**PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Bac Lieu Province Wind Power Plant
Version number of the PDD	04
Completion date of the PDD	21 August 2012
Project participant(s)	1) Cong Ly Construction - Trading - Tourism Co., Ltd. 2) Swiss Carbon Assets Ltd.
Host Party(ies)	Vietnam
Sectoral scope and selected methodology(ies)	Sectoral scope: 1.Energy industries (renewable sources) Applied Methodology: ACM0002, version 13.0.0 "Consolidated baseline methodology for grid-connected electricity generation for renewable sources"
Estimated amount of annual average GHG emission reductions	143,761 tCO2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Bac Lieu Province Wind Power Plant[1] includes the construction of a near-shore wind power farm on the area of 540ha along the East Dam (De Dong) of Bac Lieu city, Bac Lieu province, Vietnam with total capacity of 99.2 MW[2] and gross annual electricity output of 335.2 GWh[2]. The project involves the installation of 62 wind turbines at capacity of 1.6 MW each in two phases.

In the first phase, 10 wind turbines will be installed on 80 ha area. The capacity and net electricity output of Phase 1 is 16 MW[2] and 55,355 MWh/year[2] respectively. Phase 2 includes the installation of the remained 52 turbines with combined capacity of 83.2 MW[2] and annual net output of 272,471 MWh[2].

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 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's purpose is to exploit the wind resources in Bac Lieu province to produce and supply electricity to the national grid under a Power Purchase Agreement (PPA) signed with the Electricity Corporation of Vietnam (EVN).

The project will reduce the emission of greenhouse gases by replacing electricity generated from fossil fuel fired power plants with zero emissions electricity from a wind power plant. It is expected that the power plant, when in full operation, will result in the reduction of 143,761 tCO_2 on average per year and 1,006,328 tCO_2 over the first crediting period.

To be the first large scale wind power project in the Mekong Delta and the first near-shore wind power project in Vietnam[3], the proposed project activity will contribute to sustainable development of local and host country in the following aspects:

General contributions towards national sustainable development:

- In recent years, Vietnam has suffered a critical electricity shortage as a consequence from rapidly increasing demand and insufficient supply, thereby imposing negative impacts on economic growth[4] as well as on daily lives of people[5]. This project activity will be a contribution towards balancing the supply and demand gap. The project will help to lessen the risks of cascading national grid collapse due to overload.
- Reducing reliance on exhaustible fossil fuel based power sources and also reducing the import of fuels for the purpose of power generation.
- Modern and highly efficient turbines and generators will be used in the project and modern technology will be transferred to host country.
- Vietnam has high potential of wind energy. However, the total installed capacity at present is only 19 MW[6]. The project will therefore accelerate the deployment of wind energy technologies in Vietnam.

[1] The title of the project was revised since the project's title in the Prior-consideration of the CDM Form submitted to EB on 2 November 2011 was "Wind power plant" which is too broad and general to specify for a specific project.

[2] Feasibility Study Report

[3] See further details in the Common practice analysis, Section B.5

[4] http://www.uni-bros.com/en/news.php/power_shortages_deter_investors/id=17958/cid=4

[5] http://laodong.com.vn/Kinh-te/Nam-2011-se-thieu-2-ti-kwh-dien/54494.bld and http://giadinh.net.vn/28083p0c1000/mat-dien-thuong-xuyen-tren-dien-rong-nguoi-dan-bi-tra-tan.htm

[6] Information on wind energy of Vietnam, April 2011, GIZ/MoIT wind energy project (http://www.windenergy.org.vn/uploads/Publications/Information_on_wind_energy_in_vietnam_ENG_Final.pdf)

Contributions towards local sustainable development:

a) Economic well-being

- Once commissioning, this proposed project will increase the industrial share in the economic structure of Bac Lieu province. This proposed project will pay annual tax to the local and State budget.
- This project will facilitate the industrialisation process as well as tourism industry and services inside the province.
- The successful implementation of the project will speed up the commissioning of other wind power projects in the region.

b) Social well-being

- The construction and operation of this project activity will result in the employment of the local people and contribute directly to alleviate poverty in the region.
- The project activity will make the scenery of the coastal area more lively and impressive which can be exploited for tourism and recreation.
- The project will construct a new 22/110 kV-2 x 63 MVA transformer station and about 18.3 km of 110 kV transmission lines[7] together with the wind farm, which will reduce electricity losses and improve the electricity quality supplied in the region.

This demonstrates that the project activity will contribute positively towards sustainable development. Therefore, it satisfies the sustainable development criteria for CDM projects set by the DNA of Vietnam.

A.2. Location of project activity
A.2.1. Host Party(ies)

Vietnam

A.2.2. Region/State/Province etc.

Bac Lieu Province

A.2.3. City/Town/Community etc.

Hiep Thanh commune, Vinh Trach Dong commune and Nha Mat ward of Bac Lieu city

A.2.4. Physical/Geographical location

The wind power farm is located in Bac Lieu city, Bac Lieu province, Vietnam. The turbines will be installed along the East Dam of Bac Lieu city within the following coordinates[8]:

- Northern latitude : 9° 12' 07" - 9° 14’ 38”
- Eastern longtitude: 105° 44' 45" - 105° 49' 41"

The locations of the turbines and the project’s site are showed in the Figures below:

[7] Investment Licence dated 12 June 2011

[8] The project’s coordinates are revised from the Prior-consideration of the CDM Form submitted to EB on 2 November 2011 for more updated information.

