Project design document form for CDM project activities

(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	InfraVest Changbin and Taichung bundled Wind Farms Project – Taiwan
Version number of the PDD	Version 01.0
Completion date of the PDD	26/11/2014
Project participant(s)	South Pole Carbon Asset Management Ltd. (private entity) InfraVest Wind Power Group (private entity)
Host Party	Taiwan
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope 1: Energy industries (Renewable source) ACM0002 (Version15.0)
Estimated amount of annual average GHG emission reductions	328,543 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>
The project is a bundle of two wind energy projects, InfraVest Changbin Wind Farm and InfraVest Taichung Wind Farm. It shall not be debundled into separate projects in the future.

The project involves the development of two wind farms in Taiwan:

- a 96.6 MW onshore wind farm located in Lugang, Siansi and Shengang townships, Changhua County (called hereafter: Changbin wind farm)
- a 46 MW onshore wind farm in Tachia and Tann, Taichung County (called hereafter: Taichung wind farm)

The two wind farms are constructed and operated by InfraVest Wind Power Group (hereafter InfraVest) which is a subsidiary of Germany based VWind AG. The project comprises 42 (for Chaingbin wind farm) plus 20 (for Taichung wind farm) Enercon E70 wind turbines, each having a capacity of 2.3 MW. At full capacity, the aggregated output of the project is expected to be of 483,864 MWh/year, which is delivered to the state-owned power grid, Taipower grid (TPG). Accordingly, the project leads to carbon dioxide emission reduction since it avoids the use of fossil fuel in the electricity generating system. The annual emission reductions are estimated as 328,543 tCO2e/year, and the total emission reductions for this second crediting period of 7 years are estimated as 2,299,801 tCO2e.

Prior to implementation of the project, electricity demand in local society is supplied by the TPG dominated by the thermal power. The baseline scenario to the project activity is the same as the scenario existing prior to the start of implementation of the project activity. The project activity is to produce electricity with clean and renewable wind sources and to displace part of the electricity from fossil fuel-fired power plants connected to the TPG. Thus, greenhouse gas (GHG) emission reductions can be achieved.

Contribution to sustainable development:
The project contributes significantly to the region's sustainable development. The specific goals for the project are to:

- reduce the greenhouse gas emissions in Taiwan by replacing fossil fuel based power generation;
- produce clean and renewable energy that does not contributes to global warming;
- contribute the development of the wind energy sector in Taiwan;
- provide clean electricity to households;
- create local employment both during the construction and operational phases;
- transfer technology and know-how as the employees are trained by German wind turbine manufacturer Enercon on maintenance, safety and operational issues;
- contribute to the reduction of pollutants such as sulphur dioxide, nitrogen oxides and particles resulting from the electricity generation from fossil fuels in Taiwan;
- contribute to Taiwan's energy sustainability and security by reducing the dependency on fossil fuel imports.

A.2. Location of project activity

A.2.1. Host Party

>>
Taiwan

A.2.2. Region/State/Province etc.

>>
Changhua County and Taichung County

A.2.3. City/Town/Community etc.

>>
Lugang, Siansi and Shengang Townships;
Taichia and Taan Townships

A.2.4. Physical/Geographical location

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The locations of the wind farms are in West Taiwan. Changbin wind farm is located at Changbin Industrial Park in Changhua County, close to the Taiwan Strait, and is divided into three zones: Siansi, Lugang and Lun-Wei. Taichung wind farm is situated in Taichia and Taan Townships.

The project activities are distributed in these zones which are at the geographical position of 24˚05'55"N, 120˚25'34"E for the first wind farm and 24˚22'38"N, 120˚38'49"E for the second one.

The locations are depicted in the pictures shown below.

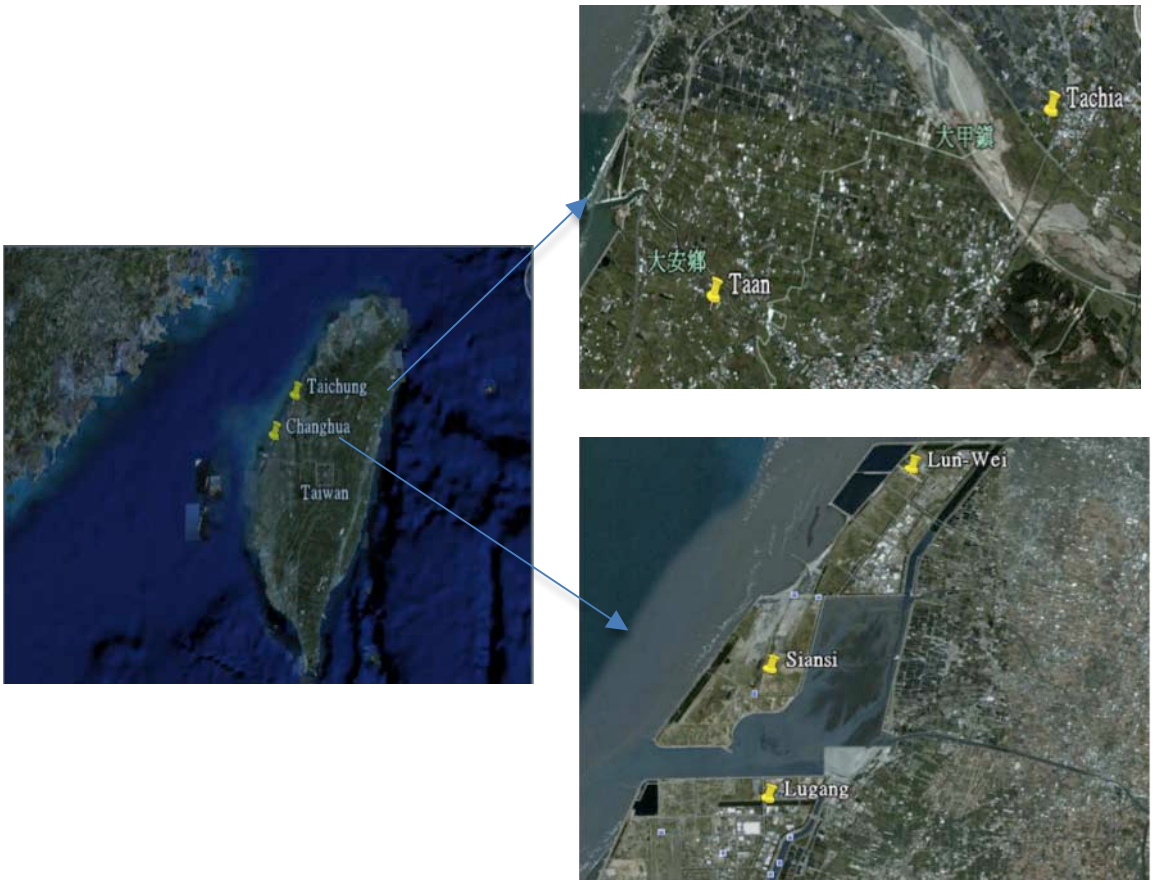

Figure 1 Project location

A.3. Technologies and/or measures

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The project activity is a grid-connected renewable power generation project activity installing new power plants at sites where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant). The project activity generates electricity by utilizing the

renewable wind resources, providing clean electricity, thus does not produce GHG emissions. The scenario prior to the project activity implementation is the same as the baseline scenario defined in section B.4, where the equivalent amount of electricity would have otherwise been generated by power plants connected to the TPG (Taipower Grid), and by the addition of new power sources to TPG. The wind power project activity therefore abates the amount of carbon dioxides (CO_2, please refer to section B.3) that would have been otherwise emitted given the grid composition that comprises mainly fossil fuel based power generation.

The project in total comprises 62 Enercon E-70 wind turbines with the unit capacity of 2.3 MW. The turbines installed are imported from German wind turbine supplier, Enercon. Wind turbines type Enercon E-70 is used, with 71 m diameters and 64 m hub heights.

Changbin wind farm consists of 2 sites: Lugang site and Changbin site. There are 18 wind turbines in Lugang site, which are connected at 22.8 kV level and transformed to the 161 kV distribution grid in Taipower grid's Lugang substation. There are 24 wind turbines in Changbin site, which are connected at 22.8 kV level and transformed to the 161 kV distribution grid in Taipower grid's Changbin substation. Taichung wind farm consists of 20 wind turbines which are connected at 22.8 kV level and transformed to 69 kV grid in Taipower grid's Taichung substation. Each wind farm site utilizes bi-directional watthour meters measuring electricity supplied to Taipower grid.

The technical data of the turbine units of turbine type E-70 is given in the tables below.

Table 1. Characteristics of the wind turbine type E-70

Wind Turbine Type:	E-70		
Site:	Lugang site	Changbin site	Taichung site
Rated Power:	2300 kW		
Number of turbines	18	24	20
Output voltage	400 V		
Rotor diameter:	71 m		
Hub Height:	64 m		
Generator:	Enercon direct-drive synchronous annular generator		
Grid feeding:	ENERCON converter		
Technical lifetime	20 years		

According to the "Tool to determine the remaining lifetime of equipment" (Version 01), option (a) "Use manufacturer's information on the technical lifetime of equipment" is chosen for identifying the technical lifetime of the wind turbines in the project activity.

A.4. Parties and project participants

Party involved (host) indicates 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)
Taiwan (host)	InfraVest Wind Power Group (Private entity)	No
Switzerland	South Pole Carbon Asset Management Ltd. (Private entity)	No
…	…	

A.5. Public funding of project activity

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There is no public funding from Annex I countries involved in the project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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The approved consolidated baseline and monitoring methodology ACM0002 (version 15.0) "Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources – Version 15.0" has been used.

The following tools are applied:

- Tool for the demonstration and assessment of additionality (Version 05.2)[1]
- Tool to calculate the emission factor for an electricity system (Version 04.0)

Details are available at the following website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved

B.2. Applicability of methodology and standardized baseline

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The choice to use the ACM0002 (Version 15.0) methodology is applicable to the project because the project meets its applicability criteria:

- The project activity is a grid-connected renewable energy power generation project activity installing Greenfield power plants (wind power plants) at sites where no renewable power plant was operated prior to the implementation of the project activity (Greenfield wind power plants) (Changbin and Taichung Wind Farms)
- The project activity does not involve switching from fossil fuels to renewable energy source at the site of the project activity, the project is not a biomass fired power plant, or hydro power plant that result in new reservoirs/increase in existing reservoirs

The choice to use the "Tool to calculate the emission factor for an electricity system" (Version 04.0) is applicable to the project because the proposed project activity supplies electricity to the grid and substitutes the grid electricity of which system is not located partially or totally in Annex 1 country.

[1] As for renewal of the crediting period, there is no need to revalidate the additionality part, so the previous version of additionality tool applied in the previous PDD for the first crediting period is still used in this PDD.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1 CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. (Power plants in TPG)	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source. Excluded for simplification. This is conservative.
		N_2O	No	Minor emission source. Excluded for simplification. This is conservative.
Project scenario	Source 1 Emission Sources of Project Activity (the project activity)	CO_2	No	Excluded, as per ACM0002 Version 15.0
		CH_4	No	Excluded, as per ACM0002 Version 15.0
		N_2O	No	Excluded, as per ACM0002 Version 15.0

According to the methodology ACM0002 (Version 15.0), the spatial extent of the project boundary includes project power plant and all power plants connected physically to the electricity system that the project power plant is connected to. Taiwan is an island with a single power grid with no cable connection with the continent. Thus there is no other connected electricity system in Taiwan, besides Taipower Grid (TPG). Therefore, the project boundary is defined as the Changbin and Taichung wind farms and the Taipower grid, and all power plants connected to Taipower grid.

B.4. Establishment and description of baseline scenario

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According to the methodology ACM0002 (Version 15.0), if the project activity is the installation of a Greenfield power plant, 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".*

As Changbin and Taichung wind farms under the bundled project activity are the installation of Greenfield power plants, so the baseline scenario described above is applied for the project activity.

Because the project is connected to TPG, the baseline scenario is estimated ex-ante by using the Combined Margin (CM) calculation, which is the CM of TPG multiplied by the electricity delivered to TPG by the project.

The calculated operating margin emission factor ($EF_{grid,OM,y}$) of Taiwan is 0.704 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.606 tCO_2e/MWh. The defaults weights for wind power are used as specified in the emission factor tool: w_{OM}=0.75; w_{BM}=0.25. Thus the result of the Baseline Emission Factor ($EF_{grid,CM,y}$) calculation is **0.679** tCO_2e/MWh. The calculations are presented in Appendix 4.

B.5. Demonstration of additionality

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Early Consideration

There was no public announcement of the project going ahead without the VER for the proposed project.
VERs were also considered and discussed seriously and comprehensively in an early stage of the feasibility study. The following elements will be disclosed to the DOE upon request during the Validation process:

- InfraVest is familiar with carbon credits and emission reduction projects since the beginning of the CDM. In 2003, they registered one of the first VER projects in China[2]. The Qingdao Huawei Wind power project is a grid connected renewable energy project consisting of 12 wind turbine generators with capacity of 1300 kW and 3 turbines with 250 kW capacity. The total installed capacity is 16.35 MW and the annual amount of VER generated is estimated to be around 20,000 tCO2e per year[3].
- Since its operation in Taiwan in early 2000's, InfraVest has always considered the potential of carbon credits for financing its wind power projects. InfraVest has thus sought actively for carbon consultants. Copies of mail exchange between InfraVest and carbon consultants (which shall remain in private confidentiality) dealing about the VER in Taiwan will be provided to the DOE at validation.
- The income of VER has also been considered since the early stage of the project development of the two wind farms. Copy of board decisions from InfraVest to undertake Changbin and Taichung wind farms as VER projects are presented in Annex *

The following table shows different steps of the project development of Changbin's and Taichung's wind farms, consisting of all milestones and when and how InfraVest considered the VER revenues.

Changbin and Taichung project timeline:

Date	Event	Evidence
2000	InfraVest opens a new office in Taiwan	Business License
December 2011	First consideration of carbon credits for financing renewable energy projects	Email
September 2002	First contact with a CER broker	Email
2003	Qingdao Huawei Wind power is registered as a VER project	
January 5th, 2006	Board decision to undertake the Taichung and Changbin wind farms with carbon credits = "**proof of early consideration**[4]"	Board decision
September 2006	InfraVest approaches a carbon consultant to present its new projects in Taiwan.	Email[5]
September 21st, 2006	Loan from bank, IKB Deutsche and KfW for Changbin phase 1 and 2. = "**project start date**[6]"	Contract
September 22nd, 2006	Turbines for Changbin phase 1 and 2 are contracted	
December 2006	Construction start of Changin phase 1	

[2] The project was registered as a VER project and not as a CDM because the Chinese DNA does not allow foreign companies to develop CDM project in China.

[3] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=393&lat=36%2E456039&lon=120%2E723381&bp=1

[4] As defined in the "GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM", http://cdm.unfccc.int/EB/041/eb41_repan46.pdf

[5] The first email making reference to carbon credits for wind farm in Taiwan is dated 5th September, and Changbin was explicitly mentioned from the 19th September.

[6] As per GS-VER_PDD template (Version 1) in Section C.1.1, The starting date of a VER project activity is the date on which the implementation or construction or real action of a project activity begins. http://www.goldstandard.org/wp-content/uploads/2011/11/GS-VER_PDD_final1.doc

February 2007	InfraVest asks KfW to help them to find a carbon consultants	Email
April 2007	South Pole starts it activities in Taiwan	
June 2007	First contact between South Pole and InfraVest	Email
July 10th, 2007	First draft of the cooperation agreement between South Pole and InfraVest	Contract
June 16th, 2007	Production start of Changbin phase 1	
December 7th, 2007	Cooperation agreement between South Pole and InfraVest is signed	Contract
December 2007	Construction start of Taichung	
July 2008	ERPA is signed between South Pole and InfraVest	Contract
August 29th, 2008	PDD is uploaded to the Gold Standard for pre-assessment	Email
July 21st, 2008	Production start of Taichung	

As it can be seen in the table above, InfraVest was aware since 2001 of carbon credits and of its financial impact on wind projects. The VER has always therefore been seriously considered by InfraVest as a mean to compensate low grid tariff in Taiwan.

In the beginning of September 2006, InfraVest started to look actively for carbon consultants that would be able to assist in developing VER projects in Taiwan, but the discussions failed after a few months due to the difficulty for the carbon consultant to find a VER buyer. In February 2007, InfraVest also sought for KfW's assistance in retaining carbon consultants able to work in Taiwan.

South Pole is the first carbon consultant present in Taiwan; it started its activities in April 2007, and two months after, in June 2007, South Pole established the first contact with InfraVest. The first cooperation agreement was drafted in July and was signed in December 2007. The ERPA for the project activity between South Pole and InfraVest was signed in July 2008.

As discussed above, it is clear that:

- InfraVest has always considered the carbon credits as a mean to finance its wind farms. There are several evidences that InfraVest has considered the carbon credits for these projects before the project start date.
- InfraVest has always sought actively for carbon credits consultants and VER developments, before and during the construction of Taichung and Changbin wind farms.

