capacity of hydropower plant before the implementation of the project activity.
Source of data used:	This is a green-field project. This value does not exist prior to the implementation of the project activity
Value applied:	0

Justification of the choice of data or description of measurement methods and procedures actually applied :	The project activity constructs a new hydropower plant, so Cap_{BL} is considered by zero.
Any comment:	For calculating the power density (PD)

Data / Parameter:	$\mathbf{A_{BL}}$
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full. For new reservoirs, this value is zero.
Source of data used:	This is a green-field project. This value does not exist prior to the implementation of the project activity
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The project activity builds a new reservoir, so A_{BL} is considered by zero.
Any comment:	For calculating the power density (PD)

Data / Parameter:	$\mathbf{EF_{grid,OM,y}}$
Data unit:	tCO_2/MWh
Description:	Operating margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data used:	Data published by DNA Viet Nam
Value applied:	0.6465
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	For calculation of $\boldsymbol{EF_{grid,CM,y}}$

Data / Parameter:	$\mathbf{EF_{grid,BM,y}}$
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor for grid connected power generation in

	year *y* calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data used:	Data published by DNA Viet Nam
Value applied:	0.5064
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	For calculation of $\boldsymbol{EF_{grid,CM,y}}$

Data / Parameter:	$\mathbf{EF_{grid,CM,y}}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data used:	Data published by DNA Viet Nam
Value applied:	0.5764
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	Fixed for crediting period.

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions

Baseline emissions are calculated as follows:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y}$$

Where: $EG_{facility,y}$ = 53.0 GWh and $EF_{grid,CM,y}$ = 0.5764 tCO_2/MWh,

Therefore: BE_y = 53,023 × 0.5764 = 30,562 tCO_2

Project emissions

The proposed project activity involves the construction of a new hydropower plant with capacity (Cap_{PJ}) of 14.0 MW and a new reservoir with surface (A_{PJ}) of 2.5 ha, thus A_{BL} = 0 and Cap_{BL} = 0.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{14.0 \times 10^6 - 0}{2.5 \times 10^4 - 0} = 560.0 (W / m^2)$$

Because the power density (*PD*) of power plant is greater than 10 W/m^2 :

$$PE_{HP,y} = 0 \ (tCO_2 e / year)$$

Because the power density of this proposed project is higher than 10 W/m^2, the monitoring of total electricity generation TEG_y is excluded from the monitoring section.

Leakage

Because the technology used in this project is neither transferred to nor transferred from another activity, leakage is considered to be zero ($LE_y = 0$)

Reduction emissions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y = BE_y$$

$$= 30{,}562 \ tCO_2$$

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

The estimated emission reduction of the project activity is provided in the table below.

Table 10. Emission reduction of the project activity

Year	**Estimation of project activity emissions (tCO_2 e)**	**Estimation of baseline emissions (tCO_2 e)**	**Estimation of leakage (tCO_2 e)**	**Estimation of overall emission reductions (tCO_2 e)**
2014 (From September to December)	0	10,187	0	10,187
2015	0	30,562	0	30,562
2016	0	30,562	0	30,562

2017	0	30,562	0	30,562
2018	0	30,562	0	30,562
2019	0	30,562	0	30,562
2020	0	30,562	0	30,562
2021 (From January to August)	0	20,375	0	20,375
Total (tonnes of CO_2e)	**0**	**213,934**	**0**	**213,934**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{y, export}$**
Data unit:	MWh
Description:	Electricity supplied by the proposed hydropower plant to the national grid
Source of data to be used:	Direct measurement at the connection point
Value of data applied for the purpose of calculating expected emission reductions in section B.6	53,023
Description of measurement methods and procedures to be applied:	Two-way power meters will be installed at the grid-connected point to measure the amount of electricity supplied to the grid by the proposed project by the positive direction. The electricity will be continuously measured by the power meters and monthly recorded. The recorded data will be confirmed by the protocol sheet which will be signed by the representatives of EVN and the project owner. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period.
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures to be applied:	The uncertainty level of this data is low. The measurement/ monitoring equipment should be complied with national standard and technology. These equipment and systems should be calibrated and checked every 2 years.
Any comment:	For $EG_{faciclity, y} = EG_{y, export} - EG_{y, import}$

Data / Parameter:	**$EG_{y, import}$**
Data unit:	MWh
Description:	Electricity supplied by the national grid to the proposed hydropower plant
Source of data to be used:	Direct measurement at the connection point

Value of data applied for the purpose of calculating expected emission reductions in section B.6	0
Description of measurement methods and procedures to be applied:	Two-way power meters will be installed at the grid-connected point to measure the amount of electricity supplied by the grid to the proposed hydropower plant by the reverse direction. The electricity will be continuously measured by the power meters. The recorded data will be confirmed by the protocol sheet which will be signed by the representatives of EVN and the project owner. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period.
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures to be applied:	The uncertainty level of this data is low. The measurement/ monitoring equipment should be complied with national standard and technology. These equipment and systems should be calibrated and checked every 2 years.
Any comment:	For $EG_{BL,y} = EG_{y,\ export} - EG_{y,\ import}$

Data / Parameter:	**$EG_{BL,y}$**
Data unit:	MWh
Description:	Net electricity supplied to the national grid by the proposed hydropower plant
Source of data to be used:	Calculating from $EG_{y,\ import}$ and $EG_{y,\ export}$
Value of data applied for the purpose of calculating expected emission reductions in section B.6	53,023
Description of measurement methods and procedures to be applied:	Calculating by subtracting $EG_{y,\ import}$ from $EG_{y,\ export}$. Double checking by the protocol sheet issued by EVN and project owner to ensure the consistency. Data will be archived within the crediting period and 2 years after the end of the crediting period.
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures to be applied:	The uncertainty level of this data is low
Any comment:	For CERs calculation

