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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: West Huaybong 3 wind farm project
Version: Version 03.4
Date: 16/08/2012

A.2. Description of the project activity:

The Thailand national electricity grid provides electricity to households across Thailand. Over 90% of electricity consumed in Thailand's grid is supplied by fossil fuel fired power plants which emit carbon dioxide into the atmosphere. The purpose of the First Korat Wind Company with this project activity is to construct a large scale commercial wind farm in Thailand to supply clean renewable electricity to the Thailand grid. The scenario existing prior to the start of the project, which is the same as the baseline scenario, is the supply of electricity from power plants connected to the grid.

The proposed site of the West Huaybong 3 wind farm project is located in Nakhon Ratchasima Province in the northeast of Thailand. Prior to the project activity there was no equipment for generating electricity at the project site. A wind resource and energy yield assessment performed at the project site predicts that it will yield an annual electricity production of 232.5 GWh. A preliminary turbine layout consisting of 45 individual 2.3MW turbines has been proposed for the project. Electricity produced by the project activity would otherwise have involved the release of CO_2 from the combustion of fossil fuels in the power plants connected to the Thailand national grid.

The project activity will contribute to the sustainable development of Thailand by producing clean renewable electricity for use in the Thailand grid. The project will create jobs associated with site construction of the turbine towers, site facilities and access roads. At the time of submission there were no examples of large scale wind farms functioning in Thailand. The project will be an example of technology transfer because it will utilise imported wind turbines purchased from Siemens Wind Power A/S, a company incorporated in Denmark. The wind turbine supplier will provide training in concepts relevant to the equipment, systems and maintenance. The project is committed to engagement with all local stakeholders and as such a local stakeholder consultation meeting was organised to enable stakeholders concerns to be addressed.

A.3. Project participants:

Name of Party involved	Private and/or public entity(ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
Thailand (host)	First Korat Wind Company Limited	No
France	EDF Trading Limited	No

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Thailand

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

Nakhon Ratchasima Province

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

Tambol Huaybong of Amphur Dan Khun Thot and Tambol Nong Wang of Amphur Teparak

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

The physical location of the wind farm is located within Tambol Huaybong of Amphur Dan Khun Thot and Tambol Nong Wang of Amphur Teparak, of Nakhon Ratchasima Province. Please refer to figure A.4.1.4a for more detail.

Nominal GPS co-ordinates for the project site are: N 15°12’ 24.18”, E 101°27’ 38.71”.

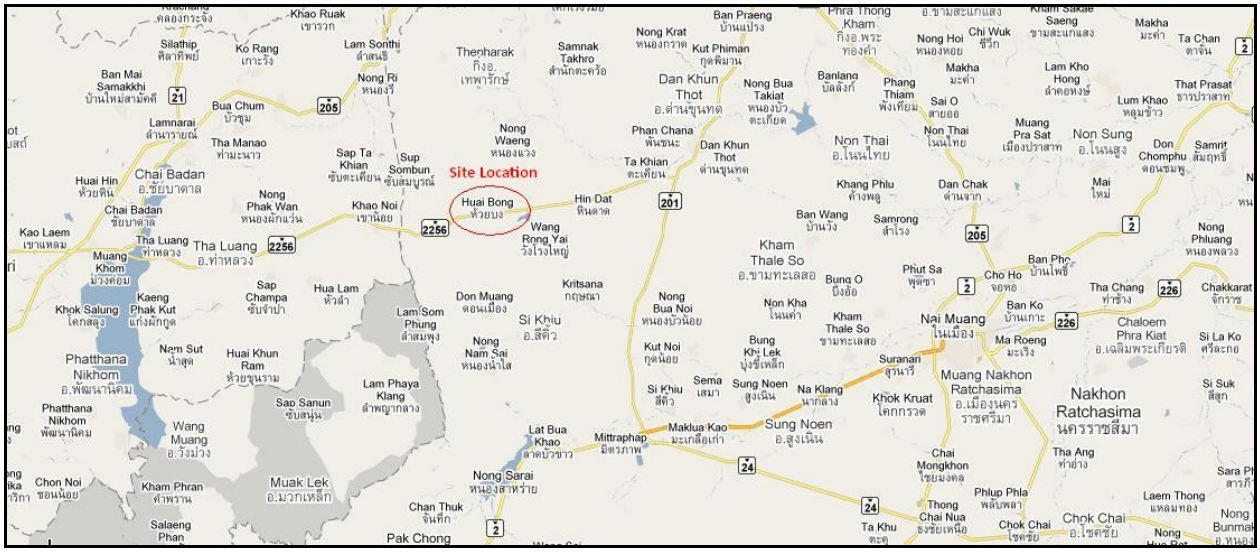


Figure A.4.1.4.a: Location of the West Huaybong 3 wind farm

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

Sectoral Scope 01: Energy industries (renewable)

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

The West Huaybong 3 wind farm project will produce renewable electricity for the Thailand national grid. Renewable electricity will be generated by wind turbines imported to Thailand and installed in the North West of Nakhon Ratchasima Province. Prior to the project activity there was no equipment for generating electricity at the project site and the Thailand grid was comprised of a mixture of generation units which included fossil fuel fired power units. In the absence of the project activity, the Thailand grid would receive electricity from the existing grid-connected power plants and by the addition of new generation sources. The baseline scenario is the same as the scenario described above which existed prior to implementation of the project activity. The production of electricity in this way creates CO_2 through the combustion of fossil fuels as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system". The CO_2 emissions from these baseline power plants is the only baseline emission source identified in section B.3 of the PDD. According to data published by the Thailand Greenhouse Gas Management Organisation (TGO), the Thailand grid produces 0.5980 tCO_2e per MWh of electricity produced[1].

The wind farm will be constructed on land administered by the Agricultural Land Reform Office. The project plans to install 45 individual 2.3MW Siemens SWT-2.3-101 turbines[2], which are based on a three blade horizontal axis turbine design and have a peak co-efficient of power (cp) of 0.46. The Design Operational Life of the turbines is 20-years based on the design power curve[3]. The planned operational life of the project is 23 years based on the assumption that the turbines will be operated beyond the technical lifetime of 20 years. A wind resource and energy yield assessment was performed at the project site which forecasts an annual electricity production of 232.5 GWh[4] and a combined loss factor of 15.6% and a plant load factor of 25.64%. The quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity will be monitored with electricity meters located at the point of connection to the grid. The electricity meters will be installed and operated in accordance with the Power Purchase Agreement (PPA) signed with the Energy Generating Authority of Thailand (EGAT). In accordance with the PPA, primary and backup export meters will be installed and the error specified by the meter manufacturer will not exceed +/- 0.2%. More details of the metering equipment are provided in section B.7. In accordance with section B.3 of the PDD, there are no project emissions associates with the project activity.