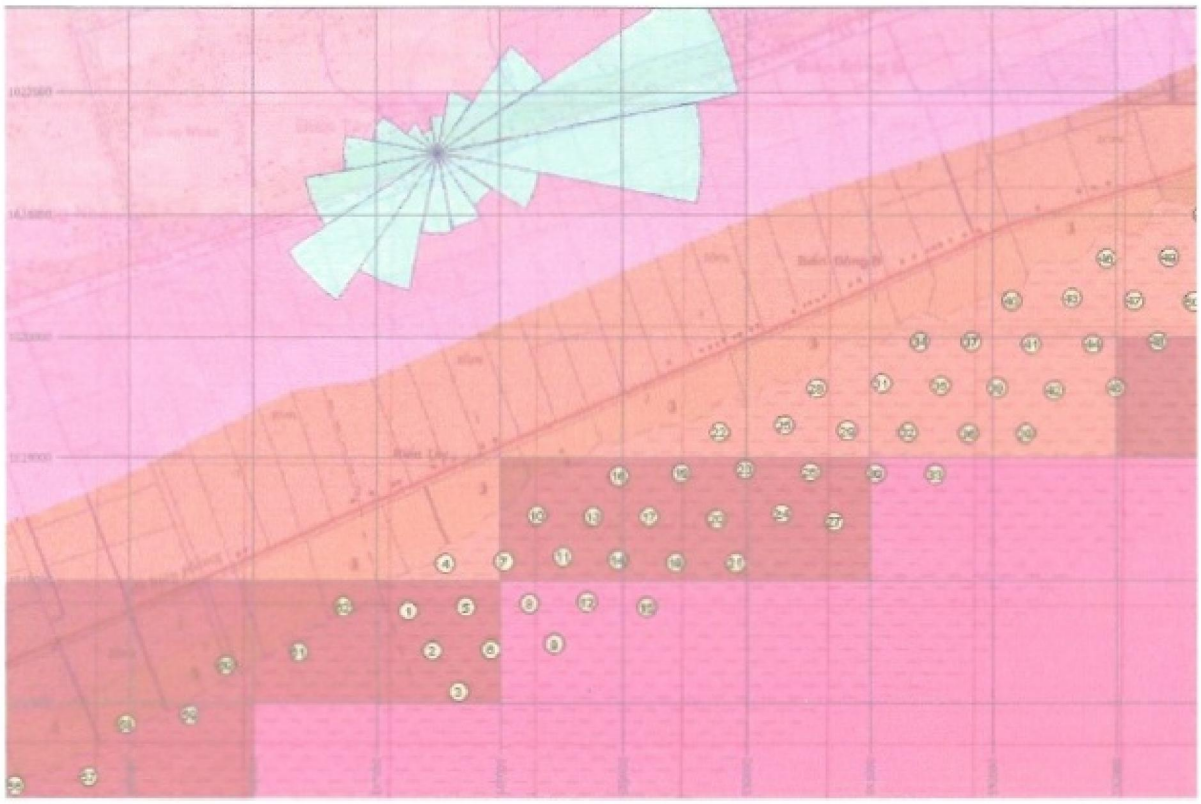

Figure 1: Turbines' Location

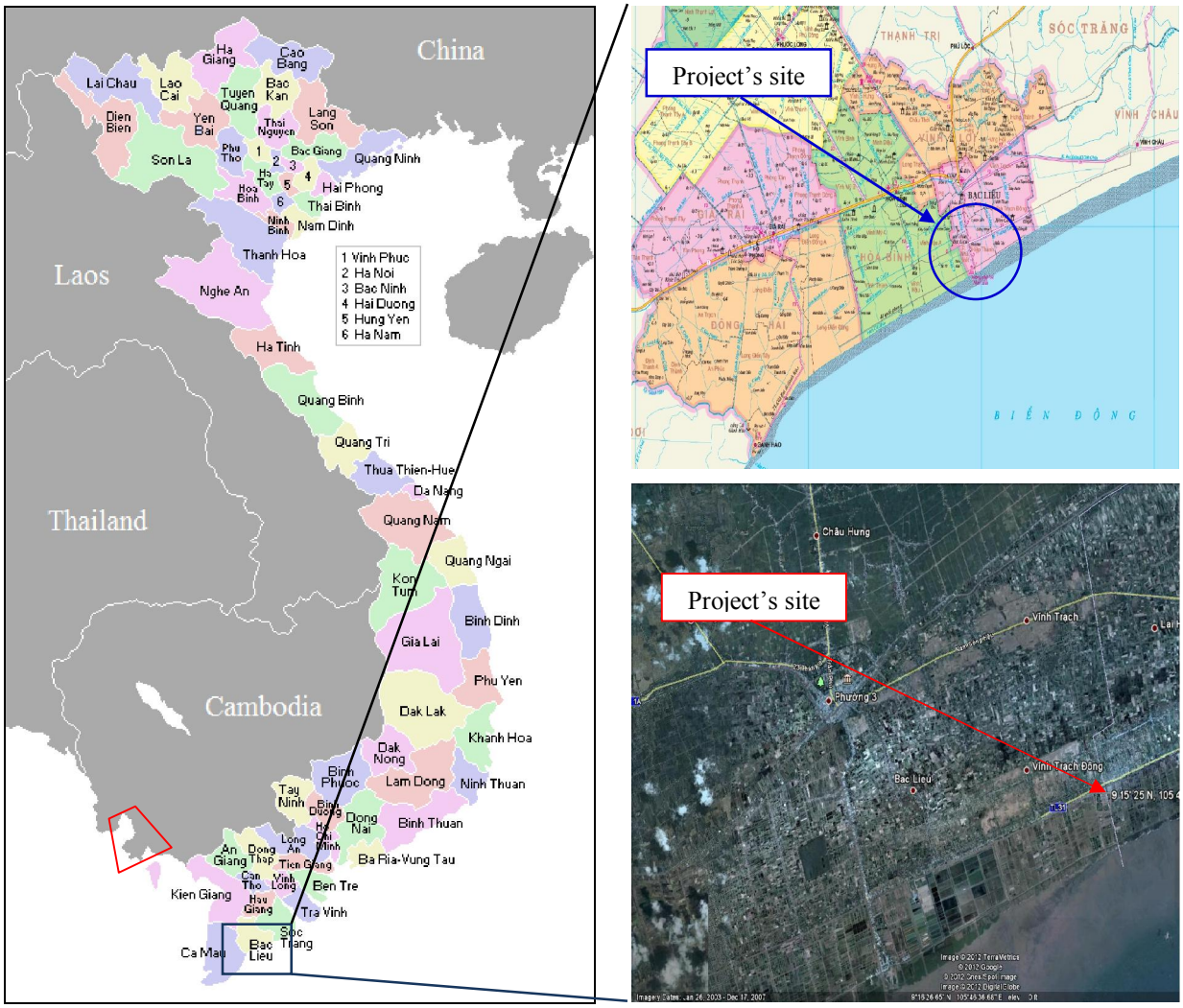

Figure 2: Project's Location

A.3. Technologies and/or measures

The project involves the construction of a 99.2 MW grid-connected wind power plant with 62 wind turbines and generators in order to convert kinetic power of the wind to electrical energy, which will be supplied to the national grid at the connection point through the transmission line. At the connection point, the electricity meter systems will be installed. They are digital and bi-directional type to measure the export and import of electricity of Bac Lieu Province Wind Power Plant.

The main technical parameters of project are shown in Table below.

Table 1: Main technical parameters of the proposed project activity

Main parameter	Unit	Value
1. Turbine[9]		

[9] Main technical parameters of turbines are extracted from the Feasibility Study Report of the project.

• Type		GE 1.6xle
• Number of turbines: + Phase 1 + Phase 2	set	 10 52
• Rated power	kW	1600
• Rotor diameter	m	82.5
• Swept area	m^2	5346
• Tower height	m	80/100
• Cut-in wind speed	m/s	3.5
• Cut-out wind speed	m/s	25
• Survival wind speed	m/s	50.1
2. Generator[10]		
• Type		three phases, asynchronous
• Voltage	V	690
• Frequency	Hz	50
• Rated speed	rpm	1915
3. Plant load factor[11]		
• Phase I	%	40.38
• Phase II	%	38.23
• Combined plant load factor	%	38.57

The main equipment utilized in this project will be supplied by the General Electric Company (GE) and GE Vietnam Limited Company[12]. The GE 1.6 xle turbine of GE Wind energy was chosen via comparison research between well-known wind turbine manufacturers based on the wind conditions at the project's site and technical features of the equipment. GE company has also established a turbine manufacture in Vietnam which is very convenient for maintenance and training activities.

Wind data in Bac Lieu province collected for ten years (from 2000-2009) at Bac Lieu weather station shows good potential for development of wind power plant in the project's area. This is also consistent with the research results conducted by World Bank. The monthly average wind speed in Bac Lieu province at 80m altitude is presented in Figure below:

[10] Main technical parameters of generators are extracted from the Equipment Contract signed with GE.
[11] Plant load factor was calculated and confirmed by the independent third party in accordance to EB 48 Annex 11.
[12] Equipment Contract between General Electric Company and Cong Ly Ltd Company.