As prescribed by the Gold Standard, the project additionality is demonstrated through use of the Tool for the demonstration and assessment of additionality (Version 05.2).

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

This step involves the definition of realistic and credible alternatives to the project activity that can be part of the baseline scenario.

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

The aim of the proposed project activity is to produce electricity; therefore we can define the alternatives as follows:

Alternative A Changbin and Taichung wind farms without VER credits

Alternative B Continuation of the current situation (no project activity or other alternatives undertaken)

Alternative C The PPs develop a hydro plant

Alternative D The PPs develop a PV power plant

Alternative E The PPs develop a power plant fired thanks to biomass resource

Alternative F The PPs develop fossil fuel fired power plant

InfraVest is a company incorporated in Taiwan which concentrates in wind energy development. This company therefore does not have the capacity to develop other types of power plant. According to the "Tool for the demonstration and assessment of additionality"[7], a hydropower, PV power, biomass power plant and fossil fuel fired power plant may not be an alternative for an independent power producer investing in wind energy. Therefore alternatives are related to technology and circumstances as well as investor, and the only relevant and credible options to the proposed project activity are:

Alternative A Changbin and Taichung wind farms without VER credits

Alternative B Continuation of the current situation (no project activity or other alternatives undertaken)

Sub-step 1b. Enforcement of applicable laws and regulations

The mandatory preliminary permits have been obtained for the project activity, showing that it is in compliance with the current laws and regulations.

- Taipower renewable energy premium purchase program[8]
- Electricity law[9]
- Electricity registration law[10]

All the alternatives to the project outlined in Step 1a above are in compliance with applicable laws and regulations.

For the demonstration of additionality, both UNFCCC and Gold Standard guidelines allow to conduct a barrier analysis or an investment analysis. Both the investment analysis and barrier analysis are carried out following.

Step 2. Investment Analysis

The main purpose of carrying out investment analysis is to determine whether the proposed project activity is not economically or financially attractive (or feasible) without the revenue from the sale of Voluntary Emission Reductions (VERs). All steps followed in this analysis are according to "Tool for the demonstration and assessment of additionality" (Version 05.2).

Sub-step 2a. Determine appropriate analysis method

As the project activity and the alternatives identified in Step 1 do have related financial benefits other than VER, the benchmark analysis (Option III) is used.

As alternative B does not include any investment and revenues, no benchmark analysis will be applied. Only Alternative A will further undergo a benchmark analysis together with the project activity.

Sub-step 2b. Option III. Apply benchmark analysis

The most suitable economic indicator for the project type and decision context is the project's internal rate of return (IRR). Thus, the benchmark of IRR should be determined. Five options can be used to derive the benchmark of IRR:
(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;

[7] Tool for the demonstration and assessment of additionality, version 05.2 page 4, footnote 4.

[8] http://www.taipower.com.tw/UpFile/ClauseFile/recycle_energy.pdf

[9] http://law.moj.gov.tw/LawClass/LawAll.aspx?PCode=J0030011

[10] http://law.moj.gov.tw/LawClass/LawAll.aspx?PCode=J0030012

(b) Estimates of the cost of financing and required return o n capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;
(c) A company internal benchmark (weighted average capital cost of the company), only in the particular case referred to above in paragraph 5. The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same benchmark;
(d) Government/official approved benchmark where such benchmarks are used for investment decisions;
(e) Any other indicators, if the project participants can demonstrate that the above Options are not applicable and their indicator is appropriately justified

Since there is no officially approved benchmark for investment decisions in Taiwan, in this case, the option (a) is chosen to determine the benchmark of equity IRR. According to Professor Aswath Damodaran at Stern School of Business at New York University[11], a fairly simple alternative is to assume that a company's exposure to country risk is proportional to its exposure to all other market risk, which is measured by the beta. Thus, the cost of equity for a firm in an emerging market can be written as follows:

$$Benchmark = RiskfreeRate + \sum \beta * (CountryRisk + EquityMarketRisk)$$

This benchmark is defined by analyzing governmental bond rates (risk free rate), increased by a suitable risk premium to reflect private investment:

- Long term government bond auctions resulted in rates of 2.13%[12] in August 2006, i.e. the time of the investment decision.

The total risk premium is calculated as beta of stock multiplied by the sum of the long term risk premium for the country under consideration and the risk premium for a mature equity market. The long term country risk premium is based on the country's rating, and the default spread of bond rates (US corporate and country bonds) compared to the US Treasury bond rate due to that rating. This becomes a measure of the country-specific risk premium for that country, to which a risk premium for a mature equity market is added. In practical terms, scaling the country risk premium to the beta of a stock (overall exposure to macro economic risk) implies that stocks with betas above one will be more exposed to country risk and equity market risk than stocks with a beta below one. For the year 2006, the current risk premium for a mature equity market was 4.91% (represents the equity market risk for countries with zero risk); and the country risk premium of Taiwan is 0.90%. This results in a total risk premium of 5.81%. While average beta of stocks for power sector in the same year is 1.39.

We estimate the benchmark IRR for the whole electricity generation sector in Taiwan to be 2.13% + (1.39 * (4.91% + 0.90%)) = 10.21%. Since we cannot conclude that benchmark is before or after tax, for conservative approach, the benchmark here is regarded as the before tax benchmark.

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

The basic financial parameters of the project provided by InfraVest Company are listed in the following table:

Wind Farm	Net Electricity Production	Annually Estimated Emission Reduction	Annual Increase Rate for O&M
	MWh/year	tCO2e/year	%
Changbin	324,735	220,495	7
Taichung	159,129	108,048	6

[11] Damodaran, Aswath,Equity Risk Premiums (ERP): Determinants, Estimation and Implications(September 23, 2008). Available at SSRN: http://ssrn.com/abstract=1274967

[12] http://www.cbc.gov.tw/public/Data/942114424071.pdf

Source: InfraVest's feasibility assessment, calculated in terms of 42 turbines operating in Changbin Wind Farm.

Besides above parameters, the average exchange rate of EUR: NTD in 21-9-2006 was 41.8[13], the purchase electricity price from Taipower is fixed at NTD 2/kWh. The depreciation is 15 years. The tax rate is 25% in Taiwan.

The key figures and Equity IRR with and without revenue from VERs are listed in the following table. Without VERs revenue, the Equity IRRs (before tax) of Changbin and Taichung wind farms are only 5.51% and 8.95% respectively, lower than the benchmark IRR. After taking fair value and tax into account, the Equity IRRs (after tax) of Changbin and Taichung wind farms are 3.85% and 7.27% respectively, lower than the benchmark. Thus, the proposed project cannot be considered as financially attractive.

While considering VERs revenues, the Equity IRRs (before tax) of Changbin and Taichung wind farms are 12.25% and 16.26% respectively, higher than the benchmark. VERs revenue significantly improves the IRRs of total investment by over 7.0%. After taking fair value and tax into account, the Equity IRRs (after tax) of Changbin and Taichung project are 9.69% and 13.50% respectively, still higher than the benchmark.

Therefore, by putting the carbon revenue into account, the proposed project is commercially feasible and considered as financially attractive to investors. The results of the IRR (before and after tax) calculations are reported below:

Wind Farm	Before Tax		After Tax	
	IRR (without VERs)	IRR (with VERs)	IRR (without VERs)	IRR (with VERs)
Changbin	5.51%	12.25%	3.85%	9.69%
Taichung	8.95%	16.26%	7.27%	13.50%

Sub-step 2d. Sensitivity analysis

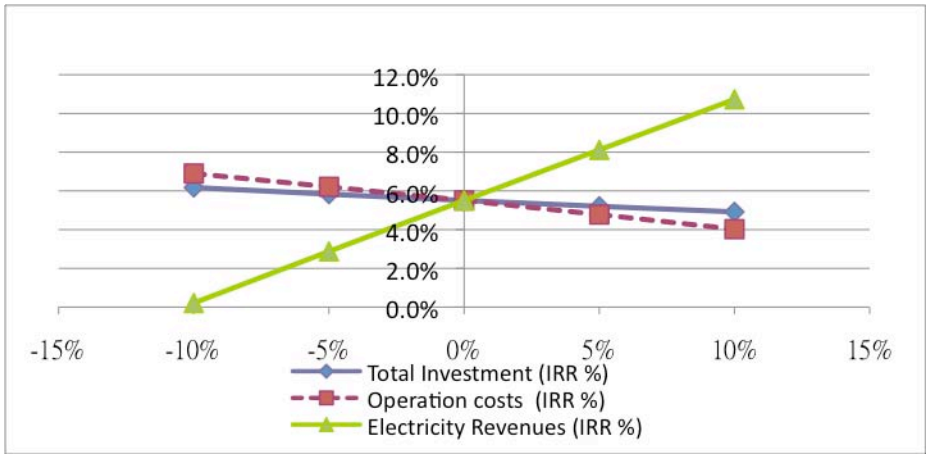
Purpose of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The variables chosen for sensitivity analysis are cost of operation and maintenance (O&M), total investment, and revenues from selling electricity, for which the variation is basically from fluctuation in power generation. The sensitivity of this analysis is tested by considering an increase and a decrease of 10% in O&M, total investment and electricity production.

Variations in IRR (before and after tax) driven from fluctuation of O&M cost, total investment and sales of electricity are summarized in the following tables:

Changbin Sensitivity analysis (before tax)

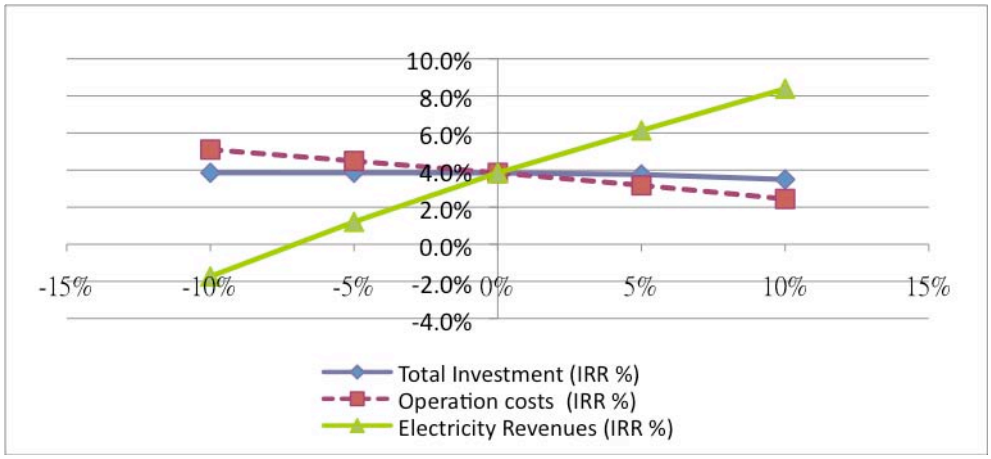
Variation	Total Investment (IRR %)	Operation costs (IRR %)	Electricity Revenues (IRR %)
-10%	6.2%	6.9%	0.2%
-5%	5.8%	6.2%	2.9%
0%	5.5%	5.5%	5.5%
5%	5.2%	4.8%	8.1%
10%	4.9%	4.0%	10.7%

[13] http://www.cbc.gov.tw/content.asp?mp=1&CuItem=36599



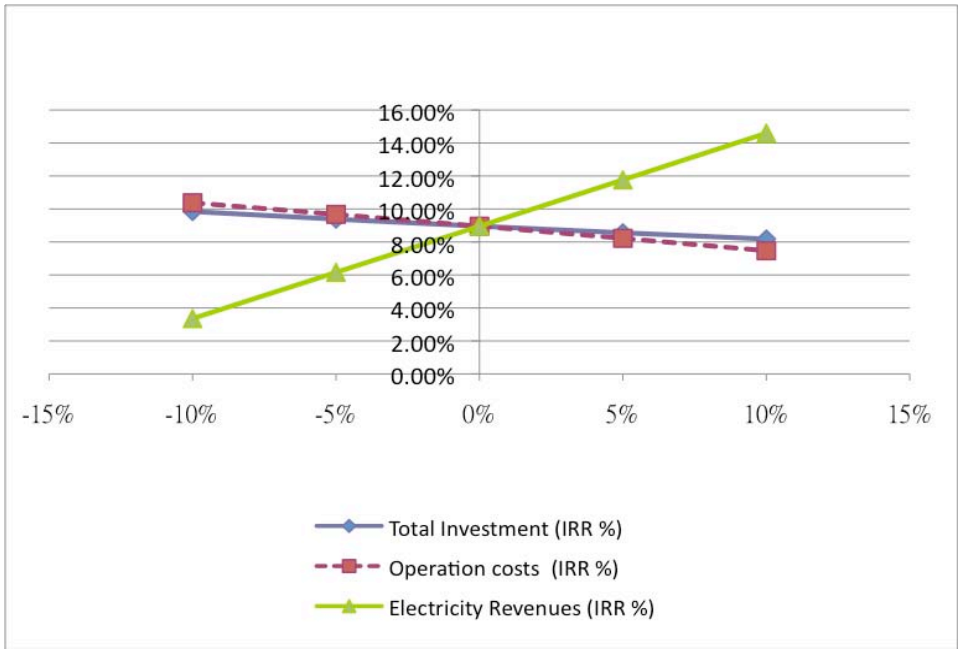
Changbin Sensitivity analysis (after tax)

Variation	Total Investment (IRR %)	Operation costs (IRR %)	Electricity Revenues (IRR %)
-10%	3.9%	5.1%	-1.7%
-5%	3.9%	4.5%	1.2%
0%	3.8%	3.8%	3.8%
5%	3.8%	3.2%	6.1%
10%	3.5%	2.4%	8.4%



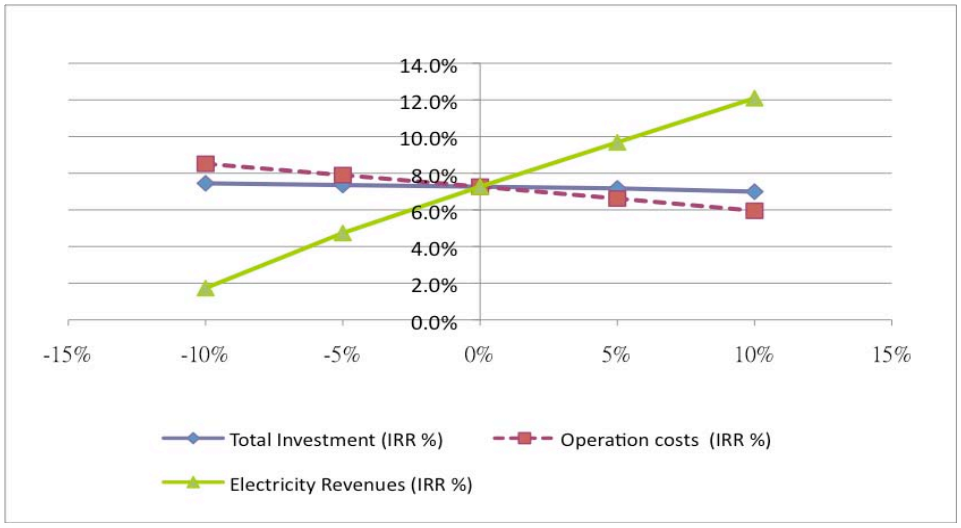
Taichung Sensitivity analysis (before tax)

Variation	Total Investment (IRR %)	Operation costs (IRR %)	Electricity Revenues (IRR %)
-10%	9.84%	10.37%	3.36%
-5%	9.38%	9.67%	6.16%
0%	8.95%	8.95%	8.95%
5%	8.55%	8.22%	11.76%
10%	8.18%	7.47%	14.60%



Taichung Sensitivity analysis (after tax)

Variation	Total Investment (IRR %)	Operation costs (IRR %)	Electricity Revenues (IRR %)
-10%	7.5%	8.5%	1.7%
-5%	7.4%	7.9%	4.7%
0%	7.3%	7.3%	7.3%
5%	7.2%	6.6%	9.7%
10%	7.0%	6.0%	12.1%



The analysis shows that the IRR is more sensitive to the net electricity revenues, while it is less elastic to O&M cost and total investment. The IRR is maintained to be less than the benchmark of 10.21% while O&M cost and total investment fluctuates in the rang of -10% to +10%.

Based on the sensitivity analysis of Changbin and Taichung wind farms, the IRRs will higher than the benchmark if the electricity revenues increase in the future. However, InfraVest signed a

contract with Taipower based on Taipower Purchase Renewable Electricity Price Directive[14]. In this contract, it clearly shows that the grid tariff is guaranteed for 15 years extendable to 20 years and the purchase electricity price is NTD 2/kWh under three conditions[15]:

(1) Renewable Energy development Act has not been approved by Legislative Yuan;
(2) The total installed capacity of the project does not reach 600 MW;
(3) The amendment of Taiwan Electricity Act has not been approved by Legislative Yuan and Taipower has not been privatized.