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Project site

Value of data applied for the purpose of calculating expected emission reductions in section B.6	25,000
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc
Monitoring frequency	Annually
QA/QC procedures to be applied:	The uncertainty level of this data is low
Any comment:	For power density calculation

Data / Parameter:	***Cap_{PJ}***
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.6	14,000,000
Description of measurement methods and procedures to be applied:	Manufacture's nameplate
Monitoring frequency	Annually
QA/QC procedures to be applied:	
Any comment:	Use for calculating the power density

B.7.2 Description of the monitoring plan:

Because the baseline emission factor of Vietnam National Grid is fixed ex-ante (detail in Section B.6), the main data to be monitored is $EG_{BL,\,y}$. $EG_{BL,\,y}$ will be calculated according to this formula below*:*

$$EG_{BL,y} = EG_{y,\,export} - EG_{y,\,import}$$

The electricity generated from the project activity will be sold to the EVN for the complete project lifetime under a long-term PPA with EVN.

The electricity generated from the project activity before entering into the grid at the grid interconnection point will be measured by a digital kilowatt hour (kWh) meter. The metering system includes the main system and a back-up system. The back-up system will be used in case of failing of the main meter.

Data from the operating meters will be recorded hourly. Additionally, monthly manual readings will be taken from the operating meters.

Monthly, EVN staff and staff of the operation division of the power plant will cross-check manual meter readings and the electronically recorded data; then prepare and sign a protocol sheet which indicates the amount of power fed into the grid within that month.

This protocol sheet is also the basis of the evidence for payment made by the EVN to the project proponent. Hence, the monitoring plan is well integrated into the standard EVN procedures.

For further details see Annex 4.

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

Date: 29/07/2011

The responsible entity: **Energy and Environment Consultancy Joint Stock Company (VNEEC)** which is the project participant listed in Annex 1 of this document.

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:

December 2011(expected)

This is the date on, which the project owner will sign the first contract for construction, which is the first contract to implement and/or to construct the project. It is the earliest date at which the commitment for expenditures was made. This is compliance with the "CDM Glossary of Terms/version 05", which defines the starting date of project as "the earliest date at which either the implementation or construction or real action of a project activity begins"

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

30 years 0 months

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

C.2.1. Renewable crediting period

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

01/09/2014

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

In accordance with Vietnamese Law on Environmental Protection 2005 and Decree No.80/2006/ND-CP detailing and providing guidance for the implementation of a number of articles of Law on Environmental Protection of Vietnam 2005 issued on 09 August 2006 The Project owner had a third party make the Environmental Impact Assessment Report for the project, which was approved by the Lao Cai Provincial People's Committee on 25 November 2010.

The surface water license is to be obtained from the Ministry of Natural Resources & Environment before operation as this is mandatory for this type of project in Vietnam.

The summary of the environmental impacts of the project activity is given below:

1.1. Environmental Impacts

1. Impacts on land

The Nam Tha 3 hydropower project will occupy about 34.7 ha[14] of land to construct project structures such as reservoir, dam, power house, etc., of which 30.2 ha are permanently occupied and 4.5 ha temporarily occupied.

No historical culture and archaeological places exist in the project site especially.

2. Impacts on water flow

The project will create a reservoir with the area of 2.5 ha. The reservoir regulates water level on the daily basis only but not seasonally. When commissioning, the reservoir will be used for the purpose of generating electricity and to regulate water serving for irrigation purpose in the region

The stream section behind the dam and power plant is short and has high slope. No households are living along this stream section; therefore, no agricultural activities are taking place here. Furthermore, there are also hardly aquatic animals living in this section because of rocky streambed. The impacts on natural environment are negligible.

3. Impacts on ecological system

The proposed project does not cross-out any natural conservation areas, national forests or specialized forest.

After commissioning, the reservoir will adjust local climate to be more moderate. This fine weather has not only positive impacts on local people health but also favorable impacts on surrounding flora system.

4. Impacts on local environment surrounding the construction site

[14] FSR, Mar-2010, EIA report

During the construction period, the project's activities such as material exploitation, material transportation, mine explosion, and road construction as well as the concentration of workers will have certain negative impacts on local environments, namely local air and noise pollutions.

However, these impacts are temporary and will be terminated upon the completion of the construction phase.

1.2. Socio-economic impacts

1. Negative impacts

There is not any household to resettle due to the project activity. Most of land occupied by the project is a forestland type. Therefore, local people's production activities area also slightly affected. However, the land area lost will be compensated fairly in accordance with requirement set by Vietnamese Government and Lao Cai Provincial People's Committee.

2. Positive impacts

As presented in Section A.2

1.3. Mitigation measures to reduce negative impacts

1. Construction phase

- *Waste collection and treatment*

– Implement regular collection and treatment of solid and liquid wastes, including the construction of a dumping area

– Conduct reforestation in the temporarily occupied areas and strengthen the slopes to avoid erosions, after accomplishing the construction of main works.

– Raise awareness of the environmental protection for workers and local people.

- *Local pollution*

– Dust removal measures will be taken such as spraying water along the roads.

– All means/vehicles for transport of construction materials must be covered in order to minimize dust dispersion.

– All transport equipments/vehicles and machines must have operational certifications

- *Socio-economic impacts:*

– Implement the compensation plan for the local impacted people according to the government law.

2. Operational phase

Preventive measures and reaction towards environment problems: Installing monitoring equipment to monitor absorption and distortion of water rising and water quality released from the plant and propose suitable and preventive measures if required.

1.4. Conclusion

The main negative impacts on environment happen during the construction phase. However, all these impacts will be mitigated by implementing mitigation measures and then will be terminated after accomplishing the construction. Preventive and mitigation measures are planned to conduct during the operation period to reduce and prevent any negative impacts.

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:

Not applicable.