[1] The study of emission factor for an electricity system in Thailand 2009, www.tgo.or.th
[2] Siemens Technical Specification SWT-2.3-101
[3] Turbine Supply Agreement
[4] Garrad Hassan Assessment of the Energy Production of the Proposed Korat Wind Farm

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2012†	11,808
2013	139,035
2014	139,035
2015	139,035
2016	139,035
2017	139,035
2018	139,035
2019†	127,227
Total estimated reductions (tonnes of CO_2 e)	**973,245**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	139,035

† The first crediting year of the crediting period commences on 01/12/2012

A.4.5. Public funding of the project activity:

No public funding from Annex 1 Parties will be used for the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The following approved baseline and monitoring methodology has been applied to the project:

Version 12.3.0 of ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

ACM0002 references the following Tools which are relevant to the project activity:

Version 6.0 of the Tool for the demonstration and assessment of additionality

Version 2.2.1 of the Tool to calculate the emission factor for an electricity system

Further details of these approved baseline and monitoring methodologies can be found at the UNFCCC CDM website at http://cdm.unfccc.int/methodologies/index.html

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

Large scale methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" 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 (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 activity is a large scale grid-connected renewable power generation project that installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (i.e. a Greenfield plant) and it meets each of the applicability conditions of the methodology as follows:

Applicability Condition	Conformance of the Project Activity
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 a wind power plant.
In the case of capacity additions, retrofits or	The project activity is not a capacity addition; it is

replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): 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 addition 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 installation of a new wind power plant.
In case of hydro power plants, at least one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity. In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply: • The power density calculated for the entire project activity using equation 5 (*of ACM0002*) is greater than 4 W/m^2; • All reservoirs and hydro power plants are located at the same river and were designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units,	The project activity is not a hydro power plant.

which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15 MW; • The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	
The methodology is not applicable to the following:	
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 activity does not involve fuel switching.
Biomass fired power plants	The project activity is not a biomass power plant.
Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the reservoir is less than 4 W/m^2.	The project activity is not a hydro power plant.

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

The project boundary for the purpose of calculating project and baseline emissions consists of the physical wind farm site and the Thailand electrical grid. The only relevant emission source is the CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. For more details refer to the table below.

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	The project is not a geothermal plant
		CH_4	No	The project is not a geothermal plant
		N_2O	No	Minor emission source
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The project is not a solar thermal or geothermal plant
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	No	The project is not a hydro plant
		N_2O	No	Minor emission source

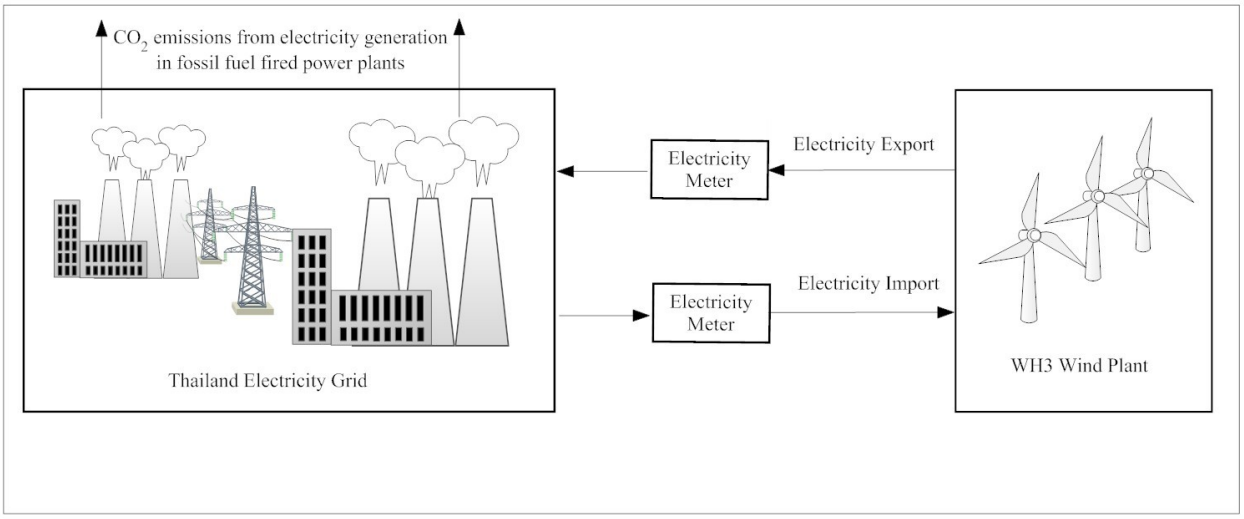


Figure B.3.a: Project Boundary and Emissions Sources

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

The baseline scenario is specified in ACM0002 section II. For project activities which involve the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

The combined margin for the Thailand grid is published by the Thailand Greenhouse Gas Management Organisation which is the DNA of Thailand.

ACM0002 also specifies a step-wise approach for identifying the baseline for project activities which involve the retrofit or replacement of existing grid-connected renewable power plant/unit(s) at the project site. The project activity is a new renewable power plant; therefore the step-wise approach is not applicable.

The "Tool for the demonstration and assessment of additionality" requires the consideration of EB guidance on national/local/sectoral policies in the calculation of financial indicators utilised for the assessment of additionality. EB22, Annex 3, specifies that national policies or regulations that give comparative advantage to less emissions-intensive technologies (E- policies) may be excluded if the national policy or regulation was implemented after 11 November 2001. Wind power projects are eligible to receive an adder tariff in accordance with the National Energy Policy Council (NEPC) policy

for 'adder payments' which was approved by the NEPC in the third resolution of its 106th meeting (3/2006) on 4 September 2006[5]. The Thailand adder tariff is specifically for renewable energy projects which are less carbon intensive than conventional sources of electricity and the tariff can be fully attributed to policy changes at the national level. As such, the adder tariff can be excluded.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Demonstration of Prior consideration of CDM.

In accordance with the guidelines for the demonstration and assessment of prior consideration of CDM, notification was sent to the UNFCCC and Host Country DNA within 6 months of the project start date on 15/08/2011 as per Section C.1.1. The Thai DNA acknowledged receipt of the prior consideration letter on the 25 March 2010 and the UNFCCC secretariat listed receipt of the prior consideration form on the 16 April 2010. The project participants also signed a CER term sheet prior to the project start date with respect to the negotiation of an Emission Reduction Purchase Agreement.