At this moment the draft of Renewable Energy Development Act[16], has been approved by Taiwan Legislative Yuan. According to this draft, the feed-in price for wind power will be increased to NTD 2.2/kWh if Legislative Yuan approved Renewable Energy Development Act. Nevertheless, the Act (Rule no. 8, point 2) has clearly stated that for contracts signed prior to the approval of the Act, the feed-in tariff stated in such contracts (NTD 2/kWh) remains to apply[17]. Presently, the feed-in tariff for wind power is as low as NTD 2/kWh, which is the main barrier that prevents wind developers to invest in Taiwan and is therefore the reason why only few of IPPs are active now in this market.

The total installed capacity of Changbin and Taichung wind farms is 142.6 MW, lower than 600 MW.

Currently no evidence shows that Taiwan Electricity Act will be amended by Legislative Yuan and Taipower will be privatized.

At current price level (NTD 2/kWh), without VERs revenues, the IRRs of Changbin and Taichung wind farms are never higher than the benchmark. With VERs revenues, the IRRs of Changbin and Taichung wind farms will be higher than the benchmark. This shows the importance of the VERs revenues for this project.

Conclusion of investment analysis

In conclusion, given the current feed-in price of NT$ 2.00/kWh, the proposed project will continue to face threat of profitability with IRRs of Changbin (5.51%, before tax and 3.85%, after tax), and Taichung (8.95%, before tax and 7.27%, after tax) substantially lower than IRR benchmark (10.21%).

Thus we can conclude that the proposed project activity is unlikely to be financially attractive without VER revenues as the IRRs of Changbin and Taichung wind farms are below the benchmark IRR under current grid tariff. However, with VERs revenues, the IRR of this project is higher than benchmark. Thus with VERs revenues, this project is commercially feasible and considered as financially attractive to investors.

Step 3. Barrier analysis

[14] Taipower Purchase Renewable Electricity Price Directives, http://www.yangger.com/official/support/filedownload/1370832076415d71/%E5%8F%B0%E7%81%A3%E9%9B%BB%E5%8A%9B%E8%82%A1%E4%BB%BD%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8%E5%86%8D%E7%94%9F%E8%83%BD%E6%BA%90%E9%9B%BB%E8%83%BD%E6%94%B6%E8%B3%BC%E4%BD%9C%E6%A5%AD%E8%A6%81%E9%BB%9E

[15] Taipower Purchase Renewable Electricity Price Directives, Rule no. 6, Point 1-3, http://www.yangger.com/official/support/filedownload/1370832076415d71/%E5%8F%B0%E7%81%A3%E9%9B%BB%E5%8A%9B%E8%82%A1%E4%BB%BD%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8%E5%86%8D%E7%94%9F%E8%83%BD%E6%BA%90%E9%9B%BB%E8%83%BD%E6%94%B6%E8%B3%BC%E4%BD%9C%E6%A5%AD%E8%A6%81%E9%BB%9E

[16] The draft of Renewable Energy Development Act, http://cdnet.stpi.org.tw/techroom/keyfacts/pdf/00_policy_002.pdf

[17] The draft of Renewable Energy Development Act, rule no. 8, point 2, http://cdnet.stpi.org.tw/techroom/keyfacts/pdf/00_policy_002.pdf

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

The following barrier would have prevented the implementation of the project if it was not developed as a VER project.

Barrier 1: Lack of prevailing practice / first of its kind

Changbin and Taichung are the first wind projects over the 50MW threshold built in Taiwan by an independent power producer (IPP). As shown in table "Wind Farms in Taiwan, till 2007, plus IPP projects under development" (see Sub-step 4a), the total installed capacity of Changbin and Taichung project is 142.6 MW. It clearly demonstrates that InfraVest is the first IPP to undertake a wind farm of over 50MW scale. Since this proposed project is the first-of-its-kind for the IPPs in Taiwan, there are the technological risks of equipment failure and other under-performance due to the lack of management experience and skilled labour to operate the wind turbines. As a result, project owner has to bear the extra risks for carrying out this project.

Furthermore Environmental Protection Administration states that wind farms over 50MW built in "non-urban land" are required to conduct an environmental impact assessment[18]. The EIA takes time for both government and environmental NGOs to conclude whether the impact of a wind farm meets the requirement. InfraVest bears the extra risks as a pioneer in wind power industry development.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (expect the proposed project activity):

Alternative B, Continuation of the current situation (no project activity or other alternatives undertaken) by the project participants is not hindered by the identified barrier. Both Alternative A and the proposed project face the identified barrier.

Step 4: Common practice analysis

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

As far as similar activities to the Project are concerned, wind power plants under IPP model and the installed capacities are identified as follows:

Wind Farms in Taiwan, until 2007, plus IPP project under development[19]

Location	Total Capacity (MW)	Completion Date	Project Owner		Turbine unit capacity	Seeking for VER benefits
Taipower 1st Nuclear Power Plant	3.96	Dec-04	Taipower		660 kW	No
Taipower 3rd Nuclear Power Plant	4.5	Jan-05	Taipower		1.5 MW	No
Datan Power Plant	4.5	Jun-05	Taipower		1.5 MW	No
Sinjhu Project	12	Feb-06	Taipower		2 MW	No
Guanying Project	30	Dec-05	Taipower		2 MW	No
Taichung Power Plant	8	Feb-06	Taipower		2 MW	No
Taichung Harbour	36	Aug-06	Taipower		2 MW	No

[18]Standards for determining specific items and scope of environmental impact assessments for development activities, Article 29, http://ivy5.epa.gov.tw/epalaw/docfile/030040z950220.doc

[19] Statistics from ITRI (Contact: Dr. Yan, Wen-Jyh wenjyh@itri.org.tw)

Project						
Jhangbin Project	46	Dec-06	Taipower		2 MW	No
Chungfen Project	3.5	2003	Chengloong Paper Company	IPP	1.75 MW	No
Mailiao	2.64	Nov-2000	Formosa Heavy	IPP	660 kW	No
Zhunan and Dapeng (Miaoli) Project	49.8	Feb-06	Macquarie Internationaln frastructure Fund (MIIF)[20] (Project is previously owned by InfraVest	IPP	2 MW	Yes
Changbin (Phase I)	75.9	Jun-07	InfraVest	IPP	2.3 MW	Yes
Changbin (Phase II)	20.7	Aug-07	InfraVest	IPP	2.3 MW	Yes
Taichung	46	Jul-08	InfraVest	IPP	2.3 MW	Yes

As shown in the table above, InfraVest is the only active, foreign wind power IPP in Taiwan. Most of the previously built wind farms are owned by Taipower (state-owned grid company), with total capacity ranging from 3.96 MW to 46 MW.

Two other private-owned projects can also be identified (Mailiao and Chungfen), but they are not comparable in size with Changbin and Taichung, and therefore do not face significant access to financial barriers. Moreover Mailiao anc Chungfen were subsidized by the government[21], and these projects are below the 50 MW benchmark that allows them not to conduct an EIA. These are therefore definitely not comparable to Changbin and Taichung, and are excluded from the analysis.

Miaoli project was previously owned by InfraVest, prior to the acquisition by Macquarie International Infrastructure Fund ("MIIF", listed on Singapore Stock Exchange) on 20 March 2008. Due to the low feed-in tariff for wind projects in Taiwan, additional revenues from carbon credits were essential for the viability of the project. Given the circumstances, InfraVest was seeking for VER revenues for Miaoli wind farm[22]. However, the VER development process was postponed since it was under negotiation process with the MIIF.

During this acquisition negotiation, MIIF was aware of the potential VER revenues of the project, and of InfraVest's efforts to secure carbon credits for the project. Subsequent to the purchase, MIIF has also been searching for the VER benefits for the Miaoli[23]. Therefore, Miaoli wind farms are excluded from the comparison of common practice analysis since they are seeking benefits from VER.

[20] http://www.macquarie.com/mgl/miif#

[21] Communication by Dr.Yan, ITRI. Mailiao (Formosa, total investment NTD 90,000,000, subsidy 38,000,000). Chungfen (Chenloong paper company, total investment NTD 115,000,000, subsidy 56,000,000). http://www.fengtay.org.tw/paper.asp?page=2006&num=311&num2=76, http://www.fhi.com.tw/english/wind.htm

[22] Supporting document: Signed offer regarding VER development for Miaoli wind farm, drafted by South Pole Carbon Asset Management Ltd. in September 2007. Signature of the project owner dated 16/11/2007.

[23] Email communication between InfraVest and MIIF

In a broader perspective, based on Energy Statistic Yearbook, 2008 – 28. Power Generation Statistics[24], wind power generation amounted only 0.25% of total grid generation. Therefore, wind power generation cannot be considered as common practice in the region.

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

Not applicable, there are not similar activities to the project in Taiwan.

Conclusion of the common practice analysis

The other previously built wind farms in the region are not comparable to the proposed project activity. Moreover, according to Energy Statistic Yearbook, 2008 – Power Generation Statistic, wind power generation amounted only 0.25% of total grid generation in Taiwan, thus the proposed project activity is not a common practice.

Conclusion of the additionality demonstration

In conclusion, the proposed project activity faces the barrier and cannot be considered as a common practice. If the proposed project fails to be registered as a VER project, this project is unlikely to be financially attractive without VERs sales revenues. Being registered as a VER project, VERs sales revenues make the IRRs of the proposed project higher than the benchmark. This project therefore is commercially feasible and considered as financially attractive to investors with VERs sales revenues.

Furthermore, VER revenues also help the project activity to overcome the barrier by reducing the overall risk profile of the project through an improved financial feasibility. The emissions reductions from the proposed project are therefore additionally to what would have occurred in absence of the project activity.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The approved consolidated baseline and monitoring methodology ACM0002 (version 15.0) "Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources – Version 15.0" has been used.

The methodology was applied with the following tools:

- Tool for the demonstration and assessment of additionality (Version 05.2)
- Tool to calculate the emission factor for an electricity system (Version 04.0)

1. Project Emission

As per ACM0002, the project emission for most renewable energy (including wind farm) project activities is zero ($PE_y = 0$).

2. Baseline Emission

As per ACM0002, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

[24] Bureau of Energy, Ministry of Economic Affairs, Energy Statistic Yearbook, 發電裝置容量及發電量統計表(082~097), "28.Power Generation", http://web3.moeaboe.gov.tw/ECW/populace/content/ContentLink.aspx?menu_id=378

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)

As per ACM0002, Changbin and Taichung Wind Farms under the project activity are the installations of Greenfield power plants, so:

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

Where:

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

3. Leakage

For the leakage, according to ACM0002, no leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

Therefore, the leakage in this project is zero as well ($LE_y = 0$).

4. Emission reductions

Emission reductions of the project are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (tCO_2e/yr)

BE_y = Baseline emissions in year y (tCO_2/yr)

PE_y = Project emissions in year y (tCO_2e/yr)

After simplification, the final result for calculating this project's emission reduction is the following:

$$ER_y = EG_{facility,y} * EF_{grid,CM,y}$$

Emission Factor

The Baseline Emission Factor is calculated as a Combined Margin, using the weighted average of the operating margin and build margin.

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

$EF_{grid,OM,y}$ Operating Margin Emission Factor (tCO2e/MWh)

$EF_{grid,BM,y}$ Build margin emission factor (tCO2e/MWh)

w_{OM} Weighting of operating margin emissions factor

w_{BM} Weighting of build margin emissions factor

Based on above equation, the operating margin emission factor ($EF_{grid,OM,y}$) of Taiwan is 0.704 tCO2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.606 tCO2e/MWh. The defaults weights for wind power are used as specified in the emission factor tool: w_{OM} = 0.75; w_{BM} = 0.25.

The result of the Baseline Emission Factor ($EF_{grid,CM,y}$) calculation is **0.679 tCO2e/MWh**. The calculations are presented in Appendix 4 (The most recent 3-year data available (2011, 2012 and

2013) are used for calculating $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$. Until the time of submission of PDD to DOE, data of year 2011, 2012 and 2013 have been the available most recent data for calculating the emission factor).

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated in the project electricity system in year y
Source of data	Energy Balances in Taiwan
Value(s) applied	See Table A4-2 in Appendix 4
Choice of data or Measurement methods and procedures	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$FC_{i,y}$
Unit	Ton, litre or 1000 m^3
Description	Amount of fuel type i consumed by power plants/units in year y
Source of data	Energy Balances in Taiwan
Value(s) applied	Step 4 Table A4-3 in Appendix 4
Choice of data or Measurement methods and procedures	Fuel consumption breakdown by power plant/unit is unavailable, total consumption amounts are published annually.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fuel type i in year y
Source of data	GHG Emission Factor Inventory v.6.0.1[25]
Value(s) applied	Please refer to the table of GHG Emission Factor Inventory v.6.0.1
Choice of data or Measurement methods and procedures	Numbers are adopted from the reference document.
Purpose of data	Calculation of baseline emissions
Additional comment	The GHG Emission Factor Inventory v.6.0.1 provides directly emission factor by unit of mass or volume in which is equal to the product of $NCV_{i,y}$ and $EF_{CO2,i,y}$

[25] GHG Emission Factor Inventory v.6.0.1., 溫室氣體排放係數管理表6.0.1版, http://ghgregistry.epa.gov.tw/Tool/tools.aspx

Data / Parameter	$EF_{CO2,i,y}$
Unit	t CO_2/GJ
Description	CO_2 emission factor of fuel type i in year y
Source of data	GHG Emission Factor Inventory v.6.0.1
Value(s) applied	Please refer to the table of GHG Emission Factor Inventory v.6.0.1.
Choice of data or Measurement methods and procedures	Publicly available data from Bureau of Energy, Ministry of Economic Affairs
Purpose of data	Calculation of baseline emissions
Additional comment	The GHG Emission Factor Inventory v.6.0.1 provides directly emission factor by unit of mass or volume in which is equal to the product of $NCV_{i,y}$ and $EF_{CO2,i,y}$

Data / Parameter	$EF_{Coal,Adv}$ $EF_{Gas,Adv}$ $EF_{Oil,Adv}$
Unit	tCO_2/MWh
Description	Emission factor of commercialized coal-fired, oil-fired and gas-fired power plant
Source of data	Equipment energy efficiency benchmark from Energy Information Network by Industrial Technology Research Institute, Bureau of Energy, Ministry of Economic Affairs
Value(s) applied	$EF_{Coal,Adv}$= 0.792 tCO_2/MWh $EF_{Gas,Adv}$= 0.367 tCO_2/MWh $EF_{Oil,Adv}$= 0.506 tCO_2/MWh Step 5 Substep 2 in Appendix 4
Choice of data or Measurement methods and procedures	Publicly available data from Bureau of Energy, Ministry of Economic Affairs
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$CAP_{source,y}$
Unit	MW
Description	Installed capacity by different sources from 2002 till 2013 (MW)
Source of data	Statistic data of power generation capacity (available data of year 1998 ~ 2013) published by Bureau of Energy, Ministry of Economic Affairs
Value(s) applied	Step 5 Substep 2 in Appendix 4
Choice of data or Measurement methods and procedures	Publicly available data from Bureau of Energy, Ministry of Economic Affairs
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2e/MWh
Description	Combined Emission factor
Source of data	Calculated
Value(s) applied	0.679 for the second crediting period
Choice of data or Measurement methods and procedures	The Baseline Emission Factor is calculated as a Combined Margin, using the weighted average of the Operating Margin and Build Margin.
Purpose of data	Calculation of baseline emissions
Additional comment	

B.6.3. Ex ante calculation of emission reductions

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Project Emissions

In accordance to ACM0002, the project emission for most renewable energy (including wind farm) project activities is zero ($PE_y = 0$).

Leakage

Based on ACM0002, there is no need of leakage calculation or monitoring for this kind of activity, thus leakage is considered to be zero (0 tCO_2e).

Baseline Emissions

Based on ACM0002, baseline emissions (BE_y) include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the proposed project activity, which is 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" (tCO_2/MWh)

According to Section B.6.1, the final result for calculating this project's emission reduction is the following:

$ER_y = EG_{facility,y} * EF_{grid,CM,y}$

The result of emission reduction:

$EG_{facility,y}$	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y	Changbin	324,735	MWh/year
		Taichung	159,129	
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor	0.679		tCO_2e/MWh
ER_y	Emission reductions annually	328,543		tCO_2e/year

The baseline emission factor of Taiwan is fixed during the second crediting period by ex-ante calculation.