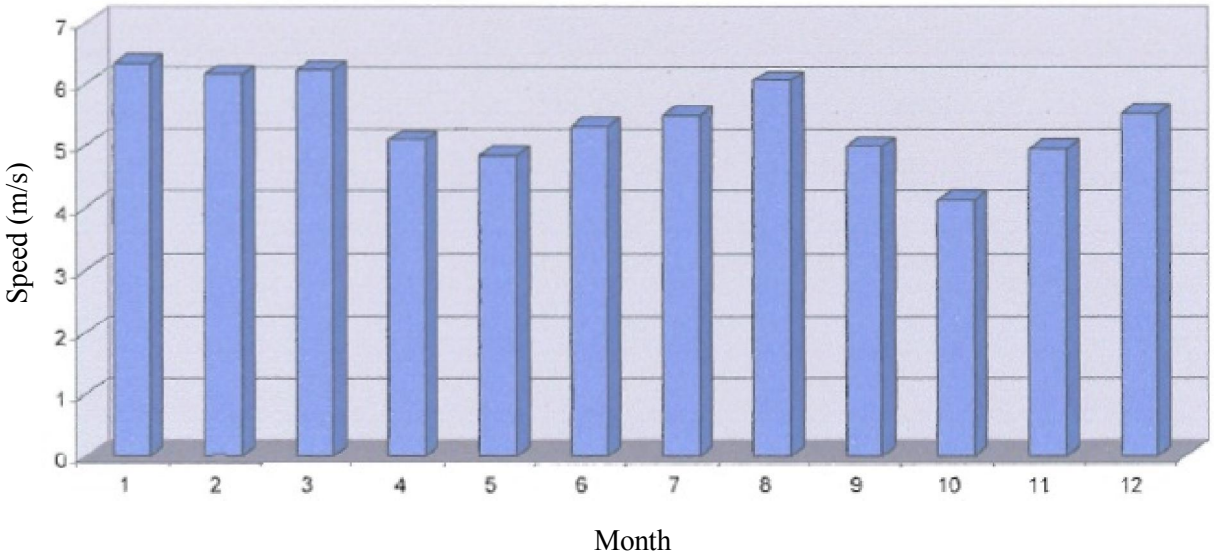

Figure 3: Monthly average wind speed in Bac Lieu province at 80m altitude

The electricity generation was based on wind data recorded by a wind speed tower installed at the project's site. The recorded wind data was automatically input and analyzed by OPENWIND program which was developed by Awstruepower (US) to calculate the annual output of the project.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Vietnam (host)	Cong Ly Construction-Trading-Tourism Co., Ltd.[13]	No
Switzerland	Swiss Carbon Assets Ltd.	No

A.5. Public funding of project activity

There are no public and/or ODA funds involved in this project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

Applied methodology:

- Version 13.0.0 of ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Related tools:

- Version 02.2.1 of the "Tool to calculate the emission factor for an electricity system"

[13] The name of project proponent is revised from the Prior-consideration of the CDM Form submitted to EB on 2 November 2011 to be more precise and inline with the Vietnamese registered name

Version 06.0.0 of the "Tool for the demonstration and assessment of additionality"

The methodology and the related tools are available on the UNFCCC website:
http://cdm.unfccc.int/filestorage/D/Y/P/DYPFI935XBG274NWH6O8CM1KEZR0VU/EB67_repan13_ACM0002_ver13.0.0.pdf?t=aUx8bTQ3Zmd0fDAoxX9TyYSCEng6RUXSEKT9

B.2. Applicability of methodology

This proposed project is a grid-connected renewable power generation that is then eligible to apply Version 13.0.0 of ACM0002. More details of the comparison of the project's characteristics and the applicability criteria as specified in, Version 13.0.0 of ACM0002 is given in Table 3

Table 3: Comparison of project's characteristics and eligibility criteria of Version 13.0.0 of ACM0002

Applicability conditions in Version 13.0.0 of ACM0002	Characteristics of the project activity	Applicability criterion met?
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (green field plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity involves the installation of a new grid connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant)	Yes
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run of river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The project activity is the installation of new wind power plant.	Yes
In the case of the capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The project activity is the installation of new wind power plant.	Not applicable
This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	The project does not involve any switch from fossil fuel to renewable energy source.	Yes

This methodology is not applicable to the biomass fired power plants;	The project activity is a wind power plant.	Yes
This methodology is not applicable to hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	The project activity is a wind power plant.	Yes

This comparison shows clearly that Version 13.0.0 of ACM0002 is applicable to the proposed project activity.

B.3. Project boundary

According to Version 13.0.0 of ACM0002, the spatial extent of the project boundary includes the Bac Lieu Province Wind Power Plant and all power plants connected physically to the national electricity grid to which the proposed project is also connected.

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

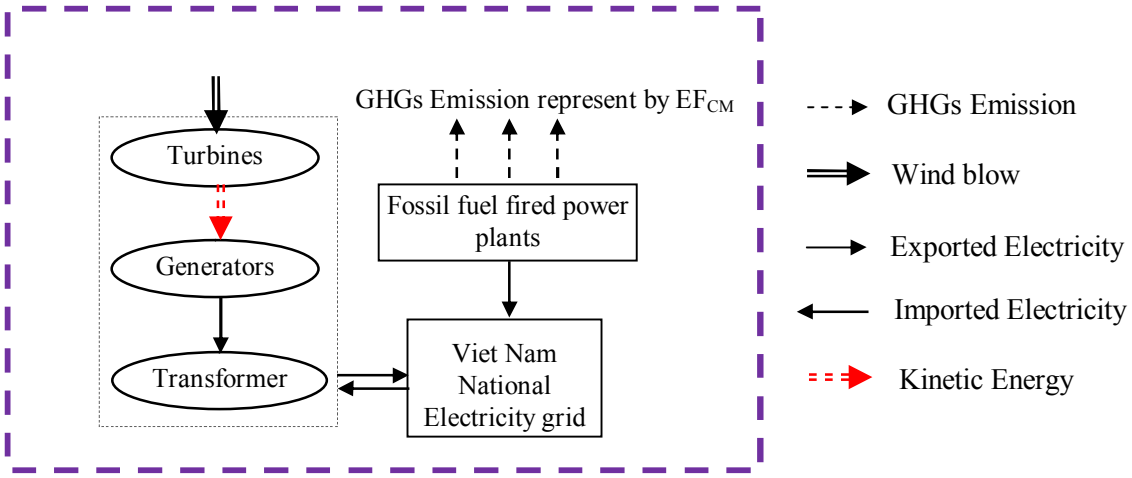

Figure 4: Project boundary

The GHGs and emission sources included in the project boundary are shown in Table 4.

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

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emission from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	Proposed project	CO_2	No	According to ACM0002, the project emission of wind energy project activity is zero.
		CH_4	No	
		N_2O	No	

B.4. Establishment and description of baseline scenario

According to version 13.0.0 of ACM0002, if the project activity includes the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations described in the "Tool to calculate the emission factor for an electricity system".

The Vietnam 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 Vietnam are physically connected is the project electricity system[14].

Thus the baseline scenario of the proposed project is the delivery of equivalent amount of annual power output from the Vietnam national grid to which the proposed project is also connected. The database for calculating the baseline is published by the DNA of Vietnam.

Following the EB guidance on the consideration of national and/or sectoral policies and circumstances in baseline scenarios (EB 22, annex 3) and "Information note on the implementation of E+/E- in the context of project", EB 53, Annex 32, two types of policies E+ and E- have been examined.

(a) National and/or sectoral policies or regulations that give comparative advantages to more emissions-intensive technologies or fuels over less emissions-intensive technologies or fuels. Up to date, the government of Viet Nam has not implemented any such E+ policies that are available and/or to be accessed publicly.

(b) National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs): the latest comprehensive policy for the power sector in Vietnam is the National Master Plan on national power development for the period 2006-2015 perspective to 2025 (Master plan VI) approved by the Prime Minister in 2007. For wind power projects, the Prime Minister recently issued the Decision No. 37/2011/QD-TTg dated June 29, 2011 on the mechanism supporting the development of wind power project in Vietnam. According to paragraph 7(b), Annex 3, EB 22, these policies need not be taken into account in developing the baseline scenario as they are implemented after the adoption by the COP of the CDM M&P (Decision 17/CP.7, 11 November 2001).. The tariff applied in the investment analysis of proposed project is derived from FSR which was designed by an expertise third party and it is not affected by any E+ policies or E- policies.