Additionality

In accordance with ACM0002, the additionality of the project shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" v06.0 (EB65 Report, Annex 21). The tool defines a step-wise approach as follows:

1. Identification of alternatives to the project activity;
2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
3. Barriers analysis; and
4. Common practice analysis.

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

The realistic and credible alternatives to the project activity are identified through the following two steps:

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

The project activity involves the provision of electricity to the Thailand National Grid. The project site is a remote rural location which has been identified as suitable for wind power through a wind resource and energy yield assessment. Therefore other types of dedicated power plants including both conventional fossil fuel and renewable power are not considered realistic or credible alternatives for the project site. In accordance with the Tool, the realistic and credible alternative scenarios that deliver similar outputs and services to the project activity are as follows:

E1: The proposed project activity undertaken without being registered as a CDM project activity
E2: Continuation of the current situation whereby electricity delivered to the grid by the project activity would have otherwise have been generated by the operation of grid-connected power plants and by the

[5] http://www.eppo.go.th/nepc/kpc/kpc-106.htm

addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Sub-step 1b. Consistency with mandatory laws and regulation:
All alternative scenarios are in compliance with applicable legal and regulatory requirements; therefore none are eliminated from further analysis.

Step 2. Investment analysis
The investment analysis is conducted to determine whether the proposed project activity is not economically or financially feasible without the revenue from the sale of CERs.

Sub-step 2a. Determine the most appropriate analysis method:
The project activity generates financial benefits other than CDM related income and in accordance with Step 1, there are no other investment options under consideration other than the project activity. Therefore, Option III is the most appropriate analysis method and the benchmark analysis is applied.

Sub-step 2b. Option III. Apply benchmark analysis.
Project IRR is considered an appropriate financial/economic indicator for the project activity. The benchmark to be applied is the weighted average cost of capital (WACC). The WACC benchmark is calculated using public indices for the cost of debt financing and the cost of equity financing. The average cost of debt financing is obtained from the Bank of Thailand website[6] which demonstrates that the average Minimum Lending Rate (MLR) of commercial banks in Thailand was 6.49% over the three years prior to the decision to invest in the project (2008-2010). The average cost of equity financing is obtained from the Stock Exchange of Thailand website[7] which demonstrates that the average Return on Equity (ROE) of electricity generation companies was 16.03% over the three years prior to the decision to invest in the project (2008-2010). The typical Debt:Equity finance structure in the electricity sector for the period of 2008-2010 is 50:50 and is applied which results in a WACC benchmark of 11.26%, as follows:

Parameter	Source	Value
Debt Percentage	Typical debt/equity finance structure	50%
Equity Percentage	Typical debt/equity finance structure	50%
Cost of Debt	Commercial Lending Rate	6.49%
Cost of Equity	ROE of Thai Energy Companies	16.03%
WACC = (debt percentage x cost of debt) + (equity percentage x cost of equity)		
WACC = (0.5 x 6.49) + (0.5 x 16.03) = 11.25679%		

Full details of the calculation and all reference data is provided in the Investment Analysis spreadsheet.

[6] Bank of Thailand http://www.bot.or.th/English/Statistics/FinancialMarkets/InterestRate/Pages/StatInterestRate.aspx
[7] Stock Exchange of Thailand website, http://www.set.or.th

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

The inputs applied to the investment analysis are relevant to the timing of the investment decision made by the Board of Directors on 26/07/2011. A summary of the inputs to the investment analysis are provided in the analysis spreadsheet.

In accordance with the relevant EB guidance on investment analysis, the assessment period of the financial analysis reflects the period of operation of the underlying project. The IRR is calculated before tax. Taxation has not been included as an expense in the IRR calculations and as such the WACC benchmark has not been adjusted for tax. Depreciation has not been deducted for the purpose of calculating the project IRR. All input values to the project IRR are taken at the time of investment decision.

Electricity Capacity and Electricity Generation

A wind survey and modelling was completed by an international consultancy company with expertise in wind energy development. The modelling produced a wind turbine layout consisting of 45 Siemens SWT 101 2.3MW turbines having a combined capacity of 103.5MW (45 x 2.3), an expected power generation of 232,500 MWh.

Electricity Tariff

The project will sell electricity to EGAT through a Power Purchase Agreement[8] for Non-firm Small Power Producers (SPP). According to the announcement from EGAT on 18 April 2007[9], the tariff for Non-firm SPP renewable energy projects consists of two components[10]: (1) the Time of Use (TOU) tariff (EP) which is based on the rate that EGAT sells power to the Provincial Electricity Authority (PEA) and Metropolitan Electricity Authority (MEA); and (2) the average Ft wholesale price calculated by the National Energy Policy Council. The EP TOU tariff is fixed at 2.9278 Baht/kWh for on-peak and 1.1154 Baht/kWh off-peak . Escalation of the tariff is addressed through the Ft rate and since January 2009, the Ft wholesale rate has been published by EGAT[11] and was 0.949 Baht/kWh on 12/07/2011. As detailed in the PIM, an escalation rate of 5% has been applied to the Ft rate and this is considered extremely conservative because the actual increase in the Ft rate[11] in 2010 was only 0.04%.

[8] PPA

[9] EGAT website: http://www.ppa.egat.co.th/Sppx/spp_50/tar_%20non-firm.pdf

[10] Wind power projects are also eligible to receive an adder tariff of in accordance with the National Energy Policy Council (NEPC) policy for 'adder payments' which was approved by the NEPC in the third resolution of its 106th meeting (3/2006) on 4 September 2006 (http://www.eppo.go.th/nepc/kpc/kpc-106.htm). In accordance with relevant CDM guidance (EB22 Annex 3) and the "Tool for the demonstration and assessment of additionality", the guidance on national and sectoral policies must be applied in the determination and assessment of input values to the investment analysis. National policies or regulations that give comparative advantage to less emissions-intensive technologies (E- policies) may be excluded if the national policy or regulation was implemented since 11 November 2001. The Thailand adder tariff is a national policy that was implemented by the National Energy Policy Council. The tariff is specifically for renewable energy projects which are less carbon intensive than conventional sources of electricity and the tariff can be fully attributed to policy changes at the national level. As such, the adder tariff can be excluded from the additionality assessment.

[11] EGAT website: EGAT website: http://www.ppa.egat.co.th/Sppx/

Investment Cost and Operation and Maintenance Costs
The Kaisakorn Bank Preliminary Information Memorandum (PIM) July 2010 for the project includes the total cost for the project. These costs have been amended applying the latest price structure of project contracts available at the time of investment decision. Excluding pre-feasibility study, pre-operating expenses, financing fees and cost of financing expenditures the total investment cost is THB 6,279 $x10^6$. The same report summarises the O&M costs as THB 152. 2 $x10^6$.