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 A	328,543	0	0	328,543
Year B	328,543	0	0	328,543
Year C	328,543	0	0	328,543
	328,543	0	0	328,543
	328,543	0	0	328,543
	328,543	0	0	328,543
Year …	328,543	0	0	328,543
Total	2,299,801	0	0	2,299,801
Total number of crediting years	7			
Annual average over the crediting period	328,543	0	0	328,543

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter	$EG_{Export,y}$
Unit	MWh/yr
Description	Quantity of electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meters
Value(s) applied	483,864 MWh
Measurement methods and procedures	Continuous measurement and at least monthly recording. Bi-directional electricity meters are applied in the project for all wind farms. Data from the electricity meters will be recorded remotely and digitally at the Taipower office. Taipower's personnel download the electronic data from the meters, and subsequent to meter reading sessions, the meters data are then incorporated in the monthly electricity receipts, which are then sent to the project owner by Taipower for confirmation on the amount of both electricity exported and imported. After confirmation from the project owner, the confirmed electricity exported to the grid is then considered as the basis on which Taipower conducts the payment to the project owner for purchasing electricity generated by the proposed project and the project owner sends the invoice to Taipower.
Monitoring frequency	Continuously
QA/QC procedures	Meter reading records will be crosschecked with the electricity receipts. The electricity meters will undergo maintenance/calibration according to Taiwan national standards (based on The Weight and Measures Act, Regulation no. CNMV 46, 'Technical Specification for Verification and

	Inspection of Electricity Meters'[26]) Accordingly, meter calibration is conducted every 8 years period.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$EG_{Import,y}$
Unit	MWh/yr
Description	Quantity of electricity consumption of the project plant/unit from the grid in year y
Source of data	Electricity meters
Value(s) applied	N/A
Measurement methods and procedures	Continuous measurement and at least monthly recording. Bi-directional electricity meters are applied in the project for all wind farms. Data from the electricity meters will be recorded remotely and digitally at the Taipower office. Taipower's personnel download the electronic data from the meters, and subsequent to meter reading sessions, the meters data are then incorporated in the monthly electricity receipts, which are then sent to the project owner by Taipower for confirmation on the amount of both electricity exported and imported. After confirmation from the project owner, the confirmed electricity imported is then considered as the basis on which the project owner conducts the payment to Taipower for electricity imported from Taipower by the proposed project and Taipower sends the invoice to the project owner.
Monitoring frequency	Continuously
QA/QC procedures	Meter reading records will be crosschecked with the electricity receipts. The electricity meters will undergo maintenance/calibration according to Taiwan national standards (based on The Weight and Measures Act, Regulation no. CNMV 46, 'Technical Specification for Verification and Inspection of Electricity Meters') Accordingly, meter calibration is conducted every 8 years period.
Purpose of data	Calculation of baseline emissions
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 Quantity of net electricity generation supplied to the grid in year y by the project plant/unit that has been added under the project activity
Source of data	Calculated by the difference of $EG_{Export,y} - EG_{Import,y}$
Value(s) applied	483,864 MWh
Measurement methods and procedures	Calculated by the difference of $EG_{Export,y}$ and $EG_{Import,y}$ which are measured continuously and at least monthly recording.
Monitoring frequency	N/A
QA/QC procedures	Meter reading records of $EG_{Export,y}$ and $EG_{Import,y}$ will be crosschecked

[26] http://www.bsmi.gov.tw/wSite/lp?ctNode=4053&nowPage=2&pagesize=15&mp=1

http://www.bsmi.gov.tw/wSite/public/Attachment/f1366880070643.doc

	with the electricity receipts, and calculation will be double checked and verified.
Purpose of data	Calculation of baseline emissions
Additional comment	

B.7.2. Sampling plan

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Not applicable.

B.7.3. Other elements of monitoring plan

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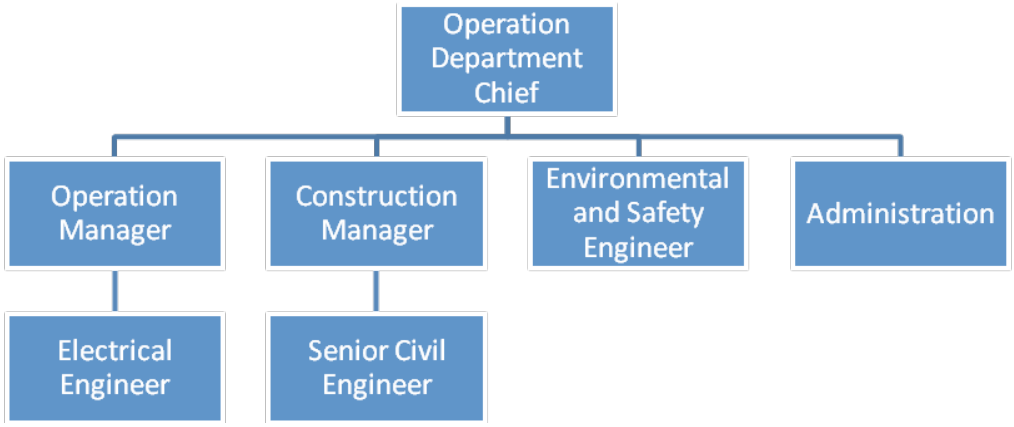
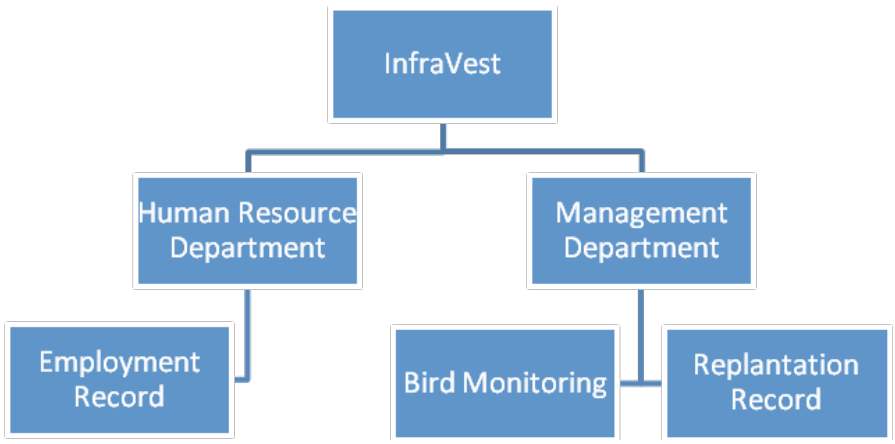
Monitoring Management

In InfraVest, the Operation Department is in charge of overall operation, maintenance, monitoring, training and report of Changbin and Taichung wind farms. The team will appoint specific civil engineer, electric engineer, environmental and safety experts for relevant work of the project activity. The organization chart for monitoring the meters is shown in the following:



The organization chart for monitoring the biodiversity indicators is shown in the following:



Name	Organization	Responsibility
Dr. Karl Eugen Feifel	InfraVest	Dr. Feifel is the president of InfraVest Taiwan and is responsible for overall project management.

Mr. Nils Casemir	InfraVest	Mr. Casemir is the chief of operation department of Changbin and Taichung wind farms. He is in charge of data recording processing and reporting for the project. The data will be either automatically recorded or manually recorder by operators. All data will be imported to Excel for validation or verification. He will also manage all training courses.
Human Resource Department	InfraVest	This department is in charge of the number of employment. The human resource department of InfraVest will provide a chart of employment, specifying the number of manpower allocated in the proposed project. Labour insurance list will also be provided to the DOE during annual verification.
Vivi Tung	InfraVest	Vivi Tung is the manager of management department. InfraVest signed a contract with Ming-Shiang Ecological Census Consultant Co., Ltd. for bird population monitoring. As stated in the contract, Ming-Shiang will monitor the bird ecology in the wind farm boundary seasonally, for a total period of 2 years. Every year this company will provide a report to InfraVest elaborating the bird monitoring. Vivi Tung will provide this report to the DOE for verification annually. Furthermore, The re-plantation contracts and monitoring record will also be provided to the DOE.
South Pole Carbon	South Pole	South Pole Carbon Asset Management Ltd. will provide review of reported data before they are submitted to DOE for validation or verification.

1. Monitoring emissions from the project activity

1.1 Monitoring Objectives:

As per ACM0002, the emission reductions achieved by the project activity will be determined ex-post through direct measurement of the amount net electricity supplied to the grid multiplied by the combined margin emission factor:

$ER_y = EG_{facility,y} * EF_{grid,CM,y}$

Where:

ER_y	=	Emissions reductions in year y (tCO_2/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid 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)

As the emission factor is fixed for the second crediting period, the aim of the monitoring is therefore only to monitor the quantity of net electricity generation supplied by the project plant to the grid using energy meters. The project proponent may use electricity from the grid for start up purpose so both electricity consumption and generation will be monitored:

$EG_{facility,y} = EG_{Export,y} – EG_{Import,y}$

Where:

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

$EG_{Import,y}$ = Quantity of electricity consumption of the project plant/unit from the grid in year y (MWh/y)

1.2 Electricity Meters:

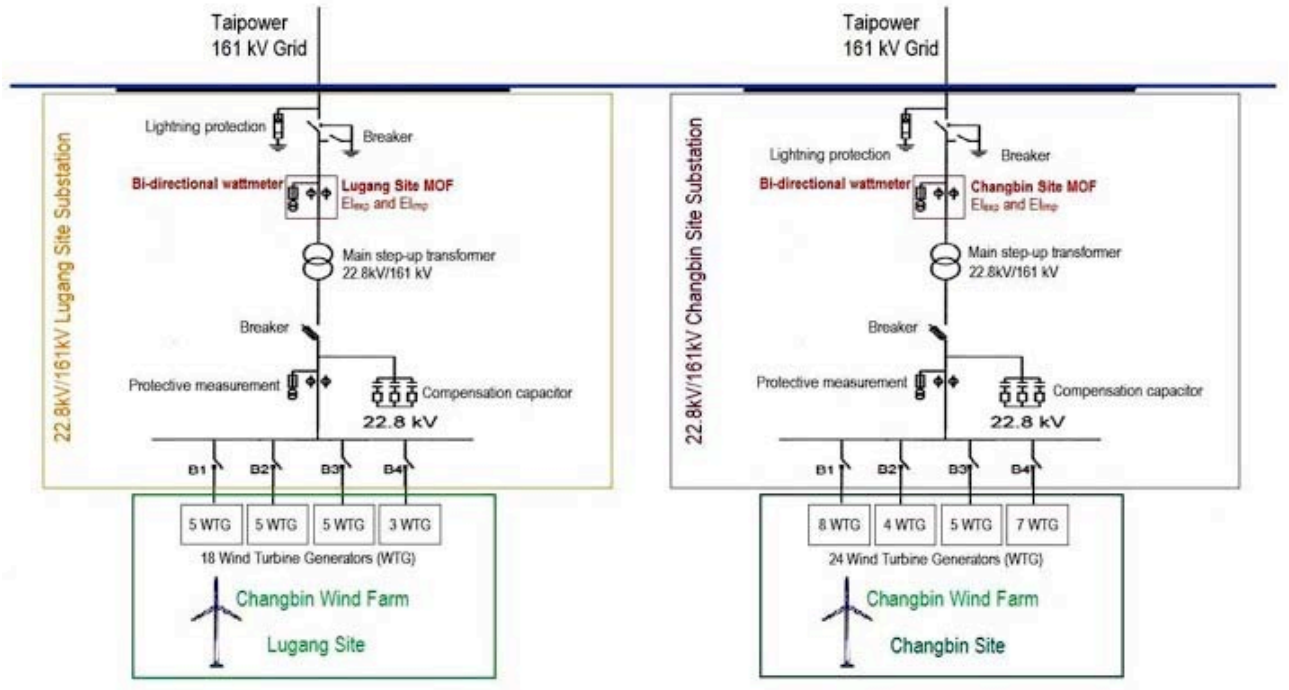
Electricity generation ($EG_{Export,y}$) and consumption ($EG_{Import,y}$) are measured continuously by bi-directional meters (Meter of Facility, MOF) installed at Taipower's substations or the wind farms switchrooms, which are owned and supervised by Taipower. The accuracy for meters is equal to or higher than 0.5%. The meters locations and numbers of meters used for each wind farm are listed as below:

Changbin Wind Farm:
Changbin wind farm consists of 2 sites, Lugang site and Changbin site. For Lugang site, one bi-directional electricity meter is located in Taipower's Ludong substation, after the 22.8kV/161kV Transformer and before connection to Taipower 161 kV grid. For Changbin site, one bi-directional electricity meter is located in Taipower's Changbin substation, after the 22.8kV/161kV Transformer and before connection to Taipower 161 kV grid.

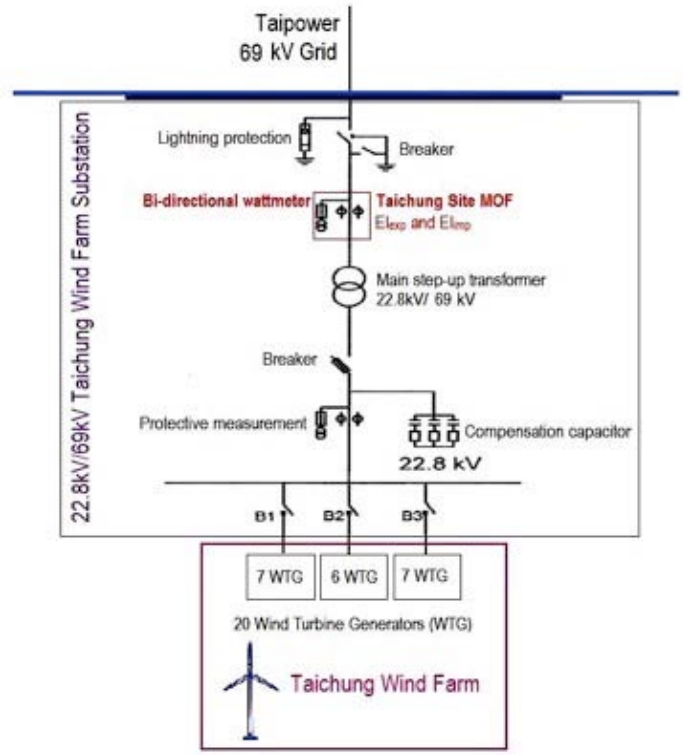
Taichung Wind Farm:
One bi-directional electricity meter is located in Taichung wind farm 22.8 kV Switchroom, after the 22.8kV/69kV Transformer and before connection to Taipower 69 kV grid.

Electricity Connection Diagrams with meters locations for Changbin and Taichung wind farms are attached as below:

Changbin Wind Farm Schematic Diagram



Taichung Wind Farm Schematic Diagram



1.3 Monitoring Procedures and Data Recording:

Readings from the MOFs will be recorded remotely and digitally at the Taipower office. Taipower's personnel download the electronic data from the meters. After the digital MOF data are incorporated into monthly electricity receipts, Taipower will send the monthly electricity receipt to InfraVest for confirmation on the amount of both electricity exported and imported. After confirmation from InfraVest, the confirmed electricity exported to the grid is then considered as the basis on which Taipower conducts the payment to InfraVest for purchasing electricity generated by the project activity and InfraVest sends the invoice to Taipower; and the confirmed electricity imported is then considered as the basis on which InfraVest conducts the payment to Taipower for electricity imported from Taipower grid by the project activity and Taipower sends the invoice to InfraVest. The ER calculation is based on the electricity data in electricity receipts that are derived from the MOF reading records. MOF data copies and the electricity receipts are archived for at least two years after the end of the crediting period by InfraVest.

The monitoring procedures can be summarized as following:

1. Data from MOFs are recorded remotely and digitally at the Taipower office. Taipower's personnel download the electric data.
2. Taipower incorporates the downloaded electric data into the monthly electricity receipts and sends to InfraVest for confirmation on the amount of both electricity export and import;
3. InfraVest confirms the electricity amount on the receipts.
4. Taipower pays the money to InfraVest for the confirmed export amount and receives export invoices from InfraVest. InfraVest pays to Taipower for the confirmed import amount and receives import invoices from Taipower.

Training Procedures for the staffs:

- In construction phase, the following trainings are carried out:

1. The introduction of driven pile and planted pile.
2. The introduction for safety regulations and procedures

- In operation and maintenance phase, the following trainings are carried out:

1. The introduction of climbing system for windmills
2. The introduction of wind energy.
3. The introduction for SCADA operation
4. The introduction for control of wind turbines

1.4 Meter Calibration and QA/QC procedures

Taipower's calibration procedures are in accordance with The Weights and Measures Act, Regulation no. CNMV 46, 'Technical Specification for Verification and Inspection of Electricity Meters'[27], governed by the Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs, Taiwan R. O. C. According to Taiwan government's regulation CNMV46, the official period of validity for the *electronic electricity meter* in this project is defined as 8 years. Furthermore, the accuracy class of the electricity meters sued for the project activity is at least 0.5%, in line with the official standard error for electronic electricity meter (MOF) at ±0.5%[28].

All the calibration records will be documented by the project owner and provided to the DOE during verification.