So, the baseline scenario of this proposed project refers to a hypothetical situation or the delivery of equivalent amount of annual power output from the Viet Nam national grid.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

B.5. Demonstration of additionality

According to Version 13.0.0 of ACM0002, the latest version of the "Tool for the demonstration and assessment of additionality" shall be used to demonstrate the additionality of this project activity. Version 06.0.0 of the additionality tool includes the following steps:

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

[14] http://vietbao.vn/Kinh-te/Tong-cong-ty-Dien-luc-VN-doc-quyen-mua-re-ban-dat/10732642/87/

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

Paragraph 4 of version 06.0.0 of the additionality tool states: "Project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity."

We will therefore consider the two scenarios in the following analysis:

Alternative 1: The proposed project undertaken without the CDM.

The construction and operation of Bac Lieu Province Wind Power Plant with the total installed capacity of 99.2 MW, without being registered as a CDM project activity.

Alternative 2: Continuation of the current situation.

In this case, the proposed project will not be constructed and the power will be solely supplied from the Vietnam national grid.

Sub-step 1b: Consistency with mandatory laws and regulations

The alternative 2 "continuation of the current situation" alternative does not face with any barrier from the current law and regulation in Vietnam because it is the "do-nothing" alternative. The project owner of a proposed project has no obligation to build or invest in the power plant to supply electricity for the local area. Hence this alternative is consistent with mandatory laws and regulations.

The alternative 1 is consistent with mandatory laws and regulations of Vietnam[15].

Step *2:* Investment *analysis*

Sub-step 2a: Determine appropriate analysis method

The proposed project activity generates financial and economic benefits other than CER revenues, so the simple cost analysis (Option I) is not applicable. Out of the two remaining options, Option II is also not applicable as there are no other credible and realistic baseline scenario alternatives other than electricity supply from the grid. Thus, the benchmark analysis (Option III) is chosen to proof additionality.

Sub-step 2b – Option III: Apply benchmark analysis

The financial indicator selected to assess the project is the project internal rate of return (IRR). As indicated in 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.

Weekly, the State Bank of Vietnam publishes a monetary report that provides the statistic data of the interest rates prevailing in the market during the reporting period. Such a report is published at the website of the State Bank weekly (www.sbv.gov.vn/en/*)*. The benchmark of Bac Lieu Province Wind Power Plant is 14.29%. This benchmark is derived from the average long-term lending rates available from the beginning of 2010 up to the date of making the investment decision. This value is conservative since the actual lending rates at the date of decision making is in between 15.5% - 17%.
This benchmark is selected based on the availability of data published by the government and accessible by the PP. Thus, the benchmark selected is suitable and in accordance with the EB guideline.

In conclusion, the applied benchmark is 14.29% is standard as it is based on the data published by the State Bank of Vietnam.

[15] This project owner received the investment license for this project on 10 Jan 2011. This proved that this project complies with the law and regulation in Vietnam.

Sub-step 2c: Calculation and comparison of financial indicators

The key assumptions used to calculate the project IRR of the proposed project are presented in Table below.

Table 5: Key assumption for investment analysis

No	Parameter	Unit	Value	Source
1	Gross capacity - Phase 1 - Phase 2	MW	99.2 16 83.2	Feasibility Study Report
2	Total annual net electricity generation - Phase 1 - Phase 2	MWh	327,826 55,355 272,471	The gross power generation subtracts 2.2%[16] as indicated in Feasibility Study Report
3	Total investment cost - Phase 1 - Phase 2	billion VND	4,218.932 775.408 3,443.524	Feasibility Study Report
4	Total annual O&M cost - Year 1-2 - Year 3-10 - Year 11-22	UScent/kWh	1 2.2 2.5	Feasibility Study Report
5	Preparation and construction period - Phase 1 - Phase 2	Year	04 02 02	Feasibility Study Report
6	Period of financial assessment	Year	22	Feasibility Study Report
7	Electricity price	UScent/kWh	9.78	Feasibility Study Report
8	Depreciation period • For the plant • For equipment	year	25 10	Decision 206/2003/QD-BTC issued by Ministry of Finance on 12/12/2003
9	Residual value	bilion VND	59.04	According to Decision 206/2003/QD-BTC, the depreciation period of the plant is 25 years while the operational lifetime of the plant is 22 years (20 years of technical lifetime and 2 years different in the operation time of the two Phases) which is shorter than the depreciation period. Residual value is therefore included at the end of assessment period.
10	**Pre-tax IRR without CDM**	**%**	**10.31**	

This table shows that the IRR of the project was lower than the benchmark at the time of decision making on the proposed project, which is defined as the date of issuance of the Investment Decision for the project by Board of Management on 16 February 2011.

All financial data are available to the DOE for Validation.

[16] Feasibility Study Report

Sub-step 2d: Sensitivity analysis

A sensitivity analysis of the project activity has been conducted to test the robustness of the above calculations. According to EB 62, Annex 5: "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". Although the O&M cost accounted less than 20% of total investment cost, it is still included in the project sensitivity analysis for more detail about the financial analysis.

The following parameters are included for the sensitivity analysis of the project activity:

- Annual electricity output
- Total investment cost
- O&M cost
- Electricity price

Table 6 shows the impact of variations in key factors on the Project IRR.

Table 6: Sensitivity analysis

No	Parameter		Variation[17]	Project IRR	Likelihoods to happen
1	Annual electricity output	Phase I	+137.98%	14.29%	The increase of 137.98% of the annual electricity output in Phase I is unlikely to happen because the potential wind power of the area has been surveyed on long term basis in period of 10 years from 2000 to 2009 [18] . Moreover, the Project Owner also installed a wind speed tower to automatically record wind data every 10 minutes. The recorded data were used to calculate the annual electricity output. It thus can be concluded that the wind conditions in the project area is not possible to reach 137.98% annual increase compared with the current estimation for the entire crediting period.
			+10%	10.60%	Lower than the benchmark of 14.29
			-10%	10.03%	Lower than the benchmark of 14.29
		Phase II	+36.62%	14.29%	The increase of 36.62% of the annual electricity output in Phase II is unlikely to happen because the potential wind power of the area has been surveyed on long term basis in period of 10 years from 2000 to 2009 [19] . Moreover, the Project Owner also installed a wind speed tower to automatically record wind data every 10 minutes. The recorded data were used to calculate the annual electricity output. It thus can be concluded that the wind conditions in the project area is not possible to reach 36.62% annual increase compared with the current estimation for the entire crediting period.
			+10%	11.45%	Lower than the benchmark of 14.29

[17] ±10% is selected according to the Decision No. 2014/QD – 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.
[18] Feasibility Study Report
[19] Feasibility Study Report

			-10%	9.13%	Lower than the benchmark of 14.29
2	Total investment cost	Phase I	+10%	10.01%	Lower than the benchmark of 14.29
			-10%	10.63%	Lower than the benchmark of 14.29
			-98.66%	14.29%	The decrease of 98.66% in the total investment cost of Phase I is not likely to happen because the inflation, average consumer prices from 2008 until 2015 [20] show an annual average increase of 9.197 %.
		Phase II	+10%	9.24%	Lower than the benchmark of 14.29
			-10%	11.52%	Lower than the benchmark of 14.29
			-29.02%	14.29%	The decrease of 29.02% in the total investment cost in Phase II is not likely to happen because the inflation, average consumer prices from 2008 until 2015 [21] show an annual average increase of 9.197 %.
3	Electricity price		+23.01%	14.29%	The increase of 23.01% in tariff annually is impossible since the Ministry of Industry and Trade has informed the Project Owner that the tariff applied to the project will be accordance to the Decision 37/2011/QD-TTg dated 29 June 2011 of the Prime Minister at 7.8 UScent/kwh which is lower than the value in FSR[22].
			+10%	12.10%	Lower than the benchmark of 14.29
			-10%	8.42%	Lower than the benchmark of 14.29
4	O&M cost		+10%	9.92%	Lower than the benchmark of 14.29
			-10%	10.70%	Lower than the benchmark of 14.29
			-112.26%	14.29%	The decrease of 112.26% in the O&M cost is never happened since no cost for O&M of the project would be incurred by the project owner during the entire operation life is absolutely not realistic.