Operational Lifetime and Remaining Value of Equipment
The specified design lifetime of the turbine is 20 years[12]. However, as a conservative assumption the period of assessment in the financial analysis is 23 years under the assumption that the turbine lifetime can be extended. This substantially increases the project IRR due to the addition of 3 years of revenue. Accordingly, the remaining value of assets is equal to zero because the 23 years of operation exceeds the 20 year technical lifetime of the equipment.

Conversion Rates, Escalation Rates
The conversion rate for THB to Euro was based on 3 year historical average obtained from the Bank of Thailand[13]. The escalation rate is based on 3 year historical average CPI for the 3 calendar years prior to investment decision for the project[14].

Project IRR
The project IRR calculated using the above range of assumption is 7.32%, which is less than the WACC benchmark of 11.26% and therefore the project is additional.

Sub-step 2d. Sensitivity analysis:
The sensitivity analysis is performed to demonstrate that the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. Only variable that constitute more than 20% of either the total project costs or total project revenues should be subjected to reasonable variations and the variations are completed in the range of +10% and -10%. The relevant variables identified are: Total Construction Costs, Total Electricity Revenues and Total Maintenance and Operations Costs, as summarised in Table B.5.a.

% Change in Cash Flow	-10%	0%	10%
Operating & Maintenance Costs	7.66%	7.32%	
Construction Costs	8.49%	7.32%	
Electricity Revenues		7.32%	8.70%
Total On-Peak and Off-Peak Base Tariff		7.32%	8.06%
Ft Tariff		7.32%	7.99%

Table B.5.a – Sensitivity Analysis of the IRR without CDM

The table demonstrates that the IRR is robust to changes in all relevant variables because all changes do not bring the IRR to pass the benchmark of 11.26% summarised as follows:

[12] Turbine Supply Agreement, Schedule D, 18 March 2010
[13] http://www.bot.or.th/English/Statistics/FinancialMarkets/ExchangeRate/Pages/StatExchangeRate_old.aspx#
[14] World Bank Historical CPI http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG

- A reduction or increase in Total Construction Costs by 10% does not cause the IRR to pass the benchmark. Therefore, the IRR is robust to changes in the Total Construction Costs.
- An increase or decrease in Total Electricity Revenues by 10% (which could be achieved by either a 10% increase in overall tariff or a 10% increase in net electricity sold to the grid) does not cause the IRR to pass the benchmark. Therefore, the IRR is robust to changes in the Total Electricity Revenues.
- An increase or decrease in the Total On-Peak and Off-Peak Base Electricity Tariff by 10% does not cause the IRR to pass the benchmark. Therefore, the IRR is robust to changes in the On-Peak Base Electricity Tariff.
- An increase or decrease in the Ft Tariff by 10% does not cause the IRR to pass the benchmark. Therefore, the IRR is robust to changes in the Ft Tariff.
- A reduction or increase in Total Maintenance and Operations Costs by 10% does not cause the IRR to pass the benchmark. Therefore, the IRR is robust to changes in the Total Construction Costs.

Therefore the outcome of the sensitivity analysis indicates that the proposed CDM project activity is unlikely to be financially attractive. Step 3 barrier analysis is an optional step and is not applied for this case.

Step 4 – Common Practice Analysis

As per paragraph 6 of tool for "Demonstration and assessment of additionality" the project is a measure (b) where a switch of technology with a change of energy source. Therefore the steps outlined in paragraph 47 are outlined below, and the full spreadsheet with the Common Practice analysis is provided to the DOE:

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

The project output (good or service) is electricity generated for the Thailand grid. In accordance with step 1 of paragraph 47, the total design capacity is equal to 103.5 MW. Therefore +/-50% of the design capacity range is 51.75 MW - 155.25 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. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step:

The geographical area is defined as Thailand; and at the time of project starting date 15/08/2011, there were no operating power plant within the capacity range had been registered under CDM. There were 25 power plants within the capacity range[15].

$$N_{all} = 25.$$

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

None of the power plants identified in Step 2 are wind power plants.

$$N_{diff} = 25.$$

[15] Information on for all projects are sourced from EGAT (Electricity Generating Authority of Thailand) http://www.egat.co.th/index.php?option=com_content&view=article&id=484&Itemid=787 and EPPO (Energy Policy and Planning Office, Ministry of Energy) http://www.eppo.go.th/power/data/index.html selected for projects within the range and excluding CDM projects Registered or under Validation

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

$$F = 0$$
$$N_{all}-N_{diff} = 0$$

As F is less than 0.2 and $N_{all} - N_{diff}$ is less than 3, the proposed project activity is not "common practice" and therefore the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

The methodology ACM0002 is applicable to grid-connected renewable power generation project activities including hydro, wind, geothermal, solar, wave and tidal power. Some project activities such as hydro and geothermal projects may involve project emissions that should be accounted for 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)

$PE_{FF,y}$ is required to be calculated for geothermal and solar thermal projects which also use fossil fuel for electricity generation. The project activity is not a geothermal or solar thermal project therefore this emissions source is not relevant.

$PE_{GP,y}$ is required to be calculated for geothermal project activities where fugitive emissions of carbon dioxide and methane occur due to release of non-condensable gases from produced steam. The project activity is not a geothermal or solar thermal project therefore this emissions source is not relevant.

$PE_{HP,y}$ is required to be calculated for hydro power projects that result in new reservoirs and projects that result in increase of existing reservoirs. The project activity is not a hydro project therefore this emissions source is not relevant.

As such, there are no project emissions for the wind power project and $PE_y = 0$.

Baseline Emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

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" (tCO_2/MWh)

In accordance with the *Tool to calculate the emission factor for an electricity system*, *version 2.2.1 (EB63 Annex 19)* the emissions factor $EF_{grid,CM,y}$ can be calculated using either an *ex ante* option at the validation stage or *ex post* for the year in which the project activity displaces electricity. The *ex ante* option is chosen and the combined margin published by the DNA of Thailand for years 2007, 2008, 2009 will be used to calculate emission reductions throughout the first crediting period. A description of the data used to calculate the combined margin is provided in Annex 3 and the step-wise approach used by the DNA of Thailand to calculate the emissions factor of the electricity system is described as follows:

STEP 1: Identify the relevant electricity systems
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) emissions factor

<u>STEP 1: Identify the relevant electricity systems</u>

For the purpose of determining the electricity emission factor, the project electricity system is defined as the electricity transmission system of Thailand which is a single system connected by transmission lines throughout the country[16] and owned by the Electricity Generating Authority of Thailand (EGAT). Electricity imports from a connected electricity system are included and as per EB 63 Annex 19 page 4, for the purpose of determining the operating margin emission factor, $0tCO_2$/MWh is applied.