All emergency and disputes management procedures related to the electricity meter are regulated by Bureau of Standards, Metrology and Inspection, M.O.E.A., R.O.C[29]. In case of meter performance failure or malfunction, Taipower and the project owner would follow the Power Purchase Agreement (PPA) clause 6: Taipower and the project owner will jointly recalculate the amount of electricity dispatched by the project during the malfunction period based on the electricity dispatched during the same period last year or on the average electricity dispatched normally during the previous three periods for electricity purchasing and sales.[30]

2. Monitoring project performance on the most sensitive sustainable development indicators

2.1 Sustainable Development Matrix (SD Matrix)

Indicator	Mitigation measure	Relevance to achieving MDG	Chosen parameter and explanation	Preliminary score
Gold Standard indicators of sustainable developmen t.	If relevant copy mitigation measure from "do no harm" table, or include mitigation measure used	Check www.undp.or/mdg and www.mdgmonitor.org Describe how your indicator is related to local MDG goals	Defined by project developer	Negative impact: score '-' in case negative impact is not fully mitigated Score 0 in case impact is planned to be fully mitigated.

[27] The Weights and Measures Act, http://law.moj.gov.tw/Eng/LawClass/LawAll.aspx?PCode=J0100052

Technical Specification for Verification and Inspection of Electricity Meters
http://www.bsmi.gov.tw/wSite/ct?xItem=46800&ctNode=4053&mp=1
http://www.bsmi.gov.tw/wSite/public/Attachment/f1366880070643.doc, Clause 9.3

[28] Technical Specification for Verification and Inspection of Electricity Meters

http://www.bsmi.gov.tw/wSite/ct?xItem=46800&ctNode=4053&mp=1
http://www.bsmi.gov.tw/wSite/public/Attachment/f1366880070643.doc, Clause 8.1.4 Table 8

[29] http://www.bsmi.gov.tw/wSite/laws/review.jsp?lawId=8a8a85591c30ce08011c31d0b3860006&mp=1

[30] http://www.taipower.com.tw/content/rules_item/rules_item04_1.aspx?CBType=5

http://www.taipower.com.tw/UpFile/RulesItemFile/ppa_9912_01.doc

	to neutralise a score of '-'			No change in impact: score o Positive impact: Score '+'
Environment				
Air quality		MDG Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	**Chosen parameter**: NOx, SOx emission Explanation: Since the fuel combustion in baseline power generation produces air pollutants besides GHG, such as NOx and SOx, and other heavy metal pollutants, the project considerably facilitates air quality improvement by producing clean electricity to the national grid. According to Taipower's latest announcement, approximately 302 kg of SOx and 327 kg of NOx emissions are generated for producing 1000 MWh of electricity in 2013[31]. Based on such estimation, the project activity is expected to abate approximately additional 146,127 kg SOx, and 158,223 kg NOx, annually. Thus, this sustainable indicator scores a "+".	+
Water quality and quantity		MDG Target 7.C: Halve, by 2015, the proportion of people without	As stated in the conclusion of the EIA[32], there is no	0

[31] http://www.taipower.com.tw/content/new_info/new_info-a57.aspx?LinkID=5

[32] EIA report, Chapter 10, Table 10-1.

		sustainable access to safe drinking water and basic sanitation	significant impact on the surface water and underground water conditions resulting from this project. However, Taiwan is subject to acid rains. The wind farm mitigates sulfur emission in the atmosphere and thus acid rain by reducing the use of fossil fuel to produce electricity. This is the only possible effect of the wind farm on water resource, thus, this indicator scores a "0".	
Soil condition		MDG Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	**Chosen parameter:** Re-plantation maintenance As stated in the GS Pre-assessment Report, concerns were raised regarding the possibilities of soil erosion during the development of Changbin wind farm. Taichung wind farm is constructed in an area that was dedicated to agricultural purposes, while Changbin wind farm is located in and industrial area. According to the results of EIA[33], this project activity will not bring any impacts to the soil condition. InfraVest	0

[33] Changbin EIA report, Chapter 7.1.1.

[34] Changbin EIA Report Chapter 11.1 point 3.2.

[35] Changbin EIA Report Chart 5.3.5-1; Taichung EIA Report Annex 0.1-11

			had made a commitment to do re-plantation of windbreaks in order to compensate on any damages caused by the construction[34]. The total re-plantation target area was previously calculated as a minimum of 13,961 m^2 and 400 m^2 for Changbin and Taichung Wind Farms, respectively[35]. After several revisions, the final re-plantation areas were settled as 15,234.67 m^2 and 2,400 m^2 for Changbin and Taichung Wind Farms respectively[36]. To behave the great circumspection, this indicator was added to the monitoring plan during the first crediting period of the project activity. The re-plantation records were already provided to DOE during the verifications. And the re-plantation targets have already been completed in 2011[37] and verified by DOE during previous	

[36] Changbin EIA - Third Changes Chart, Table 2.3; Taichung EIA – Differences Analysis Report, Section 2.2.2

[37] Changbin wind farm: Inspection records of re-plantation in Siansi and Lugang area (dated 18/04/2011, 24/06/2011 and 27/09/2013)

Taichung wind farm: Inspection records of re-plantation in Shuangliao, Taichia area (dated 13/12/2010 and 04/05/2011)

			verifications. As normal conservations are doing regularly on all the re-plantation sites, this indicator should still be monitored and conservation or inspection records will be provided to DOE for verification.	
Other pollutants		MDG Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	As per the conclusions of EIA[38], only some suspended dusts are produced in the construction phase, but their impacts are considered as very limited. However, there are no GHG gases and dusts will be produced in the whole operational period. Furthermore, the noise and vibration deriving from the project activity is also very limited during construction and operational period compared to the condition before the project development. In Changbin wind farm, the increases of noise both in construction and operation phase are below 0.1dB. In Taichung wind farm, the increases of noise range between 0.5 and 7.9 dB during construction and operation phase. The results of measurement are in line with the	0

[38] EIA report, Chapter 10, Table 10-1.

			regulation standards. Thus this indicator scores “0”.	
Biodiversity		MDG Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	Taiwan is considered a sensitive place for bird migration. The impact of the wind farm on bird populations is unknown until now. To behave a great circumspection, this indicator is added into the monitoring plan for the first crediting period of the project activity. InfraVest had contracted with Ming-Shiang Ecological Census Consultant Co., Ltd. for monitoring the bird population. According to the contract, Ming-Shiang would monitor the bird ecology in the wind farm boundary seasonally, for a total period of 2 years. Each year in 2 years period, this company would provide a report to InfraVest for elaborating the outcome of the bird monitoring. For Changbin wind farm, the bird monitoring period had already ended in March 2010, while for Taichung wind farm, the bird monitoring period has already ended in February 2011. As per the bird monitoring reports, there was no negative impact observed.	0

			Therefore, no formal monitoring of bird populations has been needed thereafter.	
Subtotal				+
Social development				
Quality of employment		MDG Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	**Chosen parameter:** Training, Labour conditions The project creates jobs in Taiwan during both construction and operation phases. The technical and security staff will be trained by InfraVest and Enercon. The training includes technical, environmental and security knowledge, and operational and maintenance instructions. Welfare provided for their well being complies with the national regulations (Labour Standards Act[39], etc.). Thus this indicator scores a "+".	+
Livelihood of the poor		MDG Goal 1: Eradicate extreme hunger and poverty MDG Goal 4: Reduce child mortality rate MDG Goal 5: Improve maternal health	Although the project is expected to lead to both economic and infrastructural development of the region, this would be very difficult to monitor. Therefore this indicator scores a "0".	0
Access to affordable & clean energy services		MDG Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	Although the project facilitates access to clean electricity by replacing the same amount of fossil fuel based	0

[39] http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL014930

			electricity generated in the grid (baseline scenario); and Wind farm development in Taiwan is also particularly important for its efforts to reduce dependency on imported fuel. However, the impact of this indicator on a local level is rather difficult to quantify and monitor. Thus this indicator scores a "0".	
Human and institutional capacity		MDG Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later that 2015 MDG Target 8.F: In cooperation with the private sector, make available benefits of new technologies, especially information and communications	No changes are expected regarding human and institutional capacity in the region.	0
Subtotal				+
Economic and technological development				
Quantitative employment and income generation		MDG Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	**Chosen parameter**: Number of jobs created and salary level The project activity generates employment opportunities during the project construction and operation period. The employees are fairly paid, well above the minimum	+

			wage requirement[40]. Thus positive impacts can be expected.	
Access to investment		MDG Target 8.D: Deal comprehensively with the debt problems of developing countries	The wind farms reduce fossil fuel imports in Taiwan. However, net foreign currency savings will be very difficult to prove and monitor, therefore this indicator scores a "0".	0
Technology transfer and technological self-reliance		MDG Target 8.F: In cooperation with the private sector, make available benefits of new technologies, especially information and communications	Prior to this wind farm development, the project owner did not have experiences in operating and maintaining wind turbines in Taiwan. Therefore, all operating and maintaining staffs had to be hired from Enercon, German Company which is the wind turbine supplier for this project. In order to overcome this problem, the project owner had organized training programs for the local staff and it is now no longer necessary to import the skilled foreign workers. Thus, this indicator scores a "0".	0
Subtotal				+
Justification choice, data source and provision of references				
Air quality	Reference: Taipower Official Website: http://www.taipower.com.tw/content/new_info/new_info-a57.aspx?LinkID=5			
Water	Reference: EIA reports of the project activity			

[40] http://www.mol.gov.tw/cht/index.php?code=list&ids=157
http://www.mol.gov.tw/upload/cht/attachment/d59c915d628845d4ee4dd76c2f99e916.doc

quality and quantity	EIA reports: Chapter 10, Table 10-1
Soil condition	Reference: EIA reports of the project activity & inspection records of re-plantation Changbin EIA report, Chapter 7.7.1 Changbin EIA report, Chapter 11.1 point 3.2 Changbin EIA report, Chapter 5.3.5-1; Taichung EIA report, Annex 0.1-11 Changbin EIA – Third Changes Chart, Table 2.3; Taichung EIA – Differences Analysis Report, Section 2.2.2 Changbin wind farm: Inspection records of re-plantation in Siansi and Lugang area (dated 18/04/2011, 24/06/2011 and 27/09/2013) Taichung wind farm: Inspection records of re-plantation in Shuangliao, Taichia area (dated 13/12/2010 and 04/05/2011)
Other pollutants	Reference: EIA reports of the project activity EIA reports, Chapter 10, Table 10-1.
Biodiversity	Reference: EIA reports of the project activity & Ecosystem Monitoring Reports Changbin EIA report, Appendix post. 2-6;Taichung EIA report, Appendix 0.1-10 Changbin Ecosystem Monitoring Report (March 2010) Taichung Ecosystem Monitoring Report (February 2011)
Quality of employment	Reference: training records from project owner Labour Standards Act: http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL014930
Livelihood of the poor	N/A
Access to affordable and clean energy services	N/A
Human and institutional capacity	N/A
Quantitative employment and income generation	Reference: HR records from project owner Minimum wage regulation: http://www.mol.gov.tw/cht/index.php?code=list&ids=157 http://www.mol.gov.tw/upload/cht/attachment/d59c915d628845d4ee4dd76c2f99e916.doc
Access to investment	Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports. http://www.geni.org/globalenergy/library/national_energy_grid/taiwan/Taiwan CountryAnalysisBrief.shtml
Technology transfer and technological self-reliance	N/A

2.2 Sustainable Monitoring Indicator

According to the outcome of SD Matrix, sustainable development indicators such as air quality, soil condition, quality of employment, and quantitative and income generation have to be monitored for the project activity.

No	1
Indicator	Air Quality

Mitigation measure		N/A
Repeat for each parameter		
Chosen parameter		NOx, SOx emission
Current situation of parameter		According to Taipower's latest announcement, an average of 302 kg SOx and 327 kg NOx emissions are generated for producing 1000 MWh of electricity produced in 2013[41]. Based on such estimation, the project activity is expected to abate approximately 146,127 kg SOx and 158,223 kg NOx annually.
Estimation of baseline situation of parameter		SOx and NOx emissions deriving from the electricity generated in the grid-connected fossil fuel fired power plants
Future target for parameter		Continuous monitoring of how much SOx and NOx are abated by the project.
Way of monitoring	How	Calculated, based on the announced SOx and NOx emissions/kWh announced by the grid company.
	When	Data will be compiled and monitored annually. All related records will be provided and verified by the DOE.
	By who	The project owner. The calculation of SOx and NOx abatement will be presented in the monitoring report during verification.

No		2
Indicator		Soil condition
Mitigation measure		N/A
Repeat for each parameter		
Chosen parameter		Re-plantation maintenance
Current situation of parameter		The re-plantation targets for Changbin and Taichung wind farms have already been completed in 2011 within the first crediting period of the project activity. And normal conservations are doing regularly on all the re-plantation sites.
Estimation of baseline situation of parameter		Re-plantation did not exist before the project was developed.
Future target for parameter		Normal re-plantation maintenances or conservations will be conducted regularly on all the re-plantation sites.
Way of monitoring	How	Copy of re-plantation maintenance records will be used to specify the re-plantation conservation situation.
	When	Records will be compiled annually. All related records will be provided and verified by the DOE.
	By who	The project owner.

No		3
Indicator		Quality of employment
Mitigation measure		N/A
Repeat for each parameter		
Chosen parameter		Training, Labour conditions
Current situation of parameter		The technical and security staffs are trained by InfraVest and Enercon. The training includes technical, environmental and security knowledge, and operational and maintenance

[41] http://www.taipower.com.tw/content/new_info/new_info-a57.aspx?LinkID=5

		instructions. Welfare provided for their well being complies with the national regulations (Labour Standards Act[42], etc.).
Estimation of baseline situation of parameter		Employment did not exist before the project was developed.
Future target for parameter		Employees will receive conventional trainings from InfraVest or Enercon. The training will include technical, environmental and security knowledge, and operational and maintenance instructions. The project owner will provide health insurance and labor insurance for the employee. Working hours will be in compliance with applicable regulations.
Way of monitoring	How	Copy of training records will be used to specify number of employees attending the trainings and the training contents. Copy of insurance lists will be used to specify the insurance status of employees.
	When	Data will be compiled and monitored annually. All related records will be provided and verified by the DOE.
	By who	The project owner.

No		4
Indicator		Quantitative employment and income generation
Mitigation measure		N/A
Repeat for each parameter		
Chosen parameter		Number of jobs, Salary level
Current situation of parameter		All employees are fairly compensated (salaries qualify above the required minimum wage).
Estimation of baseline situation of parameter		Employment opportunity did not exist before the project was developed.
Future target for parameter		The project provides employment to permanent staffs for wind farms operation and all staff will be fairly compensated (above the required minimum wage). The project owner provides health insurance and labor insurance for the employee. Working hours and staff's salary is in compliance with applicable regulations.
Way of monitoring	How	Copy of employment contract and the labour insurance list from Labour Insurance Bureau will be used to specify number of permanent employees of the project owner and to indicate the salary levels. The project owner will also provide a chart of employment, specifying the number of manpower allocated in the project activity.
	When	Data will be compiled and monitored annually. All related records will be provided and verified by the DOE.
	By who	The project owner will keep all employment records.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

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Date of completion of application of methodology and standardized baseline: November 20, 2014

The baseline has been prepared by South Pole Carbon Asset Management Ltd.

Contact information of responsible persons/entities:

[42] http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL014930

Jane Duan
South Pole Carbon Asset Management Ltd.
Technoparkstrasse 1
8005 Zurich
Switzerland
Phone: +41 43 501 35 50
Fax: +41 43 501 35 99
j.duan@southpolecarbon.com

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
The start date of the project activity is chosen as the financial closure date of the two wind farms i.e. 21 September 2006 (see section B5 in the "early consideration" paragraph for an explanation).

C.1.2. Expected operational lifetime of project activity

>>
The grid tariff is guaranteed for 15 years extendable to 20 years, the operational lifetime of the project activity is therefore chosen as 20 years.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewable crediting period.
This is the second crediting period.

C.2.2. Start date of crediting period

>>
Start date of the first crediting period: 14/01/2008
Start date of the second crediting period: 14/01/2015

C.2.3. Length of crediting period

First crediting period: 7 years and 0 months
Second crediting period: 7 years and 0 months
Total: 7 x 3 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The Environmental Impacts Assessment (EIA) of the project activity was carried out by InfraVest and was supervised by the Environmental Protection Agency (EPA). For Changbin Wind Farm, the EPA organised the first examination meeting of the Environmental Impact Assessment of Phase I on September 21st, 2004 and the site visit later on December 8th, 2004. The site visit of Phase II

was held later, on January 17th, 2005. For Taichung Wind Farm, the EPA concluded to offer a conditional approval on November 29th, 2004. As every requirements set by the EPA were completed for both wind farms, the project activity has started to take place.

Copy of the EIA reports will be provided to the DOE during validation upon request.