SECTION E. Stakeholders' comments

The stakeholders' consultation has been conducted pursuant to the existing regulations on development of CDM projects and investment in power generation in Viet Nam.

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

The following stakeholders of the proposed project have been consulted since the early stage of the project preparation:

- People Committee of Lao Cai province (highest local authority): approved the Environmental Impact Assessment Report submitted by Phuc Khanh Energy Development and Construction Investment Joint Stock Company via Decision No.3438/QD-UBND on 25th November 2010.
- Local people in the project area in Nam Tha commune, Van Ban district, Lao Cai province.

Following the international CDM modalities, the local people of Nam Tha commune was involved in the consultation process.

On 25 December 2010, the meeting between the project owner and the following representatives of the local people was held in order to consult local people on the social-economic and environmental impacts of the proposed project for the development of this project as a CDM activity.

- Commune's People Committee (CPC): CPC is the lowest administration level in Vietnam administrative hierarchy. Chairman of CPC is elected by the Commune People Council, so he well represents the commune's interest.
- Commune's communist party committee: Commune's communist party committee is one of the key government bodies in making development strategies at the communal level.
- Village's representatives: head of village, secretary of young union, head of farmers' association, head of women's association. Such associations are NGOs and represent the interests of different groups.

Then the internal meetings of local commune were organised subsequently to announce the proposed project activity in non-technical and local language to local residents.

E.2. Summary of the comments received:

Comments by the representatives of local people and local authority are summarized as follows:

- The project generates a clean and stable source of electricity, promoting rural electrification process, improving intellectual standard and local production and contributing to the common economic development of the whole region.
- The project contributes to improve the traffic system of the region, creating good conditions for daily activities and production of local people, facilitating goods transport, travel, etc.
- The project creates jobs for local people, especially the ethnic minority people, reducing the local unemployment rate.
- The project improves the living standard of local people, narrowing the cultural and economic gap among ethnic groups and areas in the region.
- The project contributes to the local and state budget through taxes.
- During the implementation of the project, the contact, communication and work with skilled workers and staff will helps local people improve their intellectual and cultural standard and acquire experience and good working manners.
- The project will supply stable source of water to agricultural production, especially share water source for domestic to local people.

The comments of the above-mentioned organisations are carefully examined by the project owner. In general, all comments are positive comments without any main concerns or any objections.

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

Most of the comments present by different local entities via the stakeholder consultations are positive comments without major concerns. To address the requests for employing local workers and reducing negative impacts, the project owner committed to employ and train local people to work in suitable positions during both the construction and operation phases; and to comply and implement mitigation activities during the construction phase planned in the EIA Report in order to minimise negative impacts on local environment.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from the Annex I parties is involved in the project activity

Annex 3
BASELINE INFORMATION

Data sources using to calculation $EF_{CM, grid}$ has been referred to the published data of DNA Viet Nam.

Data of power plants in the Vietnam national grid in 2006, 2007 and 2008
Table 11: Data for calculating of $EF_{grid, OM, 2006}$

Power Plant	Total electrictiy generation supply to the grid (MWh)	Main fuel consumed						Fuel included							Volume of emissions
		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		
			Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ		Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ	t CO2
A	B	C	D	E	Coal, DO, FO: F=E*4.1868 Gas: F=E*1000	G	H= G/10^6	I	J	K	L=K*4.1868	M	N= M/10^6	O=D*F*H+J*L*N
Coal fired														
Phả Lại 1	2,462,209	Coal	1,717	4,953	20,737	94,600	0.0946	FO	7.62	9,800	41,031	75500	0.0755	3,391,921
Phả Lại 2	3,696,205	Coal	1,951	5,039	21,097	94,600	0.0946	FO	3.76	9,800	41,031	75500	0.0755	3,905,457
Uông Bí	766,634	Coal	554	5,258	22,014	94,600	0.0946	FO	1.52	10,097	42,273	75500	0.0755	1,157,907
Uông Bí 2	0	Coal	0	0	0	94,600	0.0946	FO	0.00	0	0	75500	0.0755	0
Ninh Bình	721,277	Coal	440	5,421	22,697	94,600	0.0946	FO	0.09	10,376	43,442	75500	0.0755	945,313
Na Dương	641,510	Coal	514	4,006	16,770	94,600	0.0946	FO	0.35	7,496	31,386	75500	0.0755	816,283
Cao Ngạn	0	Coal	0	0	0	94,600	0.0946	FO	0.00	0	0	75500	0.0755	0
Formosa	701,395	OtherBituminousCoal	470	6,483	27,143	89,500	0.0895	FO	0.23	9,810	41,073	75500	0.0755	1,142,615
Gas turbine														