<u>STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)</u>

The inclusion of off-grid power plants is an optional step. For the purpose of the Thailand grid, Option I is applied[16] and only grid power plants are included in the calculation.

<u>STEP 3: Select a method to determine the operating margin (OM)</u>

The calculation of the operating margin emission factor (EFgrid,OM,y) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

[16] The study of emission factor for an electricity system in Thailand 2009, DNA of Thailand, page 2

(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The simple OM method (Option a) can be used if low-cost/must-run resources (LC/MR) constitute less than 50% of total grid generation in the average of the five most recent years. Annex 3 Table Anx3.f: outlines that LC/MR in Thailand is less than 10% and therefore option (a) Simple OM will be applied. The simple OM is calculated using the ex ante option for data vintages.

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

The simple OM emission factor for Option B 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 as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_y}$$

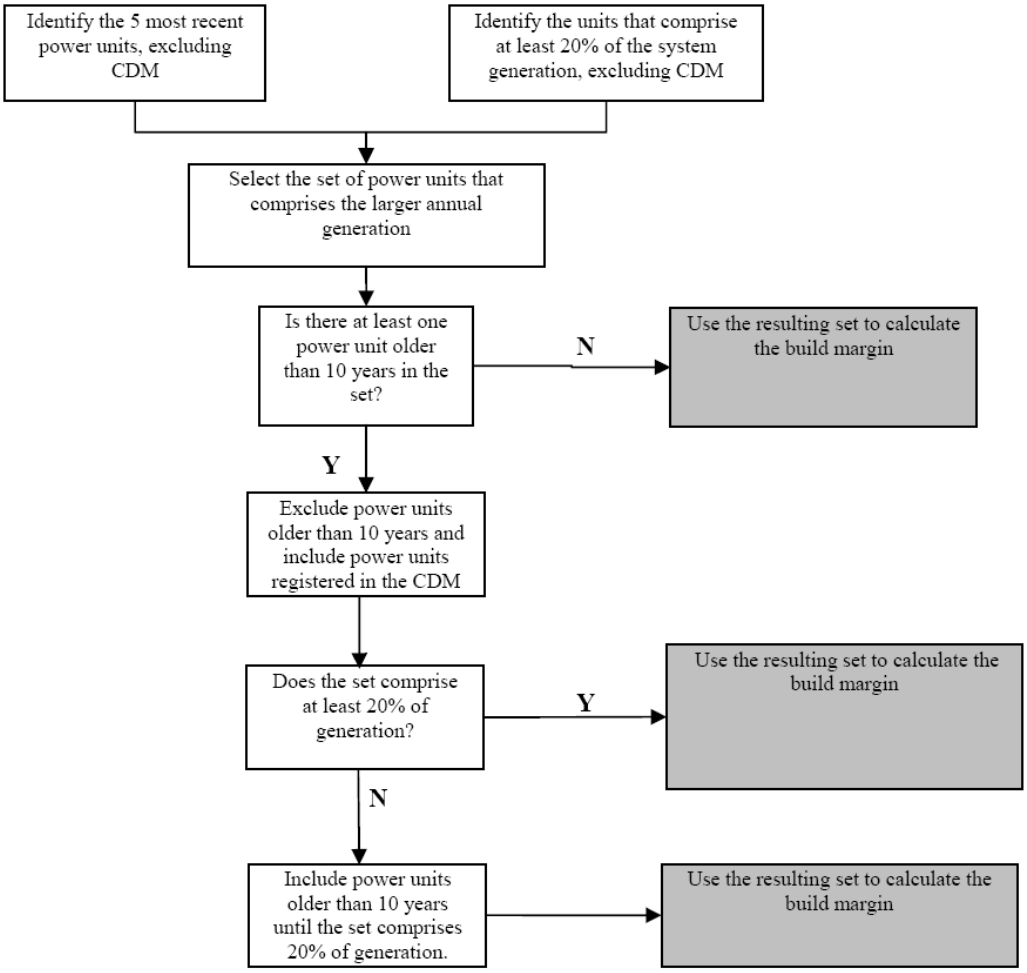
where,

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$ = Net calorific value 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_2y/GJ)
EG_y = Net electricity generated & delivered to the grid by all power units serving the system, not including LC/MR 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 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)

Option B may be applied because:
(a) the net electricity generation and CO2 emission factor of each power unit is not available; and
(b) only renewable power generation was considered as LC/MR and the quantity of electricity supplied to the grid by these sources is available and
(c) off-grid power plants are not included in the calculation (i.e. Option I of Step 2 was chosen).

STEP 5: Calculate the build margin (BM) emission factor

The build margin emission factor is calculated ex-ante for the first crediting period as per Option 1. The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of a sample group of power units, during the most recent year *y* for which power generation data is available. The Sample group of power units *m* used to calculate the build margin should be determined via the procedure summarised in the diagram of the Tool:



Following this procedure, $AEG_{SET\ >/20\%}$ is larger than $AEG_{SET\ 5\text{-units}}$ and all of these power units started supplying electricity to the grid less than 10 years ago, therefore $AEG_{SET\ >/20\%}$ is applied as power units *m* for the Build Margin. The details for these power units are included in Annex 3.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) is calculated as follows:

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

Where the CO_2 emissions factor of each power unit is calculated as per the simple OM emission factor method Option A2 (as only data on electricity generation and the used fuel types is available), and the other terms are as follows:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant/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 = The most recent historical year for which power generation data is available

STEP 6: Calculate the combined margin (CM) emissions factor
The combined margin emissions factor is calculated as follows:

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

where:
$EF_{grid,BM,y}$ = Build margin CO_2 emissions factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emissions factor in year y (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

For wind power project, the default values for weightings are: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and subsequent crediting periods.