[20] http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2008&ey=2015&scsm=1&ssd=1&sort=country&ds=.&br=1&pr1.x=20&pr1.y=14&c=582&s=PCPIPCH&grp=0&a=#cs1

[21] http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2008&ey=2015&scsm=1&ssd=1&sort=country&ds=.&br=1&pr1.x=20&pr1.y=14&c=582&s=PCPIPCH&grp=0&a=#cs1

[22] Official Letter No. 5080/BCT-DTDL dated 13 June 2012 of the Ministry of Industry and Trade to EVN and Cong Ly Construction-Trading-Tourism Co., Ltd.

The benchmark is defined as the expected rate of return, at which the investment project is considered to be financially feasible while project IRR is actual rate of return of the proposed project and calculated based on the project-specific assumptions in the FSR that have been designed by an independent third party and approved by the national authorities. If the project IRR is lower than the benchmark then the project is not financially attractive and subsequently no investments would be made at such project IRR in general.

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

Step 3: Barrier analysis

Not applied

Step 4: Common practice analysis

According to the paragraph 47 of the "Tool for the demonstration and assessment of additionality", version 06.0.0, EB 65, the project activity falls in the type of "Switch of technology with or without change of energy source, including the use of renewable energies" which listed in the paragraph 6 of the tool. Therefore, the following stepwise approach according to the Additional Tool shall be applied to analyze the common practices for the proposed project.

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The proposed project activity has the installed capacity of 99.2 MW.

So applicable output range as +/-50% of the capacity of the proposed project activity is 49.6 MW and 148.8 MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project.

The entire host country (Vietnam) was chosen as the applicable geographical area.

According to the "*Information on wind energy of Vietnam*" which was developed under the GIZ/MoIT Wind Energy Project in April 2011, the wind energy applications in Vietnam that has started operation before the start date of the project are as follows:

Table 7: Wind energy applications in Vietnam[23]

No.	Application	Capacity (Wp)	Quantity	Operation start	Area of installation
1	Household wind turbine	100-200	about 1,000	Measured from 1999	Central coastal area
2	Wind-diesel hybrid system	30,000	1	1999	Hai Thinh commune, Hai Hau district, Nam Dinh province
3	Wind-solar hybrid system	2,000	1	2000	Dac Ha district, Kon Tum province
4	Large wind turbines for	800,000	1	2004	Bach Long Vi island

[23] Information on wind energy in Vietnam-page 29 (http://www.windenergy.org.vn/uploads/Publications/Information_on_wind_energy_in_vietnam_ENG_Final.pdf)

	islands				
5	Grid-connected wind turbines	1,500,000	12	5 turbines in 2009, 7 turbines in early 2011	Tuy Phong, Binh Thuan province

The table shows that current applications of wind power in Vietnam are limited and on small scale, which do not fall into the applicable output range as +/-50% of the capacity of the proposed project activity from 49.6 MW to 148.8 MW for common practice analysis.

Moreover, applications no. 1 to 4 are not grid-connected and enjoy different investment conditions from the proposed project activity[24]

In the applicable geographical area, there is only Binh Thuan Wind Power Plant No.1 (application no. 5) with capacity of 30 MW that is grid-connected and has started commercial operation before the start date of the project. Details of this project are as follows:

Table 8: List of relevant wind power plants for common practice analysis[25]

No	***Name***	***Capacity MW***	***Elec. outputs 10^3 MWh***	***Load factor***	***Construction starting year***	***Commissioning year***	**Investor during the investment and construction period**
0	***The proposed project***	**99.2**	**335,200**	**38.57%**	***2010***	***2012***	
1	*Binh Thuan*	*30*	*91.571*	37.1	2008	*5 turbines in 2009, 7 turbines in 2011*	REVN[26]

This sole wind power project in Vietnam, however, does not fall into the applicable output range as +/-50% of the capacity of the proposed project activity from 49.6 MW to 148.8 MW and was registered as CDM project on 6 April 2009[27]. So, one gets $N_{all} = 0$.

Step 3: Identify plants that apply technologies different than the technology applied in the proposed project activity

As stated above, there is no wind power project in Vietnam that has started commercial operation before the start date of the project without the aid of CDM, therefore N_{diff} is ascertained to be 0.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ where $N_{diff} = N_{all}$ (= 0) thus $N_{diff}/ N_{all} = 1$ and the resulted factor $F=1-N_{diff}/N_{all} = 0$ that is lesser than 0.2 (for common practice, it should be more than 0.2)

[24] See further details in "Information on wind energy of Vietnam, GIZ/MoIT wind energy project, April 2011" (http://www.windenergy.org.vn/uploads/Publications/Information_on_wind_energy_in_vietnam_ENG_Final.pdf)
[25] Information on wind energy of Vietnam, GIZ/MoIT wind energy project, April 2011 (http://www.windenergy.org.vn/uploads/Publications/Information_on_wind_energy_in_vietnam_ENG_Final.pdf)
[26] Vietnam Renewable Energy Joint Stock Company
[27] http://cdm.unfccc.int/Projects/DB/KEMCO1219986182.6/view

N_{all}-N_{diff} = 0 that is smaller than 3 (for common practice, it should be more than 3). Hence, the project activity is not a common practice as by the definition of the EB Guidance at Annex 12, EB 63.

Implementation timeline of the proposed project activity

CDM early consideration and the serious actions to secure the CDM status for the project are reflected in the key milestones in the development of the project listed below:

Table 9: Major milestones in developing the investment project and CDM application

Development of the wind power project	**Activities taken to secure CDM status**	**Time**	**Implication on CDM**
Finalize Feasibility Study Report (Phase I and Phase II) which includes CDM consideration		Jun 2010	Evidence for early CDM consideration
Issue Investment License by the People's Committee of Bac Lieu province		10 Jan 2011	
	Achieving the Minutes of a meeting to consult public opinions on the social and environmental impacts of the project in order to develop it as a CDM activity	3 Feb 2011	Evidence for early CDM consideration
Issuing the Investment Decision on implementing the investment project with the CDM application by the Board of Management		**16 Feb 2011**	**Date of making Investment decision**
Signing Equipment Purchase Contract		**03 June 2011**	**Starting date of the project activity**
	Notification to UNFCCC on idea to develop the project under CDM	2 Nov 2011	
	Notification to Vietnam DNA on idea to develop the project under CDM	16 Nov 2011	
	Signing Emission Reduction Purchasing Agreement	7 May 2012	
Expected commissioning date for the 1st phase		Jan 2013	
Expected commissioning date for the 2nd phase		Jan 2015	

In conclusion, the proposed project is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

The reduced emission is calculated in accordance with the approved consolidated baseline methodology Version 13.0.0 of ACM0002.

I. Project emissions *(PE_y)*

According to ACM0002, Version 13.0, the project emissions are calculated using the following equation:

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

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 in 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 wind power plant that neither uses fossil fuel nor operates geothermal power plants or having water reservoirs (i.e. $PE_{FF,y} = 0$; $PE_{GP,y} = 0$; $PE_{HP,y} = 0$); therefore, the project emission is zero:

$$PE_y = 0$$

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:

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

Where:

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

<u>Calculation of EG_{PJ}</u>

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

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

Where:

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

Therefore, the baseline emissions are calculated as follows:

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

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

The Version 02.2.1 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 (BM) emission factor.