Gas-Turbine-Gas														
Bà Rịa	1,308,583	Gas	436.24	34.85	34,850	54,300	0.0543	-		0	0	0	0	825,524
Phú Mỹ	10,073,917	Gas	2,432.92	37.17	37,173	54,300	0.0543	-		0	0	0	0	4,910,834
		Gas	523.22	38.80	38,797	54,300	0.0543	-		0	0	0	0	1,102,253
Phú Mỹ 3	2,531,004	Gas	703.82	38.75	38,750	54,300	0.0543	-		0	0	0	0	1,480,929
Nhơn Trạch	0	Gas	0.00	0.00	0	54,300	0.0543	-		0	0	0	0	0
Cà Mau 1&2	0	Gas	0.00	0.00	0	54,300	0.0543	DO	0	0	0	72600	0.0726	0
Phú Mỹ 2.2	4,838,810	Gas	1,354.87	38.75	38,750	54,300	0.0543	-		0	0	0	0	2,850,809
VÊ ĐAN	47,894	Gas	236.67	42.80	42,800	54,300	0.0543	FO	1.09	9,665	40,465	75500	0.0755	553,370
Đạm Phú Mỹ	38,556	Gas	55.49	42.50	42,500	54,300	0.0543	-						128,062
Gas-Turbine-Oil														
Bà Rịa	13,958	DO	4	10,300	43,124	72,600	0.0726	-			0	0	0	13,900
Phú Mỹ	67,721	DO	18	10,895	45,615	72,600	0.0726	-			0	0	0	60,637
Phú Mỹ 3	12,615	DO	3	10,255	42,936	72,600	0.0726	-			0	0	0	10,369
Phú Mỹ 2.2	0	DO	0	0	0	72,600	0.0726	-			0	0	0	0
CẦN THƠ	106,998	DO	33	10,860	45,469	72,600	0.0726	-			0	0	0	110,304
THỦ ĐỨC	32,290	DO	11	10,800	45,217	72,600	0.0726	-			0	0	0	34,962
Steam tail														
Bà Rịa	660,965	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ	5,336,388	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ 3	1,473,329	Đuôi hơi			0	0	0	-			0	0	0	0
Nhơn Trạch	0	Đuôi hơi			0	0	0	-			0	0	0	0
Cà Mau 1&2	0	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ 2.2	0	Đuôi hơi			0	0	0	-			0	0	0	0
Oil-fired														
HIỆP	453,303	FO	229	10,220	42,789	75,500	0.0755	DO	0.011	10,150	42,496	72600	0.0726	740,161

PHƯỚC														
CẦN THƠ	118,748	FO	36	10,226	42,814	75,500	0.0755	DO	1.9693	10,860	45,469	72600	0.0726	122,939
THỦ ĐỨC	471,940	FO	133	10,300	43,124	75,500	0.0755	DO	0.132	10,800	45,217	72600	0.0726	431,933
Diesel FO														
CÁI LÂN - VINASHIN	0	FO	0	0	0	75,500	0.0755	-			0	0	0	0
AMATA	80,000	FO	16.60	9,600	40,193	75,500	0.0755	-			0	0	0	50,374
Diesel DO														
NM điện Đồng Khởi (Bến Tre)	3,150	DO	0.81	10,700	44,799	72,600	0.0726	-			0	0	0	2,621
NM điện Diesel Cà Mau	3,123	DO	0.83	10,970	45,929	72,600	0.0726	-			0	0	0	2,776
NM điện Diesel An Giang	1,505	DO	0.39	10,305	43,145	72,600	0.0726	-			0	0	0	1,222
Điện lực Đồng Tháp	119	DO	0.03	10,320	43,208	72,600	0.0726	-			0	0	0	107
Điện lực Bình Thuận	6,372	DO	1.54	10,150	42,496	72,600	0.0726	-			0	0	0	4,745
Diesel khác	10,732	DO	2.79	10,150	42,496	72,600	0.0726	-			0	0	0	8,609
Import	**937,000**	-			0	0	0	-			0	0	0	0
Total generated electricity	MWh	37,618,249												
Total emissions	tCO2	24,806,935												
Emission factor	tCO2/MWh	0.659												

Table 12: Data for calculating of $EF_{grid,OM,2007}$

Power plant	Total electrictiy generation supply to the grid (MWh)	Main fuel consumed						Fuel included						Volume of emissions
		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		
			Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ		Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ	t CO2
A	B	C	D	E	Coal, DO, FO: F=E*4.1868 Gas: F=E*1000	G	H= G/10^6	I	J	K	L=K*4.1868	M	N= M/10^6	O=D*F*H+J*L*N
Coal-fired														
Phả Lại 1	2,501,097	Coal	1,728	4,946	20,708	94,600	0.0946	FO	6.59	9,800	41,031	75500	0.0755	3,405,500
Phả Lại 2	3,804,635	Coal	2,054	5,021	21,022	94,600	0.0946	FO	4.66	9,800	41,031	75500	0.0755	4,099,163
Uông Bí	705,778	Coal	526	5,210	21,813	94,600	0.0946	FO	1.74	11,975	50,137	75500	0.0755	1,091,402
Uông Bí 2	520,000	Coal	281	5,021	21,022	94,600	0.0946	FO	0.64	11,975	50,137	75500	0.0755	560,692
Ninh Bình	652,464	Coal	412	5,286	22,131	94,600	0.0946	FO	0.10	10,376	43,442	75500	0.0755	861,910
Na Dương	660,520	Coal	546	4,076	17,067	94,600	0.0946	FO	0.17	9,973	41,754	75500	0.0755	882,111
Cao Ngạn	352,577	Coal	330	4,980	20,850	94,600	0.0946	FO	1.52	9,800	41,031	75500	0.0755	654,693
Formosa	639,334	OtherBituminousCoal	511	6,259	26,205	89,500	0.0895	FO	0.11	9,802	41,039	75500	0.0755	1,197,908
Gas Turbine														
Gas-Turbine-Gas														
Bà Rịa	1,244,018	Gas	416.89	34.85	34,850	54,300	0.0543	-		0	0	0	0	788,908
Phú Mỹ	10,700,737	Gas	3,040.39	36.99	36,988	54,300	0.0543	-		0	0	0	0	6,106,460
		Gas	99.85	38.49	38,486	54,300	0.0543	-		0	0	0	0	208,659
Phú Mỹ 3	2,393,620	Gas	665.69	38.56	38,560	54,300	0.0543	-		0	0	0	0	1,393,825
Nhơn Trạch	0	Gas	0.00	0.00	0	54,300	0.0543	-		0	0	0	0	0