Full details of the calculation of the above Steps 1-6 are outlined in the excel sheet provided with this PDD. The resulting calculation of the combined margin is as follows:

$EF_{grid,CM,y}$ = 0.615 x 0.75 + 0.548 x 0.25
= 0.598 tCO_2/MWh

The calculation of $EG_{PJ,y}$ is defined for: (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions. If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

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

Where:
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

Leakage
No leakage emissions are considered. The potential sources 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
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_2/yr)
PE_y = Project emissions in year *y* (t CO_2e/yr)

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

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	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 version 2.2.1
Source of data used:	Thailand Greenhouse Gas Management Organisation (TGO), the Designated National Authority (DNA) of Thailand for 2009.
Value applied:	0.5980
Justification of the choice of data or description of measurement methods and procedures actually applied :	The combined margin CO_2 emission factor for the Thailand grid is published by the DNA of Thailand.
Any comment:	-

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system version 2.2.1"
Source of data used:	Thailand Greenhouse Gas Management Organisation (TGO), the Designated National Authority (DNA) of Thailand for 2009
Value applied:	0.548
Justification of the choice of data or description of measurement methods and procedures actually applied :	The combined margin CO_2 emission factor for the Thailand grid is published by the DNA of Thailand.
Any comment:	-

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system version 2.2.1"
Source of data used:	Thailand Greenhouse Gas Management Organisation (TGO), the Designated National Authority (DNA) of Thailand for 2009
Value applied:	0.615
Justification of the choice of data or description of	The combined margin CO_2 emission factor for the Thailand grid is published by the DNA of Thailand.

measurement methods and procedures actually applied :	
Any comment:	-

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

Emissions Reductions

The methodology ACM0002 states that leakage emissions are not required to be considered, therefore the emission reductions are calculated as:

$ER_y = BE_y - PE_y$

$ER_y = 139{,}035 - 0 = 139{,}035\ tCO_2e$

Parameter	Description of Value Applied	Value	Units
BE_y	Calculated as per ACM0002 and shown below	139,035	tCO_2e
PE_y	In accordance with equation (1) of ACM0002 the project emissions for wind power projects is zero.	0	tCO_2e
ER_y	Calculated as $BE_y - PE_y$	139,035	tCO_2e

Baseline Emissions

The total baseline emissions from existing grid connected power plants are calculated as:

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

$BE_y = 232{,}500 \times 0.598 = 139{,}035\ tCO_2e$

Parameter	Description of Value Applied	Value	Units
$EG_{PJ,y}$	Wind Farm Energy Yield Analysis Report	232,500	MWh
$EF_{grid,CM,y}$	Published by the Thailand Greenhouse Gas Management Organisation (TGO), the DNA of Thailand.	0.598	tCO_2/MWh
BE_y	Calculated as $EG_{PJ,y} \times EF_{grid,CM,y}$	139,035	tCO_2e

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

Year	Baseline Emissions (tCO_2)	Project Emissions (tCO_2)	Leakage (tCO_2)	Emission Reductions (tCO_2)
2012†	11,808	0	0	11,808
2013	139,035	0	0	139,035
2014	139,035	0	0	139,035
2015	139,035	0	0	139,035
2016	139,035	0	0	139,035
2017	139,035	0	0	139,035
2018	139,035	0	0	139,035
2019	127,227	0	0	127,227
Total	**973,245**	**0**	**0**	**973,245**

† The first crediting year of the crediting period commences on 01/12/2012

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year *y*
Source of data to be used:	Monitored at the project activity site with electricity meters and calculated by subtracting imported electricity from exported electricity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	232,500 MWh
Description of measurement methods and procedures to be applied:	The net electricity will be measured with bi-directional electricity meters recording both the amount of electricity exported and imported to/from the grid by the project plant. A backup bi-directional meter will be installed and used to measure electricity exports and imports if the primary meter fails. Electricity will be measured continuously and recorded monthly. A separate grid connection may be installed to enable backup electricity to be imported from the PEA. A backup meter will not be installed on the import line. If the primary import meter on this backup electricity line fails, the data for that month will be replaced with data from the month with the highest electricity consumption recorded during the monitoring period. Net electricity will be calculated by subtracting total imported electricity from total exported electricity.
QA/QC procedures to be applied:	Measurement results will be cross checked with records for sold electricity. In accordance with the PPA regarding the export meter, the error specified by the meter manufacturer will not exceed +/- 0.2%[17]. In case of meter failure, and a replacement export meter is required, it may be installed and the error specified by the meter manufacturer will not exceed +/- 0.2%. If a backup electricity supply is installed by the PEA then an import meter will be installed on the backup supply line. The error specified by the meter manufacturer will not exceed +/- 0.5%. The PPA specifies that the meters shall be calibrated once during each calendar year (the maximum time between two calibration events is 24 months). The backup line electricity meter will also be calibrated once per calendar year.
Any comment:	-

[17] Power Purchase Agreement

B.7.2. Description of the monitoring plan:

Details of Data to be Monitored

The emission reductions achieved by the project will be monitored and calculated in accordance with the methodology ACM0002. The methodology defines the equations and monitoring parameters for calculating emission reductions. On-site data collection will involve metering the net electricity supplied by the project activity to the grid. Any auxiliary consumption imported to the West Huaybong 3 facilities from the grid will be metered to enable net electricity to be calculated.

Monitoring Procedure

Electricity exported to the grid will be monitored continuously with the bi-directional electricity meters of the power authority. In case any electricity is imported into the project facilities for auxiliary consumption (during plant shut down), this electricity will also be monitored continuously with the bi-directional meter of the power authority. In case a back-up line is brought to the site, this will also be monitored for auxiliary consumption. Monthly records will be used to calculate the net electricity generation supplied by the project plant to the grid. Net electricity will be calculated as follows:

$$EG_{facility,y} = EG_{facility,export,y} - EG_{facility,auxilary,y} - EG_{backupline,auxilary,y}$$

If no auxiliary electricity is imported to the project facilities then the auxiliary power consumption ($EG_{facility,auxilary,y}$) will be equal to zero.

Data Management

Monthly meter readings will be conducted by the power authority. After receiving the receipt of power sales from the power authority, the meter data will be input into an electronic data file. West Huaybong 3 operations personnel will check the data file for consistency and completeness. At the end of the monitoring period, the entire data file will be printed and reviewed by the Responsible Manager. An electronic copy of the data file will be backed up in the West Huaybong 3 head office at least once per month.

All data collected as part of the monitoring process will be retained for at least two years after the end of the crediting period during which the data was recorded.

Quality Assurance

The following quality assurance measures will be taken relating to the monitoring equipment and its installation and operation:

- Prior to operation, the Responsible Manager will validate that the monitoring equipment is calibrated according to the appropriate standards.
- All monitoring equipment will be located in secure locations to prevent accidental damage
- Routine calibration of all monitoring equipment will be performed to ensure that the data remains accurate.

To ensure the quality of the recorded data, all relevant personnel will be trained in accordance with this monitoring plan.

Quality Control Procedures

To ensure malfunction is identified promptly, the operations personnel will check the data records and report any data outages or inconsistencies in the data to the Responsible Manager. Any equipment faults or loss of data will be recorded in an operational log with details of the fault and length of time over which data was affected. All meter data will be checked against the official receipts.