Requirements and main conclusions of the EIA:

Requirement of the EPA		Conclusion	Actions taken during the first crediting period
Physics and Chemical Environment Assessment	1. Terrain, Geology and Earth	Since the west coast faces directly the wind direction, although the turbines are proved to lower the speed of the wind, additional windbreaks are recommended for this area to stop the thick sands from the wind.	Windbreak has already been replanted. The final total re-plantation target area was settled as 15,234.67 m^2 and 2,400 m^2 for Changbin and Taichung wind farms respectively[43]. And the re-plantation targets have already been completed in 2011 [44] within the first crediting period and verified by DOE during pervious verifications.
	2. Water Quality	No negative effects are reported. The project is not in the water quality protection area and is in a safe distance of any source of drinking water.	
	3. Waste from projects	Wind farm produce few waste during its activity, the impact is thus considered negligible.	
	4. Noise and Vibration	Wind turbines produce low frequency noises; the impact is thus considered very limited.	
	5. Weather and Air Quality	Concerns over dust that might fly in the air during the construction phase are raised. Another impact on the air quality might be the sulphur emissions during construction. Impact on weather is limited.	InfraVest watered the land (dust is emitted when moisture content of land is insufficient) during construction to minimize the impact on the air quality Low sulphur diesel engines had been adopted to reduce the pollution during construction.
Ecology	6. Animal Life	Concerns regarding the impact of	Bird watching points are

[43] Changbin EIA - Third Changes Chart, Table 2.3; Taichung EIA – Differences Analysis Report, Section 2.2.2

[44] Changbin wind farm: Inspection records of re-plantation in Siansi and Lugang area (dated 18/04/2011, 24/06/2011 and 27/09/2013)

Taichung wind farm: Inspection records of re-plantation in Shuangliao, Taichia area (dated 13/12/2010 and 04/05/2011)

Environment	on the land	the wind farm on birds' activity are raised.	set to monitor the wind farm impact on the birds' activity. InfraVest had contracted with Ming-Shiang Ecological Census Consultant Co., Ltd. for monitoring the bird population. According to the contract, Ming-Shiang would monitor the bird ecology in the wind farm boundary seasonally, for a total period of 2 years. Each year in 2 years period, this company would provide a report to InfraVest for elaborating the outcome of the bird monitoring. For Changbin wind farm, the bird monitoring period had already ended in March 2010, while for Taichung wind farm, the bird monitoring period has already ended in February 2011. As per the bird monitoring reports, there was no negative impact observed.
	7. Research on Birds		
Sociology and Economy	8. Residents Characteristics	The project activity will make the second industry (manufacturing) and third industry (services) more prosperous by bringing almost 50 job opportunities	
	9. Economic Environment	Job opportunities are increased and the service industry and income of the local residents will be promoted as well	
	10. Industry Structure	The wind farm is expected to promote tourist activities in the area and increase opportunities to the local industries. Farming will not be influenced by the project activity.	
	11. Usage of Land	Concerns over the usage of land arise from Taiwan's mountainous geographical characteristic which limited the human's activity space and agrarian lands. However, the project is to develop in terms of dots not facets, meaning the	

		distance between Each turbine is considered significant and there is plenty of room for other purpose of land, if any. Basically there will be no severe impact on the usage of land. Furthermore, the turbines are built on public land, managed by the government, and it is not dedicated for agrarian or residential purposes.	
	12. Infrastructure	There will be 10 staffs during construction period in average time while 30 in peak time; employment will be mainly offered to local residents that there would not be extra demand for existing infrastructure.	
	13. Transportation: overview and traffic analysis	Impact on traffic depends on the service quality of the road during the transportation of staff, machine and material. The project-derived one way traffic is 29 p.c.u [45] /hr. However, the construction period is short and the transportation will avoid the heavy hours in such extend that generally the overall impact on traffic is limited	
Tourism Impact	14. Scenery Study and Entertainment Study	Concerns over construction that it might devastate the scenery of the area. However, the windbreak would cover the construction scene during the construction period	
Cultural Environment	15. Excavation	No excavation found.	
	16. Ancient Buildings	No ancient buildings in the designated site have been reported.	
	17. Cultural Customs and Religions	No impact on close cultural customs and religions activities	

Prior to EIA, InfraVest conducted a survey using questionnaire to serve the purpose of stakeholder consultation, which constituted as part of the EIA report. On May 4th, 2005, InfraVest received the conditional offer from the Environmental Protection Bureau. Before construction in 2006, InfraVest organized the public hearing according to the Environment Impact Assessment Law, Article 7[46] "*For those circumstances in which the competent authority deems in the review conclusion in the foregoing paragraph that it is not required that a phase II environmental impact assessment be conducted and for which permission is received, the developer shall hold a public explanation meeting.*" Issues addressed in the meeting are summarized in Section E.2.

[45] Passenger car unit

[46] http://ivy5.epa.gov.tw/epalaw/search/LordiDispFull.aspx?ltype=03&lname=0010

D.2. Environmental impact assessment

>>

As stated in the EIA report, no environmental impacts are considered significant.

Aside from the EIA results, since Taiwan is considered a sensitive place for bird migration, a particular research was conducted during the EIA process, which is summarized as the following:

> Method: Counting Flocks, Counting Roosts (Sutherland 1996).
> Bird species and population that dominates the region, such as land birds, egrets, and water birds, are monitored at different periods of time, according to the migrating cycles of each group. Due to the contrast between the broad radius of bird activity and the limited area of individual wind turbines, the monitoring areas are focused at the planned positions of the turbines and the surroundings. The wind farm is divided into several regions, each consists of few turbines. Organisms living within each region are recorded, and the impacts of the proposed project towards their existence were assessed. There was no endangered bird species identified living in the wind farm region.
> In order to minimize the impacts on local bird population, the project owner made a commitment of a small scaled, phase-by-phase construction process, and demanded the construction workers not to conduct any distractive actions towards the wilderness in the region. The bird population shall as well be monitored continuously within 2 years period of operation, by Ming-Shiang Ecological Census Consultant Co., Ltd. (appointed by the project owner). In the cases that the monitored number of population was decreasing rapidly and significantly, the project owner will conduct a cause research and will take necessary actions to minimize and/or prevent the effect in the future.
> Bird monitoring assessment for Changbin wind farm was carried out since January 2003 until June 2004, while Taichung wind farm's was carried out through the mid to end of the year 2004. The greater number of bird species and/or population is found at the areas surrounding turbines number: 17-21, 23, 3, and 22, in Taichung wind farm. In order to minimize the impacts of the project towards the bird population within such areas, construction schedules were carefully planned, to avoid the breeding season of the concerned species. Furthermore, the project owner was also leaning towards a more conservative approach when determining the distances between the above mentioned turbines. The distances range at the minimum of 350 meters and maximum of 830 meters, which is up to few times the diameter of the blades (approx. 80 meters).
> The bird migration altitude normally ranges at 240 m - 300 m, while the height of wind turbines ranges at 99-135 m. The chance of collision between the migrating birds and the wind turbines is therefore minimized, given such height difference and the broad distances between the turbines. Supporting case studies in the subject are available, based on the previously built wind farms in other countries[47]. In a conclusion, the effect towards bird migration was considered in the wind farm planning.

As per GS Pre-assessment Report, concerns on wind farm development may lead to soil erosion was raised. According to the results of EIA[48], this project activity will not bring any impacts to the soil condition. InfraVest had also committed to re-plantation in order to compensate on any damages to the windbreaks during the construction phase[49]. To behave the great circumspection, this indication was added to the monitoring plan during the first crediting period of the project activity. The re-plantation targets have already been completed within the first crediting period, and the re-plantation records have already been verified by DOE during previous verifications. Normal conservations are now doing regularly on all the re-plantation sites.

About other impacts please see the table of requirements and main conclusions of EIA in previous section.

[47] EIA report, section '参考文献'

[48] EIA report, Chapter 7.1.1

[49] EIA report, Chapter 11.1 point 3.2

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

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Concerning the interests of the local stakeholders, the project owner collected opinions from them in various occasions and forms

Public Consultation in EIA

In Environment Impact Assessment (EIA) process, a public hearing with the local residence is necessary before the construction started (see Environment Impact Assessment Law, Article 7). The public hearing was arranged on July 18th, 2006 for Changbin and on July 19th, 2006 for Taichung. The official invitation letters were sent on June 28th, 2006 and July 6th, 2006 respectively.

For Changbin, the invitees include Industrial Development Bureau, Bureau of Energy, Environmental Protection Agency, Taipower, Changhua County, Changhua County Environmental Protection Bureau, Shangsi Township, Lugang Township, Shangsi representative of residents, Lugang representative of residents and local residents.

For Taichung, the invitees include Bureau of Energy, Environmental Protection Agency, Taipower, Taichung County, Environmental Protection Bureau Taichung County, Tachia Township, Taan Township, Tachia representative of resident, Daan representative of resident, and local residents.

July 18th, 2006	Public hearing required for the Environment Impact Assessment of Changbin's wind farm was held at the Service Center of Industrial Technology Research Institute, Changbin Industrial District.
July 19th, 2006	Public hearing required for the Environment Impact Assessment of Taichung wind farms was held at Tachia township government

First Round Stakeholder Consultation (was conducted on May 23rd, 2008)

Two separate emails and web consultations have been organized: one for Changbin wind farm and one for Taichung wind farm. They were started on May 23rd, 2008 separately for both farms.

South Pole Carbon Asset Management Co., Ltd. invited international stakeholders through emails. Recipients of invitation included Gold Standard, local supporters of Gold Standard, Greenpeace and WWF in China and Hong Kong, academic researchers and local NPOs (non profit organizations) for Taichung project. The list of the recipients is shown below:

Organization Invited	Email address
Gold Standard	info@cdmgoldstandard.org
Mr. Liam Salter, WWF	lsalter@wwf.org.hk
The climate group	joshharris@theclimategroup.org
Ms. Hsin Hsin Hsu, Taiwan Environmental Information Center	Hsin2@e-infor.org.tw
Mr. Wim Chang, Delta Foundation	Wim.chang@delta-foundation.org.tw
Professor Wanli Cheng, Environmental Science and Engineering Department, Tonghai University	wlcheng@thu.edu.tw

Dr. Youngshun Sheng, Environmental Science and Engineering Department, Dayeh University	ysshen@mail.dyu.edu.tw

South Pole Carbon Asset Management Ltd. also made the non-technical descriptions of the project design document and potential environmental impacts publicly available through the website "*http://www.southpolecarbon.com/projects/project_development_standards/consultations*". Comments from stakeholders were also invited over the Internet.

The Second Round Stakeholder Consultation

According to the Gold Standard Pre-assessment Report, the project proponent had to carry out a second round Stakeholder Consultation for Changbin and Taichung wind farms during which public comments were once again invited. The Second Round Stakeholder Consultation consists of a public meeting and a site visit involving the local stakeholders. The Public meeting was held in Dagangcheng Seafood Restaurant in Lugang, Changhua County on December 18th, 2008. InfraVest invited all stakeholders including local NGO's and the international NGO's.

Date of Invitation	December 2nd, 2008
Date of Consultation Meeting	December 18th, 2008
Invitations Sent by	South Pole Carbon Asset Management Ltd.
Means of Invitation	Email and Letters
Consultation Conducted by	Chungwei Wind Power Co., Ltd., Luwei Wind Power Co., Ltd., and South Pole Carbon Asset Management Ltd.
Venue of Consultation Meeting	Dagangsheng Seafood Restaurant / 168, Ziyou Road – Lugang, Changhua County, Taiwan R.O.C
Website of Consultation	http://www.southpolecarbon.com/projects/project_development_standards/consultations

The field visit trip for the stakeholders was held earlier that day, in order to let local stakeholders take a closer look at the wind farm. The main purpose of the trip was to give the opportunity to the stakeholders to gain further insights on the wind farm operation, the equipments and the surroundings. They were tour-guided by InfraVest's professional team which provided explanations throughout the three hour trip.

Mr. Roger Lee, the Assistant of the Vice-General Manager of InfraVest made an oral presentation on the project. Furthermore, a written project description and a questionnaire were handed out during the meeting. The questions, comments and requests related with the project were received and replied in a transparent way.

The List of NGO invited to the 2nd round Stakeholder Consultation:

NGO Invited	Email address
Gold Standard	info@cdmgoldstandard.org
Mr. Liam Salter, WWF	lsalter@wwf.org.hk
Mr. Steve Sawyer, Green Peace	Steve.Sawyer@diala.Greenpeace.org
Mr. Josh Harris, Climate Group	joshharris@theclimategroup.org
Mr. Rosa Tsou, NEAT Taiwan	Master.neat@mas.hinet.net
Ms. Dorothy McIntosh	dmclntosh@uk.mercycorps.org
Mr. John French	John.french@reeep.com

List of attendees:

Participants	M/F	Organisation / Firm	Function	Contact

Xu, Mao Rong	M		Local Resident	+886 932 543 711
Chen, Ken Zheng	M		Local resident	+886 4 2681 4027
Xu, Wan De	M		Local Resident	+886 4 7764 992
Huang, Jun Jie	M		Local resident	+886 4 776 8636
Xu, Ting Yu	M		Local resident	+886 920 738 331
Xu, Zhan	M		Local resident	+886 937 738 331
Chen, Shun Wen	M		Local resident	+886 4 2681 4607
Liu, Zhen Xing	M		Local resident	89, Ling Jiang Rd., Jian Xing Village, Dajia County
Zhong Lin, Yan Hui	M		Local resident	7, Ru Yi Road, Jian Xing Village, Dajia County
Cai, Xin Lang	M		Local resident	12, Ru Yi Rd., Jian Xing Village, Dajia County
Li, Shi Hong	M		Local resident	+886 4 2681 2835
Wu, Zhen Rong	M		Local resident	+886 4 2681 8799
Guo, Wan Lai	M		Local resident	+886 937 723 503
Shao, Yong Ci	M		Local resident	14, Ru Yi Road 12th Lane, Jian Xing Village Dajia County
Huang, Wen Xiong	M		Local resident	+886 963 188 099
Li, Chun Rong	M		Local resident	15, Ling Jiang Rd., Jian Xing Village, Dajia County
Wu, Hui Er	M		Local resident	6, Ru Yi Road, Jian Xing Village Dajia County
Wu, Qiu Jiang	M		Local resident	+886 4 2681 3005
Guo, Rong Fu	M		Local resident	+886 4 2681 2477
Zhuang, Zheng Er	M		Local resident	+886 2681 5352
Yong, Jia Ming	M			+886 4 2681 5350
Guo, Shu Yue	F		Local resident	+886 928 064 628
Zhang, Qiong Fang	F		Local Resident	+886 4 776 8772
Lin, Feng Qiao	F		Local resident	+886 4 2681 6706
Yang, Mei Xue	F		Local resident	+886 4 778 0940
Chen, Mei Xiang	F		Local resident	+886 4 777 5492
Xu, Ying Fan	F		Local resident	+886 4 777 4985
Deng, Yue Xia	F		Local resident	+886 4 2681 2477
Lin, Rui Ruan	F		Local resident	+886 4 2681 2448
Liang, Zuo Nei	M		Local resident	+886 2681 2182
Zhuang, Yuan Xuan	M		Local resident	+886 6812 075
Zheng, Zheng Chun	M		Local resident	113, Ling Jiang Road, Jian Xing Village, Dajia County
Zeng, Yong Kang	M		Local resident	+886 919 815 009
Lin, Zheng Shun	M		Local resident	+886 932 537 730
Zhuang, Dong Sheng	M		Local resident	+886 4 268 111 63
Huang, Zhen Gao	M		Local resident	+886 937485 527
Wang, Jing Nan	M		Local resident	+886 4 777 1223
Wu, Wen Nan	M		Local resident	+886 4 2681 2090
Wu, Zheng Zhu	M		Local resident	+886 4 2681 2090

Zhang, Song Han	M		Local resident	+886 776 2259
Li, Ming Ying	F		(Rep.) Head of Jian Xing Village	+886 912 397 701
Zhuang, Jia Cun	M		Dajia County Representative	+886 932 537 829
Rosa Tsou	F	NEAT Taiwan	General Secretary	+886 2 2381 2580
Richard Huang	M	SGS Taiwan	Project Management Professional	+886 2299 3279
Alfie Zheng	M	SGS Taiwan	GHG Project Verifier	+886 2299 3279
Sam Lin	M	SGS Taiwan	GHG Project Verifier	+886 2299 3279

GS Stakeholder Feedback Round (SFR)

The Stakeholder Feedback Round started on December 3rd, 2008 and ended on February 3rd, 2009. Some invitations are sent via emails and the documents related to the project are published on South Pole Carbon Asset Management Ltd. official website. "http://www.southpolecarbon.com/projects/project_development_standards/consultations"

The documents that were posted on the invitations and website were:

- The original Project Design Document
- A non-technical summary of the Project Design Document
- The invitation to the public meeting

Following NGOs are specifically invited by email to comment on the project:

NGO Invited	Email address
Gold Standard	info@cdmgoldstandard.org
Mr. Liam Salter, WWF	lsalter@wwf.org.hk
Mr. Steve Sawyer, Green Peace	Steve.Sawyer@diala.Greenpeace.org
Mr. Josh Harris, Climate Group	joshharris@theclimategroup.org
Mr. Rosa Tsou, NEAT Taiwan	Master.neat@mas.hinet.net
Ms. Dorothy McIntosh	dmcIntosh@uk.mercycorps.org
Mr. John French	John.french@reeep.com

E.2. Summary of comments received

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Two separate public consultations have been organized: one for Changbin wind farm and one for Taichung wind farm.