Cà Mau 1&2	697,572	Gas	15.82	39.00	39,000	54,300	0.0543	DO	20.669	10,909	45,674	72600	0.0726	102,028
Phú Mỹ 2.2	4,942,360	Gas	1,383.86	38.56	38,560	54,300	0.0543	-		0	0	0	0	2,897,539
VÊ ĐAN	26,742	Gas	229.22	42.80	42,800	54,300	0.0543	FO	0.44	9,665	40,465	75500	0.0755	534,065
Đạm Phú Mỹ	18,542	Gas	59.23	42.50	42,500	54,300	0.0543	-			0	0	0	136,686
Gas-Turbine-Oil														
Bà Rịa	80,828	DO	25.33	10,300	43,124	72,600	0.0726	-			0	0	0	79,318
Phú Mỹ	240,652	DO	64.92	10,895	45,615	72,600	0.0726	-			0	0	0	214,993
Phú Mỹ 3	17,278	DO	4.50	10,244	42,890	72,600	0.0726	-			0	0	0	14,027
Phú Mỹ 2.2	0	DO	0.00	0	0	72,600	0.0726	-			0	0	0	0
CẦN THƠ	148,862	DO	45.10	10,880	45,552	72,600	0.0726	-			0	0	0	149,165
THỦ ĐỨC	70,260	DO	23.41	10,800	45,217	72,600	0.0726	-			0	0	0	76,850
Steam tail														
Bà Rịa	618,330	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ	5,986,285	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ 3	1,377,820	Đuôi hơi			0	0	0	-			0	0	0	0
Nhơn Trạch	0	Đuôi hơi			0	0	0	-			0	0	0	0
Cà Mau 1&2	911,012	Đuôi hơi			0	0	0	-			0	0	0	0
Phú Mỹ 2.2	0	Đuôi hơi			0	0	0	-			0	0	0	0
Oil-fired														
HIỆP PHƯỚC	1,102,498	FO	410	10,196	42,690	75,500	0.0755	DO	0.018	10,150	42,496	72600	0.0726	1,322,437
CẦN THƠ	128,641	FO	38	10,215	42,768	75,500	0.0755	DO	3.1779	10,880	45,552	72600	0.0726	133,040
THỦ ĐỨC	603,270	FO	166	10,300	43,124	75,500	0.0755	DO	0.24	10,800	45,217	72600	0.0726	540,708
Diesel FO														
CÁI LÂN - VINASHIN	104,626	FO	25.15	9,800	41,031	75,500	0.0755	-			0	0	0	77,907
AMATA	0	FO	0.00	9,600	40,193	75,500	0.0755	-			0	0	0	0

Diesel DO														
NM điện Đồng Khởi (Bến Tre)	4,483.00	DO	1.14	10,700	44,799	72,600	0.0726	-			0	0	0	3,717
NM điện Diesel Cà Mau	6,820.60	DO	0.18	10,870	45,511	72,600	0.0726	-			0	0	0	588
NM điện Diesel An Giang	1,628.51	DO	0.42	10,305	43,145	72,600	0.0726	-			0	0	0	1,316
Điện lực Đồng Tháp	272.26	DO	0.08	10,320	43,208	72,600	0.0726	-			0	0	0	243
Điện lực Bình Thuận	7,246.00	DO	1.73	10,150	42,496	72,600	0.0726	-			0	0	0	5,349
Diesel khác	21,549.63	DO	5.60	10,150	42,496	72,600	0.0726	-			0	0	0	17,286
Import	**2,629,000**	-			0	0	0	-			0	0	0	0

Total generated electricity	MWh	43,921,357
Total emissions	tCO2	27,558,493
Emission factor	tCO2/MWh	0.627

Table 13: Data for calculating of $EF_{grid, OM, 2008}$

Power Plant	Total electrictiy generation supply to the grid (MWh)	Main fuel consumed						Fuel included						Volume of emissions
		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		Type of fuel	Fuel consumption	Net calorific values		Emission factor of fuel		
			Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ		Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ	t CO2

A	B	C	D	E	Coal, DO, FO: F=E*4.1868 Gas: F=E*1000	G	H= G/10^6	I	J	K	L=K*4.1868	M	N= M/10^6	O=D*F *H+J*L *N
Coal-fired														
Phả Lại 1	2,299,120	Coal	1,621	4,788	20,046	94,600	0.0946	FO	7.66	9,800	41,031	75500	0.0755	3,097,779
Phả Lại 2	3,929,218	Coal	2,081	4,995	20,913	94,600	0.0946	FO	4.05	9,800	41,031	75500	0.0755	4,129,534
Uông Bí	722,766	Coal	515	5,216	21,838	94,600	0.0946	FO	1.13	10,087	42,231	75500	0.0755	1,068,215
Uông Bí 2	532,000	Coal	282	4,995	20,913	94,600	0.0946	FO	0.55	10,087	42,231	75500	0.0755	559,172
Ninh Bình	675,372	Coal	431	5,191	21,734	94,600	0.0946	FO	0.16	10,376	43,442	75500	0.0755	887,373
Na Dương	627,930	Coal	532	4,034	16,889	94,600	0.0946	FO	0.20	9,923	41,545	75500	0.0755	850,587
Cao Ngạn	708,693	Coal	526	4,980	20,850	94,600	0.0946	FO	0.75	9,800	41,031	75500	0.0755	1,040,482
Formosa	560,295	OtherBituminousCoal	495	6,579	27,545	89,500	0.0895	FO	0.28	9,808	41,064	75500	0.0755	1,221,712
Gas Turbine														
Gas-Turbine-Gas														
Bà Rịa	1,331,905	Gas	450.37	34.85	34,850	54,300	0.0543	-		0	0	0	0	852,263
Phú Mỹ	11,085,997	Gas	3,193.95	36.99	36,991	54,300	0.0543	-		0	0	0	0	6,415,396
		Gas	72.54	38.18	38,184	54,300	0.0543	-		0	0	0	0	150,402
Phú Mỹ 3	3,167,237	Gas	883.26	38.59	38,590	54,300	0.0543	-		0	0	0	0	1,850,807
Nhơn Trạch	544,809	Gas	166.38	40.50	40,500	54,300	0.0543	-		0	0	0	0	365,894
Cà Mau 1&2	2,106,807	Gas	647.24	39.00	39,000	54,300	0.0543	DO	4.417	10,909	45,674	72600	0.0726	1,385,309
Phú Mỹ 2.2	4,141,980	Gas	1,159.75	38.59	38,590	54,300	0.0543	-		0	0	0	0	2,430,192
VÊ ĐAN	12,780	Gas	209.48	42.80	42,800	54,300	0.0543	FO	0.79	9,665	40,465	75500	0.0755	489,253
Đạm Phú Mỹ	4,716	Gas	56.15	42.50	42,500	54,300	0.0543	-			0	0	0	129,573
Gas-Turbine-Oil														
Bà Rịa	34,460	DO	10.64	10,300	43,124	72,600	0.0726	-			0	0	0	33,325
Phú Mỹ	69,324	DO	18.69	10,895	45,615	72,600	0.0726	-			0	0	0	61,895