In accordance with the PPA, the error specified by the manufacturer of the export meter will not exceed +/-0.2%. In case of meter failure, replacement export meters may be installed and the error specified by the meter manufacturer will not exceed +/-0.2%. The meters will be calibrated once during each calendar year (the maximum time between two calibration events is 24 months).

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

Application of the baseline study and monitoring methodology was performed by Carbon Bridge. Carbon Bridge is not a project participant.

Date of completion of the baseline study and the monitoring methodology: 04/10/2011.
Responsible Entity: Carbon Bridge Pte Ltd
Responsible Person: Paul Corletto

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:

15/08/2011 (Date the company issued the Notice to Proceed to the turbine suppler Siemens Wind Power A/S)

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

23 years and 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:

01/12/2012

C.2.1.2. Length of the first crediting period:

7 years and 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

In accordance with the Ministry of Natural Resources and Environment "Notification on type and size of project or enterprise that must report an environmental impact assessment" dated 16 June 2009 and published in the Government Gazette dated 31 August 2009; wind farms are not designated as a project type required to complete an Environmental Impact Assessment (EIA). All CDM projects which are not specifically required to perform an EIA must complete and submit Initial Environmental Evaluation (IEE) to the TGO. The IEE has been completed and will be submitted to the TGO in accordance with the CDM approval procedures for Thailand.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The IEE report concludes that the environmental impacts are not considered to be significant, except for the following impacts:

Impact	Level of Impact	Preventive and Mitigation Measure
1. Air quality - dust	Medium to high	- Avoid transportation route passing the community. - Cover dump truck during transportation. - Dampening the ground with water spray to decrease dust creation, twice a day. - Covered disrupted earth with material that can protect dispersion of the soil. - Plant cover around the turbines.
2. Noise and vibration - noise impact on the community	Medium to high	- Minimize construction period - Limit construction to 8.00 - 16.00 where possible - Project shall install equipment/technology to ensure noise levels are within acceptable limits. - The wind farm design employs curtailment of turbines to ensure noise limits are not exceeded
3. Terrestrial ecology - noise impact to wild life	Medium	- Project shall install equipment/technology to ensure noise levels are within acceptable limits. - The wind farm design employs curtailment of turbines to ensure noise limits are not exceeded

SECTION E. Stakeholders' comments

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

A stakeholder consultation meeting was held on 15/09/2011 at Sima Thani Hotel to enable local stakeholders to comment on the project. Invitation letters were sent directly to the sub-district administrative organization who directly invited the relevant stakeholders to the consultation meeting. A wide range of stakeholders were invited from Dan khun Thot district, Huay Bong sub-district and Thepharak district, Nong Wang sub-district. Stakeholders who were directly invited include: representatives from relevant government offices, teachers from the local school and villager leaders. Public invitation notifications were also posted at Huaybong sub-district and Nong Wang sub-district administration offices. In accordance with local customs, the village leaders were engaged to ensure that all local landowners were aware of the consultation meeting. During the meeting there were a total of 125 participants from all sectors listed above.

E.2. Summary of the comments received:

During the consultation local stakeholders were given an opportunity to ask questions and give comment on the project. Relevant stakeholder comments are summarised as follows:

- Can we watch during installation of the turbine?
- Please construct the road #3165 as soon as possible.
- How much experience of wind farms does the company has?
- Regarding long term impact, what will happen after the project lifetime is finished?
- The project should start community development plan at the same time of the project implementation and should not wait until the project is operating and receiving income.
- Teacher and students in the project area should be provided with more knowledge about wind energy than others.
- Will there be impact from vibration of the turbines, will there be any impact on cassava plantation? Can we still do agriculture (on ALRO land) and plant trees in the reforestation projects (on reserved forest land)?
- Apart from noise impact will there be impact on ecology, especially pollination?
- Some of the electricity posts block the entrance of some house.
- Can you please confirm how much money the community will receive from the community development fund?
- (*We*) would like company to confirm that there is no impact to villagers.

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

The project developer provided answers to each question/comment during the meeting as per the details below. Stakeholders were also re-informed about the company's public relation co-ordinator, who they can speak to regarding further questions or complaints.

Summary of explanation for questions and comments in E.2 are:

- Communities can watch the turbine installation at a safety distance after requesting permission.
- The project will start the road (#3165) construction within a few weeks.
- The company CEO and staff have appropriate experience in developing wind farms.
- It will depend on future government policy and ALRO policy as to whether the contracts can be renewed. Regards noise impact, Gerrad Hassan and SECOT were hired as international and local consultant to assist with the calculation of the impact and we will follow their recommendations to minimize the impact. We are confident that the impact will be minor.
- At the moment we are drafting a corporate social responsibility (CSR) plan.
- We are happy to receive suggestions regarding knowledge transfer to the local schools and community about wind energy.
- The project does not object to tree plantation. The project installs turbines on ALRO land, not in the reserved forest. At the moment there are many cases of forest encroachment from farming which is unrelated to the wind project.
- Apart from noise impact there is no significant impact on ecology. This is according to IEE which we will submit to community leaders.
- The electricity posts belong to Provincial Electricity Authority (PEA).
- We expect that the community fund will be 200,000 Baht/MW for the first year.
- To confirm how the impacts will be mitigated we will provide a copy of the IEE to community leaders.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This page was intentionally left blank, the project does not make use of public funding.

Annex 3

BASELINE INFORMATION

The data used by the DNA of Thailand to calculate the Thailand grid emissions factor is provided in the document 'The study of emission factor for an electricity system in Thailand 2009" and summarised below.

Fuel type [A]	Unit	Net Calorific Value [1] (MJ/Unit)	CO_2 Emission [2] (tCO_2/TJ)	CO_2 Emission ($kgCO_2$/Unit)
Natural Gas	scf.	1.02	54.30	0.0554
Lignite	ton	10,470.00	90.90	951.7230
Bituminous	ton	26,370.00	89.50	2,360.1150
Bunker	liter	39.77	75.50	3.0026
Diesel	liter	36.42	72.60	2.6441

[1] Electric Power in Thailand 2008/ Department of Alternative Energy Development and Efficiency, Ministry of Energy

[2] IPCC default values at the lower limit as provide in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Table Anx3.a: Net calorific Value and CO_2 emissions factor of fuels