Public Consultation in EIA for Changbin wind farm

The public hearing required by the Environment Impact Assessment was held at the Service Center of Industrial Technology Research Institute, Changbin Industrial District, on July 18th, 2006. The goal of the public hearing is to communicate with the local residence and to solve their concerns over the project.

List of people invited to the meeting:

20 days before the meeting, invitations were sent by letter. The 18th of July 2006, 30 people, excluding the staff from project owner attended the meeting. Local press came to report this event as well.

1. IDB (Industrial Development Bureau)
2. BOE (Bureau Of Energy)
3. EPA (Environmental Protection Agency)
4. TPC (Taipower Company)
5. ZhangHwa County
6. ZhangHwa County EPB (Environmental Protection Bureau)
7. ShangSi Township
8. Lugang Township
9. ShangSi representative of resident
10. Lugang representative of resident
11. Local resident

Program of the meeting:

1. Presentation: the host, Ms, Yuni Wang, Vice President of InfraVest made a 30-minute briefing on the company introduction, background of building the wind farm and reasons to initiate the consultation. She appreciated the attendees' participation on behalf of the project owner and sincerely invited comments from these people.
2. Discussion: the VP of InfraVest, Yuni Wang is the moderator during the 90-minute discussion.

Short summary of the meeting:

Since the original opinions are Chinese in EIA report, a short summary in English is presented here.

The general outcome of the meeting was positive; the stakeholders are in favour of the project.
The key concerns addressed in the stakeholders' meeting regarding Changbin wind farm can be summarized as following:

- The job opportunities to the locals created by the project
- The possibility of developing the wind farm as a tourist spot

The habitants emphasised the importance of the job opportunities created by the project. InfraVest GmbH stated that it is their will to have the locals hired for the construction, operation and maintenance in the hope to bring this area to a prosperous future. InfraVest GmbH is willing to cooperate with local governments on the relevant job training, environmental education activities and tourist spot development.

InfraVest GmbH also committed to provide the neighbourhood with the cash reward totalled €8,511/MW[50], paid in 20 years once the wind farm begins its operation.

During the consultation, the following concerns were raised by the public. The following table summarized the concerns and the response made by InfraVest:

Concerns raised	Response
Noise evaluation and the lines to connect the national grid might devastate the view	In terms of the noist evaluation, InfraVest GmbH responded that the low frequency noise is less than 35 dB(A) and the turbines are erected in areas far from the factor and residence district, therefore the noise nuisance is not perceived as a problem. And to the concerns that whether the lines to connect the national grid might devastate the view, InfraVest GmbH stated that all the lines will be constructed underground

[50] €/NTD=47 from Central Bank of Taiwan on 2008/2/20 (http://www.cbc.gov.tw/public/Attachment/4112517494171.pdf)

	which won't have impact on the view.
To build the wind farm one might have to cut down trees in the windbreak forest	InfraVest further explained that the turbines are to be set up at the border of the windbreak forest or the empty field and that they won't have to cut down the trees. Plants will also be planted around the area to make the area greener.
The project owner is not the national electricity utility but IPP	There was a minor issue raised that why the wind farm developer is an independent power provider. To this, InfraVest GmbH replied that it requires both public and private sector's effort to achieve the governmental goal of installing 2,159 MW of wind power by 2010.

Public Consultation in EIA for Taichung wind farm

The public hearing required by the Environment Impact Assessment was held at the first meeting room in Tachia township government, Taichung County, on June 19th, 2006. The goal of the public hearing is to communicate with the local residence and to solve their concerns over the project.

List of people invited to the meeting:
13 days before the meeting, invitations were sent by letter. The July 19th, 2006, 30 people, excluding the staff from project owner attended the meeting.
1. BOE (Bureau Of Energy)
2. EPA (Environmental Protection Agency)
3. TPC (Taipower Company)
4. Taichung County
5. Taichung County EPB (Environmental Protection Bureau)
6. Tachia Township
7. Taan Township
8. Tachia representative of resident
9. Taan representative of resident
10. Local resident

Program of the meeting:

1. Presentation: the host, Ms, Yuni Wang, VP of InfraVest made a 30-minute briefing on the company introduction, background of building the wind farm and reasons to initiate the consultation. She appreciated the attendees' participation on behalf of the project owner and sincerely invited comments from these people.
2. Discussion: the VP of InfraVest, Yuni Wang is the moderator during the 90-minute discussion.

Short summary of the meeting
The full report is in Chinese. A short summary in English is presented here.

The general outcome of the meeting was positive; the stakeholders are in favour of the project. The key concerns addressed in the stakeholders' meeting regarding Taichung Wind Project can be summarized as following:

- The job opportunities to the locals created by the project
- The possibility of developing the wind farm as a tourist spot

The habitants emphasised the importance of the job opportunities created by the project. InfraVest GmbH stated that it is their will to have the locals hired for the construction, operation and maintenance in the hope to bring this area to a prosperous future. InfraVest GmbH is willing to cooperate with local governments on the relevant job training, environmental education activities and tourist spot development.

InfraVest GmbH also committed to provide the neighbourhood with the cash reward totalled €2,960/MW[51], paid in 20 years once the wind farm begins its operation.

During the consultation, the following concerns were raised by the public. The following table summarizes the concerns and the response made by InfraVest:

Concerns raised	Response
Noise evaluation and the lines to connect the national grid might devastate the view	In terms of the noise evaluation, InfraVest GmbH responded that the low frequency noise is less than 35 dB(A)[52] and the turbines are erected in areas far from the factory and residence district, therefore the noise nuisance is not perceived as a problem. And to the concerns that whether the lines to connect the national grid might devastate the view, InfraVest GmbH stated that all the lines will be constructed underground which won't have impact on the view
To build the wind farm one might have to cut down trees in the breakwind forest	InfraVest further explained that the turbines are to be erected along the breakwind forest. Access roads for each turbine will be built by avoiding passing through the forests to limit the ecological impact.
People asked if turbine will stop during Typhoon	InfraVest replied that the turbine will stop when the speed of wind reaches 25 meter/second.

First Round Stakeholder Consultation

South Pole Carbon sent the email invitation on May 23rd, 2008, to Gold Standard, Gold Standard supporting organizations in Hong Kong, local non profit organizations (NPOs) and academic researchers.

The NPOs we sent the invitation to are Taiwan Environmental Information Centre (TEIA)[53] and Delta Foundation[54]. They are chosen because their websites are catered to communicate with the popularity; transforming the knowledge or environmental issues to a daily language that makes the topic easier to access. Considering these, the project participants think they might be able to provide comments represent the majority of the stakeholders.

The academic researchers chosen are specialists from the Environmental Science and Engineering area.

- Professor Cheng served in the UNEP based in Kenya before he accepted the teaching profession in Tunghai University. Now the director of environmental science and engineering department, he is often invited to participate in the public / private project evaluation from the environmental point of view.
- Dr. Shen works closely with the Industrial Technology Research Institute (ITRI) to promote the industrial carbon reduction project. He has good knowledge on CDM, and global carbon trading mechanism.

[51] €/NTD=47 from Central Bank of Taiwan on 2008/2/20 (http://www.cbc.gov.tw/public/Attachment/4112517494171.pdf)

[52] Regulation of noise evaluation model during construction, Appendix 7.1.4-A, Taichung EIA

[53] Website of TEIA: http://teia.e-info.org.tw/

[54] Website of Low Carbon Life Blog, Delta Foundation http://lowestc.blogspot.com/

Therefore, we believe these experts would be able to give the neutral feedbacks from their experiences and knowledge.

Simultaneously, the invitations together with all documents were uploaded to the website of South Pole Carbon Asset Management Ltd, at address of: http://www.southpolecarbon.com/projects/project_development_standards/consultations.
Documentation prepared in Mandarin (Chinese official language). These documents are available as hardcopies and will be handed over to the Designated Operational Entity (DOE) conducting the Gold Standard validation process.

Comments from the Consultation

Two emails have been received during the email consultation

Email 1: TEIA apologized for not being able to provide any comments on the project because of the limited time and human resources in the organization. They appreciated our invitation but addressed that reviewing the project is beyond their capability at the moment.

Email 2: Professor Cheng, did not comment on the project nor state any major concerns in the questionnaire.

Email Stakeholder Consultation Report is made publicly available at South Pole Carbon's official website: "http://www.southpolecarbon.com/projects/project_development_standards/consultations".

The Second Round Stakeholder Consultation

One comment received during the public meeting:

- One of the local stakeholders expressed an inquiry, wondering if the wind turbine would rotate to the wind direction.

2nd Round Stakeholder Consultation Report is made publicly available at South Pole Carbon's official website:
"http://www.southpolecarbon.com/projects/project_development_standards/consultations".

Besides the above opinions, there were no other comments on this project.

GS Stakeholder Feedback Round (SFR)

There were no comments received up to the date of the completion of the Main Stakeholder Consultation.

E.3. Report on consideration of comments received

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InfraVest's responds for Email and Web Stakeholder Consultation

Only two emails have been received during the email consultation. Since no comments were received from the email and web, no responds were given by InfraVest.

InfraVest's responds for the 2nd round Stakeholder Consultation

For the concerns about rotation of wind turbines, Mr. Roger Lee, the Assistant of the Vice-General Manager of InfraVest, explained that the wind turbine would not rotate following the wind direction.

Besides these, no comments received up to the date of the completion of the PDD for the first crediting period.

SECTION F. Approval and authorization

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N/A

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Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☐ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	InfraVest Wind Power Group
Street/P.O. Box	10-2F, No. 9, Sec. 2, Roosevelt Rd.
Building	
City	Taipei
State/Region	
Postcode	100
Country	Taiwan
Telephone	+886 2 2395 4886
Fax	+886 2 2395 1580
E-mail	info@infra-vest.com
Website	http://www.infra-vest.com/
Contact person	Karl Eugen Feifel
Title	President
Salutation	Dr.
Last name	Feifel
Middle name	Eugen
First name	Karl
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	feifel@infra-vest.com

Project participant and/or responsible person/ entity	☐ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	South Pole Carbon Asset Management Ltd.
Street/P.O. Box	Technoparkstr. 1
Building	
City	Zurich
State/Region	Zurich
Postcode	8005
Country	Switzerland
Telephone	+41 43 501 35 50
Fax	+41 43 501 35 99

E-mail	info@southpolecarbon.com
Website	www.southpolecarbon.com
Contact person	Renat Heuberger
Title	
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

There is no public funding from Annex I countries involved in the project activity.

Appendix 3. Applicability of methodology and standardized baseline

N/A

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

According to the "Tool to calculate the emission factor for an electricity system" (Version 04.0), six steps shall be applied for calculating the emission factor:

Step 1: Identify the relevant electric systems

A project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

A national connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system. Taiwan is an island with no cable connection with the continent. Thus there is not any connected electricity system in Taiwan. The spatial extent of the Project Boundary is defined as the insular electricity grid of Taiwan operated by Taipower Company. Figure A4-1 below shows Taiwan electricity system.

Figure A4-1. Taiwan power grid map[55]

The source of data used in calculation of OM and BM is publicly available in Taiwan:

- Energy Balances in Taiwan (from the Bureau of Energy[56]), which give access to electricity production and fossil fuel consumption in Taiwan by sectors.

As it will be explained below, the data will be used for calculating the operating margin and the build margin.

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

According to "Tool to calculate the emission factor for an electricity system (Version 04.0)", project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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.

[55] http://www.taipower.com.tw/e_content/content/about/about01-1.aspx?sid=4

[56] Energy Balances in Taiwan: Energy Balance Sheet – OECD Energy Statistic Format (Original Unit), http://web3.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

Since option II requires collecting data on off-grid power generation, while such data is not publicly available in the region, thus the off-grid power plants are excluded from the calculation and option I is chosen.

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

In order to calculate the Operating Margin, the emission factors of fossil fuels are listed in the following table:

Table A4-1 Net Calorific Values ($NCV_{i,y}$) multiplied by $EF_{CO2,i,y}$ of fossil fuel used for OM and BM calculation

Fuel Type	$EF_{CO2,i,y}$ * $NCV_{i,y}$[57]	Unit
Bituminous Coal – Steam Coal	2.22	tCO_2/t
Sub-Bituminous Coal	1.90	tCO_2/t
Coke Oven Gas	0.66	$KgCO_2/M^3$
Blast Furnace Gas	0.71	$KgCO_2/M^3$
Oxygen Steel Furnace Gas	1.13	$KgCO_2/M^3$
Diesel Oil	2.55	$KgCO_2/L$
Residual Fuel oil	3.03	$KgCO_2/L$
LNG	2.05	$KgCO_2/M^3$
Petroleum Coke	2.85	$KgCO_2/Kg$
Natural Gas	1.82	$KgCO_2/M^3$
Refinery Gas	1.82	$KgCO_2/M^3$

According to "Tool to calculate the emission factor for an electricity system (Version 04.0)", the calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

The simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Hydro power, nuclear power, geothermal electricity, solar photovoltaic, wind energy, biomass power and waste to generation are defined as low-cost/must-run resources, which turns out to be between 21.17% and 22.67% of the total electricity generation during years 2009 and 2013:

Table A4-2 Gross and Net Electricity Generation (EG_y) in Taiwan[58]

	Unit	2009	2010	2011	2012	2013
Total electricity generation	MWh	233,562,285	250,785,847	255,733,038	253,862,468	255,875,507
Total low-cost/must-run	MWh	52,947,420	53,658,833	54,138,650	54,091,229	55,750,472
Share of low-	MWh	22.67%	21.40%	21.17%	21.31%	21.79%

[57] http://ghgregistry.epa.gov.tw/Tool/tools.aspx

[58] Extracted from the "Energy Balances Sheet in Taiwan", Bureau of energy, http://web3.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

cost/must-run						
Total power plants own use	MWh	10,083,085	10,628,686	10,678,208	10,556,467	10,223,738
Total low-cost/must-run power plants own use	MWh	1,634,110	1,645,131	1,642,496	1,584,200	1,610,638
Net generation excl. low-cost/must-run	MWh	172,165,890	188,143,459	192,558,676	190,798,972	191,511,935

Since the average share of electricity generation by low-cost/must-run resources for five most recent years is found to be less than 50%, simple OM method (Option a) is chosen. The simple OM emission factor can be calculated using either of the two following data vintages:

(a) *Ex-ant option*: if the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;

(b) *Ex-post option*: if the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The *ex-ante option* is selected to calculate the operating margin emission factor of the proposed project. A 3-year generation-weighted average, based on the most recent data available at the time of submission of the PDD to the DOE for validation, is used. Monitoring and recalculation of the emission factor during the crediting period is not required.

Step 4: Calculate the operating margin 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.

The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO_2 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.

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

Complete plant-specific data required by Option A is unavailable, Taipower can furnish some plant specific data but only for the power plants they operate, these numbers do not comprise all independent power producers for which plant specific statistics are not available.