Phú Mỹ 3	0	DO	0.00	10,246	42,898	72,600	0.0726	-			0	0	0	0
Phú Mỹ 2.2	0	DO	0.00	0	0	72,600	0.0726	-			0	0	0	0
CẦN THƠ	62,274	DO	19.39	10,890	45,594	72,600	0.0726	-			0	0	0	64,189
THỦ ĐỨC	17,030	DO	5.62	10,800	45,217	72,600	0.0726	-			0	0	0	18,449
Steam tail														
Bà Rịa	658,459	Steam Tail			0	0	0	-			0	0	0	0
Phú Mỹ	6,037,037	Steam Tail			0	0	0	-			0	0	0	0
Phú Mỹ 3	1,853,448	Steam Tail			0	0	0	-			0	0	0	0
Nhơn Trạch	0	Steam Tail			0	0	0	-			0	0	0	0
Cà Mau 1&2	2,728,872	Steam Tail			0	0	0	-			0	0	0	0
Phú Mỹ 2.2	0	Steam Tail			0	0	0	-			0	0	0	0
Oil-fired														
HIỆP PHƯỚC	877,631	FO	366	10,195	42,685	75,500	0.0755	DO	0.019	10,150	42,496	72600	0.0726	1,179,989
CẦN THƠ	66,709	FO	20	10,220	42,789	75,500	0.0755	DO	3.7286	10,890	45,594	72600	0.0726	76,804
THỦ ĐỨC	537,540	FO	149	10,300	43,124	75,500	0.0755	DO	0.228	10,800	45,217	72600	0.0726	484,277
Diesel FO														
CÁI LÂN - VINASHIN	90,465	FO	22.48	9,800	41,031	75,500	0.0755	-			0	0	0	69,633
AMATA	0	FO	0.00	9,600	40,193	75,500	0.0755	-			0	0	0	0
Diesel DO														
NM điện Đồng Khởi (Bến Tre)	860.00	DO	0.22	10,700	44,799	72,600	0.0726	-			0	0	0	719
NM điện Diesel Cà Mau	1,273.50	DO	0.33	10,940	45,804	72,600	0.0726	-			0	0	0	1,095
NM điện Diesel An Giang	252.86	DO	0.07	10,305	43,145	72,600	0.0726	-			0	0	0	219
Điện lực Đồng Tháp	51.25	DO	0.01	10,320	43,208	72,600	0.0726	-			0	0	0	45

Điện lực Bình Thuận	7,575.00	DO	1.80	10,150	42,496	72,600	0.0726	-			0	0	0	5,560
Other diesel	4,987.39	DO	1.30	10,150	42,496	72,600	0.0726	-			0	0	0	4,001
Import	**3,220,000**	-			0	0	0	-			0	0	0	0

Total generated electricity	MWh	48,719,874
Total emissions	tCO2	28,924,142
Emission factor	tCO2/MWh	0.594

Table 14: Data for calculating of $EF_{grid, BM, 2008}$

Total domestic electricity generation of Vietnam Grid in 2008	**74,689,635.97**	**MWh**
20% of domestic electricity generation of Vietnam Grid in 2008	**14,937,927.19**	**MWh**

Power Plant	**Commission year**	**Grid-connected out put (MWh)**	**Main fuel**						**Included fuel**						
			Type of Fuel	**Fuel consumed**	**Net calorific value**		**Emission factor of fuel**		**Type of Fuel**	**Fuel consumed**	**Net calorific value**		**Emission factor of fuel**	**Volume of emissions**	
				Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/GJ		Coal, DO, FO: kt; Gas: mill.m3	Coal, DO, FO: kCal/kg; Gas: MJ/m3	Coal, DO, FO: GJ/kt; Gas: GJ/mill.m3	kg CO2/TJ	tCO2/ GJ	t CO2
A	B	C	D	E	F	Coal, DO, FO: G=F*4.1868 Gas: G=F*1000	H	I= H/10^6	J	K	L	M=L*4.1868	N	O= N/10^6	P=E*G*I+K*M*O
5 most recently power plants															
A Vương	2008	168,103.50	Hydropower												
Tuyên Quang	2008	1,136,112.18	Hydropower												