Generation System	Grid Generation (GWh)				
	EGAT	IPP	SPP	Total	%
2552					
Summary	66,488.10	64,840.72	13,971.37	145,300.19	100.00
Non LC/MR	59,541.66	64,840.72	11,811.42	136,193.80	93.73
LC/MR [5]	6,946.44	–	2,159.95	9,106.39	6.27
Thermal	23,463.69	12,388.03	2,225.63	38,077.35	
Combined-Cycle	33,164.46	52,452.69	8,752.19	94,369.35	
Gas Turbine	309.63	–	833.60	1,143.23	
Diesel Engine	1.44	–	–	1.44	
Hydropower	6,941.74	–	23.97	6,965.71	
Renewable Energy	4.70	–	2,135.98	2,140.68	
Electricity Import	2,602.43	–	–	2,602.43	
2551					
Summary	63,719.02	67,420.14	14,092.83	145,232.00	100.00
Non LC/MR	56,791.19	67,420.14	11,904.81	136,116.14	93.72
LC/MR	6,927.83	–	2,188.03	9,115.86	6.28
Thermal	26,778.89	14,398.34	1,996.83	43,174.06	
Combined-Cycle	26,449.20	53,021.80	9,029.90	88,500.90	
Gas Turbine	659.33	–	878.07	1,537.41	
Diesel Engine	2.30	–	–	2.30	
Hydropower	6,926.02	–	28.77	6,954.79	
Renewable Energy	1.81	–	2,159.26	2,161.07	
Electricity Import	2,901.47	–	–	2,901.47	
2550					
Summary	67,704.95	62,233.44	14,426.00	144,364.39	100.00
Non LC/MR	59,765.33	62,233.44	11,982.99	133,981.76	92.81
LC/MR	7,939.62	–	2,443.02	10,382.64	7.19
Thermal	30,265.00	17,453.59	2,168.76	49,887.35	
Combined-Cycle	24,124.09	44,779.85	8,935.60	77,839.54	
Gas Turbine	884.20	–	878.63	1,762.83	
Diesel Engine	1.17	–	–	1.17	
Hydropower	7,937.20	–	21.70	7,958.90	
Renewable Energy	2.42	–	2,421.32	2,423.73	
Electricity Import	4,490.87	–	–	4,490.87	

[4] Electricity report 2007 – 2009/ Electricity Generating Authority of Thailand

Table Anx3.b: Electricity delivered to the Thailand Grid

Fuel type	Unit	Fuel Consumption			
		EGAT	IPP	SPP	Total
2552					
Natural Gas	scf.	369,146,214,392	459,228,417,361	140,550,086,056	968,924,717,809
Lignite	ton	15,818,265	—	—	15,818,265
Bituminous	ton	—	3,645,721	1,840,527	5,486,248
Bunker	liter	111,039,065	38,180,874	8,797,506	158,017,445
Diesel	liter	12,140,891	—	1,685,046	13,825,937
2551					
Natural Gas	scf.	340,739,529,461	490,866,999,785	145,410,364,035	977,016,893,281
Lignite	ton	16,407,465	—	—	16,407,465
Bituminous	ton	—	3,711,791	1,866,776	5,578,567
Bunker	liter	247,441,682	93,212,260	9,555,452	350,209,394
Diesel	liter	6,792,039	43,698,832	1,451,087	51,941,958
2550					
Natural Gas	scf.	342,335,310,261	454,590,745,280	145,512,075,117	942,438,130,658
Lignite	ton	16,060,766	—	—	16,060,766
Bituminous	ton	—	3,692,979	1,889,868	5,582,847
Bunker	liter	785,979,152	144,198,973	6,042,880	936,221,005
Diesel	liter	7,381,996	2,688,851	1,266,337	11,337,184

[6] Electricity report 2007 – 2009/ Electricity Generating Authority of Thailand

Table Anx3.c: Fossil Fuel Consumption of Power Plants in the Thailand Grid

Power Unit	Grid Generation [7] (GWh)	COD
1. Bangpakong Power Plant (Unit 05)	1,918.11	16-Sep-09
2. South Bangkok Power Plant (Unit 03)	4,745.32	1-Mar-09
3. Chana Power Plant (Unit 01)	4,150.26	15-Jul-08
4. Ratchaburi Power Company Limited (RPCL) (Unit 1&2)	8,153.26	1-Jul-08
5. Gulf Power Generation Co., Ltd. (Unit 1&2)	9,338.68	1-Mar-08
6. BLCP Power Co., Ltd. (Unit 1&2)	10,018.13	1-Feb-07
Summary	38,323.76	
Percentage as of 2009 Grid Generation (145,300.19 GWh)	26.38	

[7] Electricity report 2009/ Electricity Generating Authority of Thailand

Table Anx3.d: Electricity Generation of SET_{sample}

Fuel type	Fuel Consumption		CO_2 Emission ($kgCO_2$/Unit)	CO_2 Emission (tCO_2)
	Unit	Volume		
Total				20,991,690
Natural Gas	scf.	223,467,679,056	0.0554	12,376,981
Lignite	ton	—	951.7230	—
Bituminous	ton	3,645,721	2,360.1150	8,604,321
Bunker	liter	—	3.0026	—
Diesel	liter	3,929,038	2.6441	10,389

[8] Electricity report 2009/ Electricity Generating Authority of Thailand

Table Anx3.e: Fuel Consumption of SET_{sample}

	2009	2008	2007	2006	2005
	Total	Total	Total	Total	Total
Total	145,300.19	145,232.00	144,364.39	139,421.94	132,212.00
Non LC/MR	136,193.80	136,116.14	133,981.76	129,460.82	124,830.70
LC/MR	9,106.39	9,115.86	10,382.64	9,961.12	7,381.30
Thermal Energy	**38,077.35**	**43,174.06**	**49,887.35**	**48,303.51**	**43,425.49**
Cogeneration	**94,369.35**	**88,500.90**	**77,839.54**	**73,992.43**	**74,907.19**
Gas Turbines	**1,143.23**	**1,537.41**	**1,762.83**	**2,000.16**	**2,119.86**
Diesel	**1.44**	**2.30**	**1.17**	**1.20**	**2.01**
Hydropower	**6,965.71**	**6,954.79**	**7,958.90**	**7,971.38**	**5,666.15**
Renewable Energy	**2,140.68**	**2,161.07**	**2,423.73**	**1,989.74**	**1,715.15**
Import	**2,602.43**	**2,901.47**	**4,490.87**	**5,163.53**	**4,376.14**
%LC/MR	6.27	6.28	7.19	7.14	5.58

Electricity Statistic Annual report 2005 – 2009/ Electricity Generating Authority of Thailand

Table Anx3.f: Ratio of Low Cost/Must Run (for 2005-2009) (source Electricity Statistic Annual Report 2005-2009/ Electricity Generating Authority of Thailand)

Annex 4

MONITORING INFORMATION

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