STEP 6. Calculate the combined margin (CM) emission factor.

Step 1. Identify the relevant electricity system

This wind power 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, so 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 simple OM method (a) has been used to determine the OM for the project activity because low-cost/must-run resources in Vietnam is 32.66 % constituting less than 50% of total grid generation in average of the five most recent years (for details see the table below).

Table 10: Rate of low cost/must-run sources based on generation[28]

Year	2006	2007	2008	2009	2010	Average Value for 2006-2010
Hydro Power (MWh)	19,508,244	22,385,232	25,933,762	29,033,871	24,241,216	121,102,325
Total Power (MWh)	57,160,493	66,348,589	74,689,636	81,369,303	91,224,603	370,792,624
Low-cost/Must-run Ratio	34.13%	33.74%	34.72%	35.68%	26.57%	32.66%

The emission factor is calculated using the ex-ante option determined at the validation stage with no requirement for monitoring and recalculation during the crediting period. A 3-year generation-weighted average has been calculated with reference to years 2008, 2009 and 2010, which is the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

Since all grid connected power plants registered as CDM projects in Vietnam are renewable energy projects (wind, hydro and biomass) there are no registered CDM projects in Vietnam which satisfy the criteria for inclusion in the sample group.

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 two 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 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:

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

Where:

$EF_{grid,OM,y}$ = 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 plants/units serving the grid in year *y* except low-cost/must-run power plants/units

[28] Data source from DNA Viet Nam

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, so the emission factor ($EF_{EL,m,y}$) should be determined as **Option A1** :

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

Where:

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

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

y = The relevant year as per the data vintage chosen in Step 3

Table 11: OM emission factor in 2010

Year	Total output (MWh)	Total emission (tCO2e)	OM_{2010} (tCO2e/MWh)
	A	**B**	**(ΣB/ΣA)**
2008	48,719,874.06	29,963,699.40	
2009	52,303,502.57	31,830,892.77	
2010	66,933,114.79	40,572,715.06	
Total	**167,956,491.42**	**102,367,307.23**	**0.6095**

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

$$\boldsymbol{EF_{grid,OMsimple,y} = 0.6095\ tCO_2/MWh}$$

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 2010, the set of five power units that have been built most recently ($SET_{5\text{-}units}$) has annual generation ($AEG_{SET\text{-}5\text{-}units}$) of 4,055,124.24 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 2010 is 91,224,603.26 MWh then 20% of the total output of Vietnam electricity grid in 2010 is 18,244,920.65 MWh.

Most recent-built power plants ($SET_{\geq 20\%}$*) addition in the electricity system that comprise 20% of the system generation in 2010 have annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$) of 23,845,894.24 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 (23,845,894.24 MWh) than the set of five power units that have been built most recently in 2010 does (4,055,124.24 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 electricity generation data is available

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

$$\boldsymbol{EF_{grid,BM,y} = 0.4722\ tCO_2/MWh}$$

Step 6. Calculate the combined margin emissions factor

According to the tool, the calculation of the combined margin (CM) emission factor ($EF_{grid,\ CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM

As the project is located in Vietnam a developing country and having more than 10 registered projects at starting date of validation, the PP chooses the weighted average CM method to calculate CM emission factor for the proposed project.

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:

$EF_{grid,BM,y}$ = 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 OM emissions factor (%)

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

In accordance with the "Tool to calculate the emission factor for an electricity system" Version 02.2.1, Annex 19, EB 63, the proposed project applies the following default values: w_{OM}= 0.75 and w_{BM}= 0.25 for the first crediting period and for subsequent crediting periods.

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

$$\boldsymbol{EF_{grid,CM,y} = 0.75 \times 0.6095 + 0.25 \times 0.4722 = 0.5751\ tCO_2/MWh}$$

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

III. Leakage *(LE_y)*

According to ACM0002, Version 13.0.0 , no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

IV. Emission reductions *(ER_y)*

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y Emission reductions in year y (t CO_2e/yr).

BE_y Baseline emissions in year y (t CO_2e/yr)

PE_y Project emissions in year y (t CO_2e/yr).

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**$EF_{grid,OM,y}$**
Unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system".
Source of data	Data published by DNA Viet Nam.
Value(s) applied	0.6095
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system"
Purpose of data	For calculation of $EF_{grid,CM,y}$
Additional comment	-

Data / Parameter	**$EF_{grid,BM,y}$**
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system"
Source of data	Data published by DNA Viet Nam
Value(s) applied	0.4722
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system"
Purpose of data	For calculation of $EF_{grid,CM,y}$
Additional comment	-

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of "Tool to calculate the emission factor for an electricity system".
Source of data	Data published by DNA Viet Nam
Value(s) applied	0.5751
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system".
Purpose of data	For calculation of BE_y
Additional comment	Fixed for the first crediting period

B.6.3. Ex ante calculation of emission reductions

Project emissions (PE_y)

The emissions of this wind power project $PE_y = 0$

Baseline emissions (BE_y)

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

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

Where:

BE_y Baseline emissions in year *y* (t CO_2e/yr).

$EG_{PJ,y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr), and equal to 327,826 MWh/yr

$EF_{grid,CM,y}$ = 0.5751 tCO_2/MWh

therefore:

$$BE_y = 327{,}826 \times 0.5751 = 188{,}532\ tCO_2e/yr$$

Leakage (LE_y)

As it is stated in ACM0002 version 13.0, no leakage emission is considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport).These emissions sources are neglected.

Emission Reductions (ER_y)

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y = 188{,}532 \text{ tCO}_2\text{/yr}$$

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 2013	31,834	0	0	31,834
Year 2014	31,834	0	0	31,834
Year 2015	188,532	0	0	188,532
Year 2016	188,532	0	0	188,532
Year 2017	188,532	0	0	188,532
Year 2018	188,532	0	0	188,532
Year 2019	188,532	0	0	188,532
Total	**1,006,328**	**0**	**0**	**1,006,328**
Total number of crediting years	7 years			
Annual average over the crediting period	**143,761**	**0**	**0**	**143,761**

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter	**$EG_{y, export}$**
Unit	MWh/yr
Description	Electricity exported by the proposed project to the national grid.
Source of data	Electricity meter(s)
Value(s) applied	327,826
Measurement methods and procedures	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 readings of electricity meter will be Continuously measured by power meter and monthly recorded. The recorded data will be confirmed by the joint balance 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. The back-up power meter will be used only in case of failure of the main power meter.
Monitoring frequency	Continuously measured by power meter and monthly recording
QA/QC procedures	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 in accordance with relevant local laws.
Purpose of data	For the determination of $EG_{facility,y}$
Additional comment	-

Data / Parameter	$EG_{y, import}$
Unit	MWh/yr
Description	Electricity imported from the grid by the proposed project
Source of data	Electricity meter(s)
Value(s) applied	0
Measurement methods and procedures	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 project by the reverse direction. The readings of electricity meter will be Continuously measured by power meter and monthly recorded. The recorded data will be confirmed by the joint balance 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. The back-up power meter will be used only in case of failure of the main power meter.
Monitoring frequency	Continuously measured by power meter and monthly recording
QA/QC procedures	The uncertainty level of this data is low. The measurement/ monitoring equipment will comply with national standard and technology. These equipment and systems should be calibrated and checked in accordance with relevant local laws.
Purpose of data	For the determination of $EG_{facility,y}$
Additional comment	-

Data / Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Calculating by subtracting $EG_{y, import}$ from $EG_{y, export}$
Value(s) applied	327,826
Measurement methods and procedures	(i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid Double checking by the joint balance 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	Continuously measured by power meter and monthly recording
QA/QC procedures	The uncertainty level of this data is low.
Purpose of data	For BE_y calculation
Additional comment	-

B.7.2. Sampling plan

Not applicable

B.7.3. Other elements of monitoring plan

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

The baseline emission factor of Vietnam National Grid ($EF_{grid,CM,y}$) is fixed ex-ante (detail in Section B.6), the main data to be monitored is $EG_{facility,y}$. $EG_{facility,y}$ will be calculated according to the formula below:

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

The electricity generated from the project activity before entering into the grid at the grid interconnection point will be measured by a digital meter (in kilowatt hour kWh). The metering system includes the main system and a back-up system with accuracy of at least 0.2 and 0.5 respectively[29]. The back-up system will be used in case of failure of the main meter.