Đại Ninh	2008	1,145,108.50	Hydropower												
Nhơn Trạch	2008	544,808.60	Gas	166.38	40.50	40,500	54300	0.0543	-		0	0	0	0	365,894
Cà Mau 1&2	2007	2,106,807.24	Gas	647.24	39.00	39,000	54300	0.0543	DO	4.417	10,909	45,674	72600	0.0726	1,385,309
		2,728,872.00	Đuôi hơi												
Total		**7,829,812.02**													
Most recently power plant capacity additions in the electricity system that comprise 20%															
A Vương	2008	168,103.50	Hydropower												
SROC Phu Mieng IDICO	2006	241,556.00	Hydropower												
SÊ SAN 3A	2006	394,895.70	Hydropower												
Tuyên Quang	2008	1,136,112.18	Hydropower												
Đại Ninh	2008	1,145,108.50	Hydropower												
SÊ SAN 3	2006	1,131,614.00	Hydropower												
Quảng Trị	2007	250,804.40	Hydropower												
Uông Bí 2	2007	532,000.00	Coal	281.759	4995	20,913	94600	0.0946	FO	*0.548*	*10,087*	42,231	75500	0.0755	559,172
Na Dương	2005	627,930.00	Coal	532	4,034	16,889	94600	0.0946	FO	0.20	9,923	41,545	75500	0.0755	850,587
Cao Ngạn	2007	708,693.00	Coal	526	4,980	20,850	94600	0.0946	FO	0.75	9,800	41,031	75500	0.0755	1,040,482
Formosa	2004	560,295.00	OtherBitumi nousCoal	495	6,579	27,545	89500	0.0895	FO	0.28	9,808	41,064	75500	0.0755	1,221,712
Nhơn Trạch	2008	544,808.60	Gas	166.38	40.50	40,500	54300	0.0543	-		0	0	0	0	365,894
Cà Mau 1&2	2007	2,106,807.24	Gas	647.24	39.00	39,000	54300	0.0543	DO	4.417	10,909	45,674	72600	0.0726	1,385,309
		2,728,872.00	Đuôi hơi												
Phú Mỹ 2.2	2004	4,141,980.00	Gas	1,159.75	38.59	38,590	54300	0.0543	-		0	0	0	0	2,430,192
Đạm Phú Mỹ	2006	4,716.00	Gas	56.15	42.50	42,500	54300	0.0543	-			0	0	0	129,573
CÁI LÂN - VINASHIN	2007	90,465.01	FO	22.48	9,800	41,031	75500	0.0755	-			0	0	0	69,633

Total		**16,514,761.12**													**8,052,553**

Total generated electricity	MWh	16,514,761.12
Total emissions	tCO2	8,052,553.43
Emission factor	tCO2/MWh	0.4876

Table 15: CO_2 emission factor according to IPCC

Fuel Type	Default Carbon Content (kg/GJ)	Default Carbon Oxidation Factor	Emission factor CO2 (kg/TJ)		
			Default Value	95% Confidence interval	
				Lower	Upper
Gas/Diesel DO	20.2	1	74,100	72,600	74,800
Fuel FO	21.1	1	77,400	75,500	78,800
Anthracite Coal	26.8	1	98,300	94,600	101,000
Bitum Coal types	25.8	1	94,600	89,500	99,700
Natural Gas	15.3	1	56,100	54,300	58,300

ANNEX 4

MONITORING INFORMATION

Details of the monitoring information can be seen as follows:

A. Description of technical equipment

The metering system will be installed at the connection point. They are digital meters bi-directly with allowed errors of at least "±0.5". The metering system includes the main system and a back-up system. The meter type used is an electronic 3 phase.

The main metering system is to measure the total electricity export and import.

The backup system is also installed and operated for measuring the total electricity export and import in parallel with the main system. Its recorded data will be served in case of any failure of the main system.

Before the power metering equipment puts into operation, the project owner and EVN shall check and accept it. Each terminal block of the equipment is sealed to prevent all illegal accesses

B. Monitoring organization

The structure of the monitoring group is as follows:

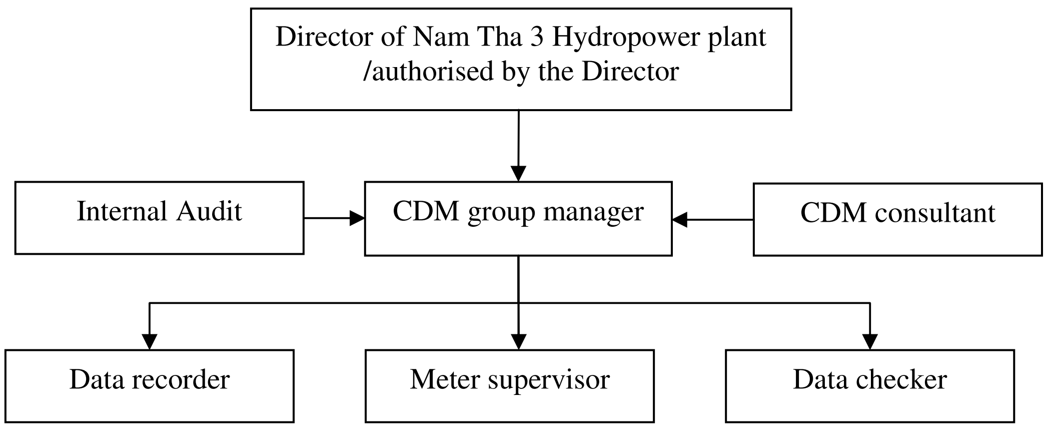


Figure 4: Structure of the monitoring group

The responsibilities of each person involved are elaborated as follows:

Group members and their responsibilities

Person	Responsibility
Director of the Nam Tha 3 Hydropower plant /authorised by the Director	Check and sign the monitoring report annually
CDM group manager	Managing the whole CDM business of Nam Tha 3 hydropower plant, guiding and supervising data recorder after trained by CDM consultant.
CDM consultant	Providing CDM group manager training and technical support about CDM monitoring plan.
Internal auditor	Check the monitoring procedure at least once a year
Data recorder	Collecting and recording data every month.

Meter supervisor	Checking power meter periodically according to relevant regulation.
Data checker	Double checking the collected data measured by power meter.