Data from the operating meters will be recorded electronically 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 with the electronically recorded data and prepare and sign a joint balance sheet which indicates the amount of power fed into the grid within that month.

This joint balance sheet is also the basis of payment by the EVN to the project proponent. Hence, the monitoring plan is well integrated into the standard EVN procedures.

For further details see Annex 5.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

03 June 2011
This is the date on which the project owner signs the Equipment Contract of 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 define 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 project activity

22 years 0 months[30]

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Seven year renewable crediting period

C.2.2. Start date of crediting period

01/01/2013 or the date of registration of the project whichever is later.

[29] In accordance to Circular No. 32/2010/TT-BCT dated 30 July 2010 of the Ministry of Industry and Trade on requirements of the power distribution system.
[30] According to equipment lifetime and construction and operation schedule presented in the Feasibility Study Report.

C.2.3. Length of crediting period

7 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The environmental impact assessment and mitigation measures have been proposed in the Feasibility Study Report of the project and received Approval of the People's Committee of Bac Lieu province at Decision No. 1695/QD-UBND dated 20 June 2011.

The environmental impacts of Bac Lieu Wind Power Plant are summarized as follows.

1.1. Environmental Impacts

1.1.1. Environmental impacts during construction

- Impacts on soil: fuel and oil, solid waste and waste water from construction activities may affect the structure, components and qualifications of the soil in the project's area if proper management measures are not implemented.

- Impacts on air: smoke and dust from construction machines and material transportation vehicles may pollute the air in the project's area.

- Impacts on ecosystem: the construction of the wind turbines' foundation, underwater cable, etc. may pose impacts on the ecosystem of the project's area. There will be a lost of about 9ha of vegetation and protection forest.

1.1.2. Environmental impacts during operation

- Waste related impacts: main waste related impacts from the operation of the project activity include solid waste and waste water from daily use of workers and staff as well as residues from oil and fuel and dust from operation and transportation activities.

- Noise and turbulence impacts: noise may be generated from the operation of wind turbines and other machines (transformers, circuit breaker, power capacitor, v.v). Turbulence may also occur during the operation of transformer station and wind turbines. The impacts however are not significant.

- Impacts on light: shadow and flicker effects will occur in the project area. However, these impacts are only recognisable at near distance and for big turbines with slow speed. Therefore, for this project, the impacts are negligible.

- Impacts on bird migration: the operation of wind turbines may cause accidents to the birds. However, the birds will soon recognize the presence of the turbines and learn how to avoid hitting the spinning turbines.

1.2. Socio-economic impacts

1.2.1. Negative impacts

- Increased traffic: The traffic in the project's area will be increased when the plant start operation. As designed, a tourism area will be formed to attract tourists thus increasing the traffic and accidents.

- Social security: The construction and operation of the project may increase the likelihood of social problems which negatively affect the social security of the local people.

- Loss of land: The implementation of the project will pose impacts on 6 households with about 40ha of land beyond the dam. The affected households will be compensated for their current investment activities on the land and be provided with other supportive policies to settle their life in accordance to the legal documents.

1.2.2. Positive impacts

As presented in Section A.2

D.2. Environmental impact assessment

The project activity brings about several environmental and socio-economic positive impacts. The main negative impacts on environment and society will be minimized as the following preventive and mitigation measures are implemented.

Construction phase

- Reclaim land based on negotiation and agreement with local authority and affected entities;
- Collect waste from clearance and construction activities as well as daily waste of the workers in order not to pollute the air, water and soil;
- Cover material during transportation, loading and unloading so as not to affect the aquaculture of the local residents;
- Minimise the noise from construction activity by using registered vehicles and maintain good operation of machines;
- Increase the awareness of the workers to ensure social security in the area.

Operational phase

Preventive measures and reaction towards environment problems include:

- Ensure the green cover of more than 20% of the total construction area;
- Collect waste water and solid waste for treatment or dumping in specified place;
- Provide workers with labour protection equipment, especially noise- reducing devices for ear protection.
- Implement environment monitoring program during construction and operation.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The project owner has submitted the Feasibility Study Report to the People Committee of Bac Lieu province. Then the People Committee has authorised for the project owner to develop this investment project via issuance of the investment license and approved the Environmental Impact Assessment Report.

Besides, the local authority and people of three communes affected by the project activity (Hiep Thanh commune, Vinh Trach Dong commune and Nha Mat ward) were invited to the consultation meeting on 3 February 2011. At first, the project owner sent the official letter to the People Committee of the communes to notify on the investment project[31]. Subsequently the stakeholders were informed about the project by public radio and loudspeaker. And then, the consultation meeting were organised by the project owner at the office of the project's Management Board.

E.2. Summary of comments received

[31] See Invitation Letter dated 1 February 2011.

The participants in the consultation meeting recognized the positive impacts of the project activity to the socio-economic development of the region and totally approved the development of the project activity under Clean Development Mechanism. Details of their comments are summarized as follows:

- Bac Lieu Wind Power Project will generate clean and stable source of energy for the electricification of rural areas, improvement of people's education and development of production activities as well as contribution to the socio-economic development of the region;
- The project will create jobs for local residents, reduce unemployment rate and make contribution to welfare and social security of the localities;
- The project will contribute to the local budget via tax;
- The project will promote eco-tourism services and attract tourists to the areas;
- The development of the project under Clean Development Mechanism will bring about additional revenue which make the project commercially viable;
- The project, however, may pose negative environmental impacts during construction phase. To minimize the impacts, the Project Owner should commit to implement mitigation measures and apply construction methods that meet sanitation requirements and to use modern equipment.
- The participants request the Project Owner to soon implement procedures to finish construction and put the project in to operation as scheduled as well as to submit the project to the Executive Board for registration.

E.3. Report on consideration of comments received

The Project Owner committed to take into consideration of the comments received and to implement the project up to the expectation of the local people.

SECTION F. Approval and authorization

The People Committee of Bac Lieu province issued the Investment Certificate No. 6012100024 on 10 January 2011 to approve the Investment Project of Bac Lieu Wind Power Plant.

The People Committee of Bac Lieu province issued the Approval of the Investment Impact Assessment Report at Decision No. 1695/QD-UBND dated 20 June 2011.

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Appendix 1: Contact information of project participants

Organization name	Cong Ly Construction-Trading-Tourism Co., Ltd.
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Building	
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State/Region	Ca Mau province
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Website	
Contact person	To Hoai Dan
Title	General Director
Salutation	Mr.
Last name	To
Middle name	Hoai
First name	Dan
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	tocongly@gmail.com

Organization name	**Swiss Carbon Assets Ltd**
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Country	Switzerland
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Contact person	Renat Heuberger
Title	Managing Partner
Salutation	Mr.
Last name	Heuberger
Middle name	
First name	Renat
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	r.heuberger@southpolecarbon.com

Appendix 2: Affirmation regarding public funding

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

Appendix 3: Applicability of selected methodology

As in Section B.2

Appendix 4: Further background information on ex ante calculation of emission reductions

As in Section B.6

In accordance with Official Letter No.109/KTTVBDKH dated 05 March 2012 of Department of Meteorology Hydrology and Climate Change under Ministry of Natural Resources and Environment (DNA) on "Emission factor of Vietnam National Grid"[32] and in referring to the "Tool to calculate the emission factor for an electricity system", Version 02.2.1, Annex 19, EB63.