C. Monitoring procedure

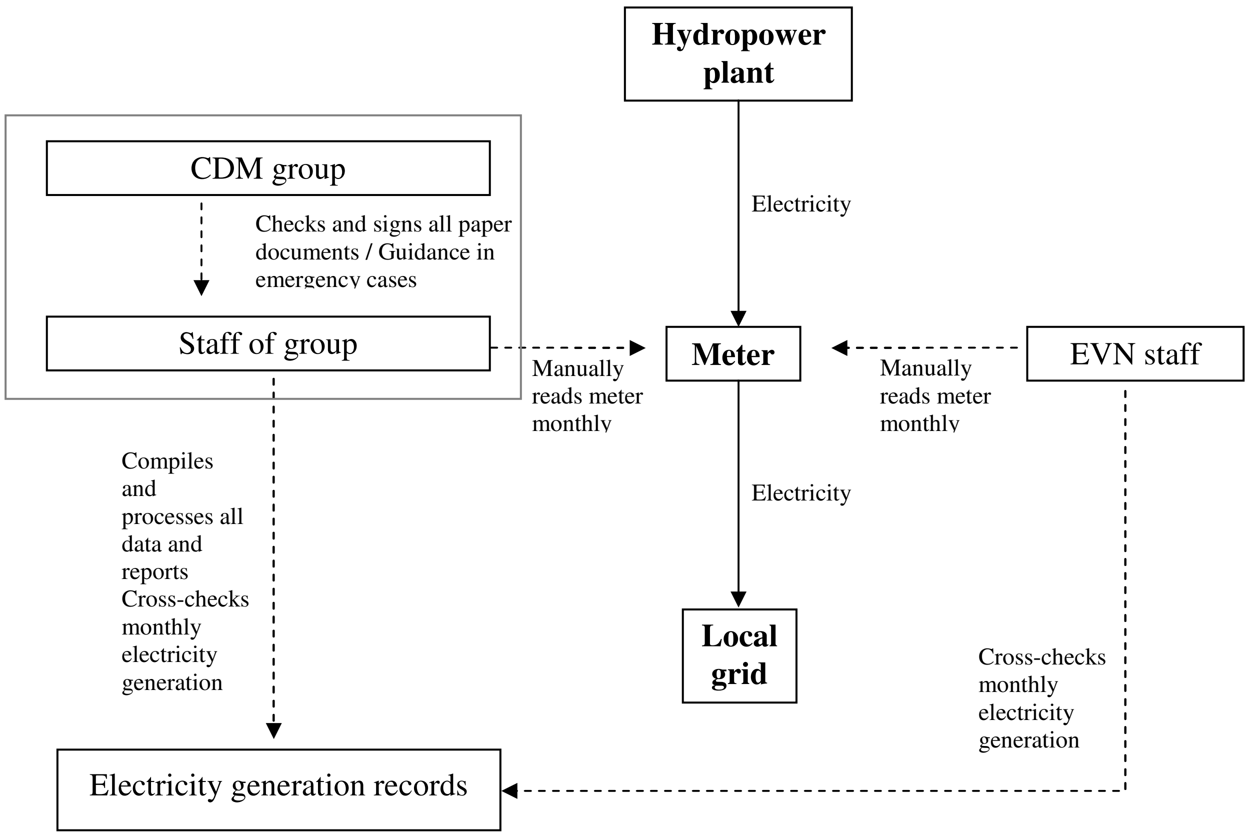
The steps of monitoring the electricity supplied to the grid and the electricity imported from grid and consumed by the proposed project are as follows:

(1) 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 continuously.

(2) Persons in charge of data record and meter supervisor from Nam Tha 3 hydropower plant together with staff from EVN shall read and collect data from main power meters on the first day of every month, the result will be signed by both parties and kept respectively;

(3) Nam Tha 3 hydropower plant provides electricity sales invoice to EVN, and keeps the copy of invoice;

(4) Every year, surface area of the reservoir when reservoir is full will be measured by the third party;



Monitoring process

D. Calibration of metering equipment

The meters will be calibrated and verified pursuant to national standard. According to the Decision No 65/2002/QD-BKHCNMT[15], calibration and verification for 3 phase meters need to be conducted every two year by the third party once during project operation. After every calibration, the meters will be sealed so that no illegal interference is possible.

E. Data recording and archiving procedures

- The CDM group appointed by Nam Tha 3 hydropower plant shall keep monitored data in electronic archives at the end of every month. Paper documents should be stored in electronic format and copied by CD. Electronic documents should be printed out and kept.
- Nam Tha 3 hydropower plant shall keep the copy of electricity sales/purchase invoices (the original electricity sales/purchase invoices shall be kept by Finance Department of the Nam Tha 3 Hydropower plant).
- In order to help verifiers obtain documents and information related to the emission reduction of the proposed project, the Nam Tha 3 Hydropower plant shall prepare an index of the data documents and monitoring report.
- The CDM group shall archive all the data and information in the form of paper documents, with at least one copy backup for each datum.
- All the data shall be kept for 2 years after the crediting period.

F. Emergency procedures

In case of any unforeseen event that is not covered under this monitoring plan, staff of the CDM group shall inform the manager and the director. The manager and director are then responsible to ensure that the cause for the unforeseen event is detected, the event is remedied and for the period of time in which the unforeseen event has occurred uncertainty in data gathered is limited as much as possible.

In the case the error of main meter exceeds allowed level; the backup meter will be used to measure output of electricity exporting to grid.

In case of both main and back-up metering systems are in failure, the project owner and the power company (EVN) will jointly calculate a conservative estimate of power supplied to the grid. The assumptions used to estimate net electricity supply to the grid will be signed by both a representative of the project owner as well as a representative of the power company (EVN).

G. Training

Before the start of the crediting period, VNEEC will in close collaboration with the chief of the operation division of the power plant develop a training manual and training course for the staff of the operation division that will clearly lay out rules and procedures for all activities related to metering, data recording and processing, data archiving and preparation of monitoring reports.

[15] Decision No 65/2002/QD-BKHCNMT[15] issued by the Minister of Scientific, Technology and Environment on 19 August 2002 to promulgate "The list of meter equipment must be calibrated and verified and the verification procedures".