[32] http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_59vnBao%20cao%20EF%202010.pdf

Appendix 5: Further background information on monitoring plan

Details of the monitoring information can be seen as follows:

A. Description of technical equipment

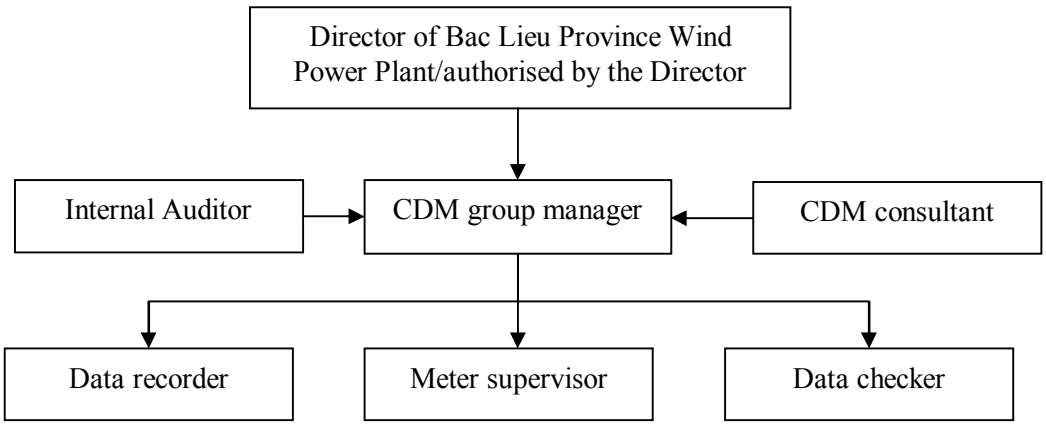
The metering system will be installed at the transformer station (as the connected point). The metering system includes the main system and a back-up system. They are digital meters bi-directly with allowed errors at least 0.2 and 0.5 for main and back-up meters respectively. The meter type used is an electronic 3 phases. Details on the technical equipment can be found in the hard copy document "Technical explanation for metering system" will be developed by the project proponent and will be approved by EVN.

Before the power metering equipment is put into operation the project owner and EVN should check and accept them. Each terminal block of the equipment is sealed with lead to prevent all the unallowable interferences.

This proposed project will supply electricity to the national grid at the transformer station. The metering system includes the main system and back-up system for measuring the electricity exported to and imported from the grid.

B. Monitoring organization

The structure of the monitoring group is as follows:



Structure of the monitoring group

The responsibilities of each person involved are elaborated as follows:

Group members and their responsibilities

Person	Responsibility
Director of Bac Lieu Province Wind Power Plant /authorised by the Director	Check and sign the monitoring report annually
CDM group manager	Managing the whole CDM business of Bac Lieu Province Wind Power 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	Checking the monitoring procedure at least once in 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

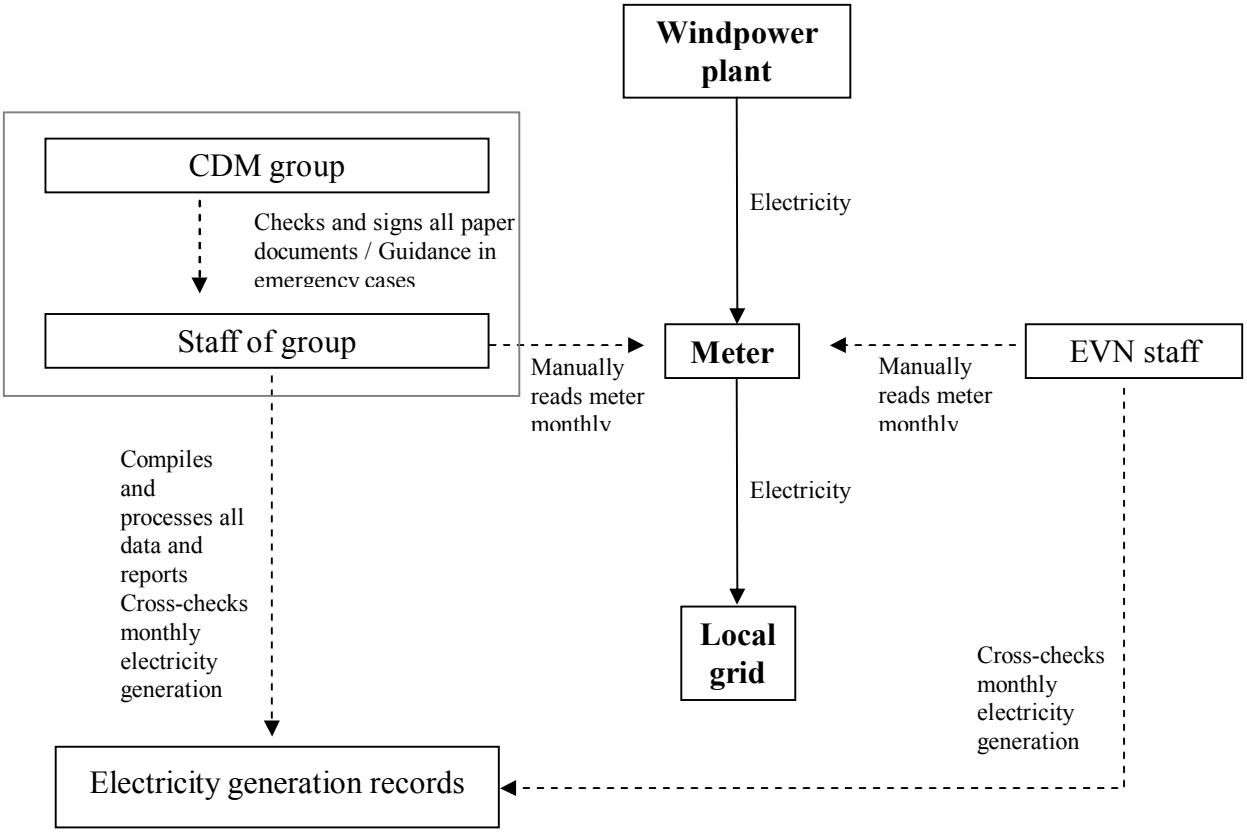
The steps of monitoring the electricity supplied to the grid and the electricity imported from grid and consumed by the proposed project are as follows:

(1) Persons in charge of data record and meter supervisor from Bac Lieu Province Wind Power 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;

(2) The data from the backup power meter will be hourly recorded by the person in charge of data recording of Bac Lieu Province Wind Power Plant. This recorded data will be cross checked with the data from main power meter. Data will be filled in the form provided by VNEEC.

(3) Bac Lieu Province Wind Power Plant provides electricity sales invoice to EVN, and keeps the copy of invoice of electricity purchased from EVN for internal use;

(4) Bac Lieu Province Wind Power Plant provides the record of main, backup power meters and copy of invoices to the verifier of DOE.



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[33] calibration and verification for 3 phase meters must be conducted every two year by the third accredited party during the project operation. After every calibration, the third party will seal the meters so that no illegal interference is possible.

E. Data recording and archiving procedures

- The CDM group appointed by Bac Lieu Province Wind Power 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.
- Bac Lieu Province Wind Power Plant shall keep the copy of electricity sales/purchase invoices (the original electricity sales/purchase invoices shall be kept by Finance Department of Bac Lieu Province Wind Power Plant).
- All the data and information in the form of paper documents shall be archived by the CDM group, 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 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 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.

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[33] Decision No 65/2002/QD-BKHCNMT[33] 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".