Option B is adopted since the necessary data for option A is not available; only renewable sources and nuclear are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and the off-grid power plants are not included in the calculation (Option I in step 2 was chosen). According to the "*Tool to calculate the emission factor for an electricity system version 04.0*," under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

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

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FC_{i,y}$ = Amount of fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
EG_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 fuel types combusted in power sources in the project electricity system in year *y*
y = The relevant year as per the data vintage chosen in Step 3

Table A4-3 Amount of fuel type i consumed by power plants/units in year y[59]

Year		Fuel	Fuel Units	Public Electricity Plants	Public Cogeneration Plants	Autoproducer Cogeneration Plants
2011	Solid	Bituminous Coal - Steam Coal	t	23,335,772	1,125,389	9,283,974
		Sub-Bituminous Coal	t	12,795,305	0	291,517
		Coke Oven Gas	km^3	0	0	492,060
		Blast Furnace Gas	km^3	0	0	6,126,470
		Oxygen Steel Furnace Gas	km^3	0	0	506,960
	Liquid	Refinery Gas	km^3	0	0	16,542
		Diesel Oil	kL	56,902	0	0
		Residual Fuel Oil	kL	1,771,246	5,337	487,517
		Petroleum Coke	t	0	0	388,365
	Gas	Natural Gas	km^3	0	0	5,045
		LNG	km^3	12,446,698	0	97,871
2012	Solid	Bituminous Coal - Steam Coal	t	20,829,928	1,092,184	8,689,515

[59] Source: from the Energy Balance Sheets in Taiwan,
http://web3.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

		Sub-Bituminous Coal	t	15,780,246	0	338,641
		Coke Oven Gas	km^3	0	0	459,760
		Blast Furnace Gas	km^3	0	0	5,249,910
		Oxygen Steel Furnace Gas	km^3	0	0	483,300
	Liquid	Refinery Gas	km^3	0	0	15,086
		Diesel Oil	kL	53,115	0	0
		Residual Fuel Oil	kL	1,388,238	2,314	458,698
		Petroleum Coke	t	0	0	474,145
	Gas	Natural Gas	km^3	0	0	4,377
		LNG	km^3	12,824,411	0	86,039
2013	Solid	Bituminous Coal - Steam Coal	t	21,133,729	1,033,023	9,614,070
		Sub-Bituminous Coal	t	13,331,650	0	394,541
		Coke Oven Gas	km^3	0	0	531,660
		Blast Furnace Gas	km^3	0	0	5,174,730
		Oxygen Steel Furnace Gas	km^3	0	0	448,490
	Liquid	Refinery Gas	km^3	0	0	13,343
		Diesel Oil	kL	52,036	0	0
		Residual Fuel Oil	kL	1,289,733	3,694	468,950
		Petroleum Coke	t	0	0	617,185
	Gas	Natural Gas	km^3	0	0	4,367
		LNG	km^3	13,261,051	0	71,229

Table A4-4 The total CO_2 emissions by fuels of 2011, 2012 and 2013

Total Emission in 2011	tCO_2	136,862,241
Total Emission in 2012	tCO_2	134,596,672
Total Emission in 2013	tCO_2	133,783,653

Thus, the results of Operating Margin are:

$EG_{grid,OM,y}$ (2011)	tCO_2/MWh	0.711
$EG_{grid,OM,y}$ (2012)	tCO_2/MWh	0.705
$EG_{grid,OM,y}$ (2013)	tCO_2/MWh	0.699
Average $EG_{grid,OM,y}$ (2011~2013)	tCO_2/MWh	0.704

The result of Operating Margin is **0.704** tCO_2e/MWh.

Step 5: Calculate the build Margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

(a) 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. The option does not require monitoring the emission factor during the crediting period.

(b) 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 emission 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.

Option 1 is selected to calculate the build margin emission factor for the proposed project.

In accordance to the calculation method proposed by the Chinese NDRC[60] which was approved by CMD EB[61], since it is impossible to separate the different generation technology capacities based on coal, oil or gas fuel etc from the generic term of "thermal power" in the present energy statistics, the following calculation measure is taken:
First, according to the energy statistics of the selected period in which approximately 20% capacity has been added to the grid, the ratio of CO2 emissions produced by solid, liquid, and gas fuel consumption for power generation is determined; then multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency. Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% (close but not lower than 20%) of installed capacity addition to the grid. The result is the BM emission factor of the grid. The sample group of power units chosen to calculate the build margin is therefore the set of power capacity additions in the electricity system that comprise 20% of the system capacity (in MW) that have been built most recently[62]. In terms of vintage of data, Option 1 is chosen:
For the second crediting period, build margin emission factor is 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.

BM emission factor of the grid is calculated as follows:

Sub-step 1

All emission factors of fossil fuels used in calculation of the emissions of fossil fuels are referred to the table "the emission factors of fossil fuels in Taiwan" in Step 2 (Table A4-1).

Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

Where:
$F_{i,j,y}$ = the amount of fuel *i* (in a mass or volume unit) consumed by power sources

[60] The build margin calculations is derived from the "Bulletin on the baseline emission factor of the Chinese Electricity Grid", which has been published by the Chinese DNA (Office of National Coordination Committee on Climate Change) on 20/10/2011.

[61] This is in accordance with the request for guidance: Application of AM0005 and AMS-I.D in China, a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM. This approach has been applied by many registered CDM projects using methodology ACM0002 so far.

[62] Note: According to the Tool to calculate the emission factor for an electricity system (version 04.0) "If 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation."

j in year(s) y

$NCV_{i,y}$ = the net calorific value of fuel *i* in year y (GJ/t for solid and liquid fuels, GJ/m^3 for gas fuels)

$EF_{CO2,i,j,y}$ = the CO_2 emission coefficient of fuel *i* (tCO_2/GJ)

Coal, *Oil* and *Gas* stands for solid, liquid and gas fuels respectively.

Table A4-5 The total CO2 emissions by fuel ($FC_{i,y}$) of 2013[63]

	Fuel	Fuel Units	Emission (tCO_2e)	λ
Solid	Bituminous Coal - Steam Coal	t	69,112,624	-
	Sub-Bituminous Coal	t	26,084,174	-
	Coke Oven Gas	M^3	326,412	-
	Blast Furnace Gas	M^3	3,450,859	-
	Oxygen Steel Furnace Gas	M^3	476,326	-
	Sub-total	-	99,450,395	74.34%
Liquid	Refinery Gas	M^3	22,684	-
	Diesel Oil	L	132,862	-
	Residual Fuel Oil	L	5,256,353	-
	Petroleum Coke	t	1,644,213	-
	Sub-total	-	7,056,112	5.27%
Gas	Natural Gas	M^3	7,434	-
	LNG	M^3	27,269,711	-
	Sub-total	-	27,277,146	20.39%
Total		-	133,783,653	100%

Sub-step 2

Calculate the operating margin emission factor of fuel-based generation:

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$$

Where:

$EF_{Thermal,y}$ = the weighted emissions factor of thermal power generation with the efficiency level of the best commercially available technology in Taiwan in the previous three years.

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ = the emission factor of coal, oil and gas-fired power generation with efficiency levels of the optimal commercially available technology in Taiwan in the previous three years.

The optimal efficiency and emission factors of commercialized coal-fired, oil-fired and gas-fired power plant are shown as below:

Type of power plant	Variables	Emission factor (tCO_2e/MWh)
Coal fired power plant	$EF_{Coal,Adv}$	0.792
Gas fired power plant	$EF_{Gas,Adv}$	0.367
Oil fired power plant	$EF_{Oil,Adv}$	0.506

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y}$$

Where:

$CAP_{Total,y}$ = the total capacity addition of the selected period in which close but not lower to 20% capacity has been added to the grid

$CAP_{Thermal,y}$ = the total thermal power capacity addition of the selected period in which

[63] Calculated from the Energy Balance Sheets in Taiwan,

http://web3.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

approximately 20% capacity has been added to the grid

The below table shows the Installed Capacity of Taiwan Power Grid[64]:

[64] Installed Capacity Statistic (Year 1998 - 2013),
http://web3.moeaboe.gov.tw/ECW/populace/content/ContentLink.aspx?menu_id=378

	Installed capacity in 2002	Installed capacity in 2003	Installed capacity in 2004	Installed capacity in 2005	Installed capacity in 2006	Installed capacity in 2007	Installed capacity in 2008	Installed capacity in 2009	Installed capacity in 2010	Installed capacity in 2011	Installed capacity in 2012	Installed capacity in 2013	Newly added installed capacity from 2002 till 2013	Proportion against newly added installed capacity
	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	
	A	B	C	D	E	F	G	H	I	J	K	L	M=L-A	$M_{THERMAL}/M_{TOTAL}$
Hydro	4,510.8	4,510.8	4,511.7	4,511.7	4,511.7	4,523.2	4,539.9	4,538.9	4,579.4	4,642.7	4,683.3	4,683.3	172.5	1.603%
Nuclear	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	5,144.0	0.0	0.000%
Thermal	27,829.0	29,826.6	31,647.9	32,809.0	34,564.4	35,284.3	35,691.9	37,168.4	37,923.8	37,631.5	37,062.5	37,285.4	9,456.4	87.854%
Renewable Energy	611.8	624.5	654.0	697.8	829.6	927.6	995.2	1,123.0	1,237.1	1,376.4	1,534.0	1,746.7	1,134.9	10.544%
Total	38,095.6	40,105.9	41,957.6	43,162.5	45,049.7	45,879.1	46,371.0	47,974.3	48,884.3	48,794.6	48,423.8	48,859.4	10,763.8	100.00%
Share	22.03%	17.92%	14.13%	11.66%	7.80%	6.10%	5.09%	1.81%	-0.05%	0.13%	0.89%	-	-	-

The result of Build Margin is **0.606** tCO_2e/MWh.

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is using the weighted average of the Operating Margin (OM) and Build Margin (BM).

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

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 operating margin emissions factor (per cent)
w_{BM}	=	Weighting of build margin emissions factor (per cent)

The operating margin emission factor ($EF_{grid,OM,y}$) of Taiwan is 0.704 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.606 tCO_2e/MWh. The defaults weights for wind power are used as specified in the emission factor tool: w_{OM} = 0.75 and w_{BM} = 0.25

The result of the Baseline Emission Factor ($EF_{grid,CM,y}$) calculation is **0.679** tCO_2e/MWh.

Appendix 5. Further background information on monitoring plan

Please refer to Section B.7.

Appendix 6. Summary of post registration changes

N/A

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Attachment. Instructions for filling out the project design document form for CDM project activities

1. General instructions

1. When designing a project activity and completing the CDM-PDD-FORM, in addition to applying the "CDM project standard" (Project standard), the selected approved baseline and monitoring methodology(ies) (hereinafter referred to as the selected methodology(ies)) and, where applicable, the selected approved standardized baseline(s) (hereinafter referred to as the selected standardized baseline(s)), consult the "Rules and Reference" section of the UNFCCC CDM website < http://cdm.unfccc.int/ >. This section contains all regulatory documents for the CDM, such as standards (including methodologies, tools and standardized baselines), procedures, guidelines, clarifications, forms and the "Glossary of CDM terms".

2. When documenting changes occurred to the project activity after its registration in accordance with applicable provisions relating to the post registration changes process, prepare two versions of the PDDs using the CDM-PDD-FORM, one in clean version and the other indicating the changes in track-change.

3. In addition to the provisions in paragraph 2 above, provide a summary of the changes, including the reasons for the changes and any additional information relating to the changes, in Appendix 6 below.

4. Where a PDD contains information that the project participants wish to be treated as confidential/proprietary, submit documentation in two versions:

   (a) One version where all parts containing confidential/proprietary information are made illegible (e.g. by covering those parts with black ink) so that the version can be made publicly available without displaying confidential/proprietary information;

   (b) A version containing all information that is to be treated as strictly confidential/proprietary by all parties handling this documentation (designated operational entities (DOEs) and applicant entities (AEs); Board members and alternate members; panel/committee and working group members; external experts requested to consider such documents in support of work for the Board; the secretariat).

5. Information used to: (a) demonstrate additionality; (b) describe the application of the selected methodology(ies) and, where applicable, the selected standardized baseline(s); and (c) support the environmental impact assessment; is not considered proprietary or confidential. Make any data, values and formulae included in electronic spreadsheets provided accessible and verifiable.

6. Complete the CDM-PDD-FORM and all attached documents in English, or contain a full translation of relevant sections in English.

7. Complete the CDM-PDD-FORM using the same format without modifying its font, headings or logo, and without any other alteration to the form.

8. Do not modify or delete tables and their columns in the CDM-PDD-FORM. Add rows of the tables as needed. Add additional appendices as needed.

9. If a section of the CDM-PDD-FORM is not applicable, explicitly state that the section is left blank intentionally.

10. Use an internationally recognized format for presentation of values in the CDM-PDD-FORM, for example use digits grouping in thousands and mark a decimal point with a dot (.), not with a comma (,).

11. Complete the CDM-PDD-FORM deleting this Attachment "Instructions for filling out the project design document form for CDM project activities".

2. Specific instructions

1. Indicate the following information on the cover page:
   (a) Title of the project activity;
   (b) Version number of the PDD;
   (c) Completion date of the PDD (DD/MM/YYYY);
   (d) Project participant(s);
   (e) Host Party;
   (f) Sectoral scope, selected methodology(ies) and, where applicable, selected standardized baseline(s);
   (g) Estimated amount of annual average GHG emission reductions.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

1. Provide a brief description of the project activity in accordance with applicable provisions related to the description of project activity in the Project standard.
2. Also provide a brief description of (in a couple of paragraphs):
   (a) The scenario existing prior to the implementation of the project activity including, where applicable, the type of facility where the project activity will take place or replace (e.g. sugar mill, swine farm, iron smelter, etc.);
   (b) The baseline scenario, as identified in section B.4 below.
3. The full description of the technologies and measures, project boundary and baseline scenario are to be provided in sections A.3, B.3 and B.4 below.
4. If the baseline scenario is the same as the scenario existing prior to the implementation of the project activity, there is no need to repeat the description of the scenarios, but only to state that both are the same.
5. Provide the estimate of annual average and total GHG emission reductions for the chosen crediting period.
6. Include a brief description of how the project activity contributes to sustainable development (not more than one page).
7. The UNFCCC CDM website presents all methodologies linked to sectoral scopes as well as standardized baselines. The CDM Methodology Booklet also classifies methodologies by sectoral scope and type of project activities and lists standardized baselines.

A.2. Location of project activity

A.2.1. Host Party

A.2.2. Region/State/Province etc.

A.2.3. City/Town/Community etc.

A.2.4. Physical/Geographical location

1. Provide details of the physical/geographical location of the project activity, including information allowing the unique identification of this project activity and a map. Do not exceed one page for the description of location.

A.3. Technologies and measures

1. Describe the technologies and measures to be employed and/or implemented by the project activity, including a list of the facilities, systems and equipment that will be installed and/or modified by the project activity. This includes:
   (a) A list and the arrangement of the main manufacturing/production technologies, systems and equipment involved. Include in the description information about the age and average lifetime of the equipment based on manufacturer's specifications and industry standards, and existing and forecast installed capacities, load factors and efficiencies. The monitoring equipments and their location in the systems are of particular importance;
   (b) Energy and mass flows and balances of the systems and equipment included in the project activity;
   (c) The types and levels of services (normally in terms of mass or energy flows) provided by the systems and equipment that are being modified and/or installed under the project activity and their relation, if any, to other manufacturing/production equipment and systems outside the project boundary. The types and levels of services provided by those manufacturing/production systems and equipment outside the project boundary may also constitute important parameters of the description. Clearly explain how the same types and levels of services provided by the project activity would have been provided in the baseline scenario.
2. Also provide a list of:
   (a) Facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project activity;
   (b) Facilities, systems and equipment in the baseline scenario, as established in section B.4 below.
3. If the baseline scenario is a continuation of current practice, thus identical to the scenario existing prior to the implementation of the project activity, there is no need to repeat the description of the scenarios, only state that both are the same.
4. Do not provide information that is not essential to understanding the purpose of the project activity and how it reduces GHG emissions. Do not include information related to equipment, systems and measures that are auxiliary to the main scope of the project activity and do not affect directly or indirectly GHG emissions and/or mass and energy balances of the processes related to the project activity.
5. Include a description of how the technologies and measures and know-how to be used are transferred to the host Party.

A.4. Party(ies) and project participant(s)

1. List in the table below Party(ies) and project participant(s) involved in the project activity and provide contact information in Appendix 1. below.
2. When the CDM-PDD-FORM is completed in support of a proposed new methodology, identify at least the host Party and any known project participant(s) (e.g. those proposing a new methodology).

Name of Party involved (host) indicates host Party	Name of private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Name A (host)	Private entity A Public entity A	
Name B	Private entity B Public entity B	
…	…	

A.5. Public funding of project activity

1. Indicate whether the project activity receives public funding from Parties included in Annex I. If so:
   (a) Provide information on Parties providing public funding;
   (b) Attach in Appendix 2. below the affirmation obtained from such Parties in accordance with applicable provisions related to official development assistance in the Project standard.
2. When the CDM-PDD-FORM is completed in support of a proposed new methodology, describe whether public funding from Parties included in Annex I is likely to be provided, indicating the Parties to the extent possible.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

1. Indicate exact reference (number, title, version) of:
   (a) The selected methodology(ies) (e.g. ACM0001: "Large-scale Consolidated Methodology: Flaring or use of landfill gas" (Version 15.0);
   (b) Any tools and other methodologies to which the selected methodology(ies) refer (e.g. "Methodological Tool: Tool for the demonstration and assessment of additionality" (Version 07.0.0));
   (c) The selected standardized baseline(s), where applicable (e.g. ASB0001 "Standardized baseline: Grid emission factor for the Southern African power pool" (Version 01.0)).
2. Refer to the UNFCCC CDM website for the exact reference of approved baseline and monitoring methodologies, tools and standardized baselines.

B.2. Applicability of methodology and standardized baseline

1. Justify the choice of the selected methodology(ies) and, where applicable, the selected standardized baseline(s) by showing that the project activity meets each applicability condition of the methodology(ies) and, where applicable, the selected standardized baseline(s). Explain documentation that has been used and provide the references to it or include the documentation in Appendix 3. below.

B.3. Project boundary

1. Use the table below to describe emission sources and GHGs included in the project boundary for the purpose of calculating project emissions and baseline emissions.
2. In addition to the table, present a flow diagram of the project boundary, physically delineating the project activity, based on the description provided in section A.3 above. Include in the flow diagram the equipment, systems and flows of mass and energy described in that section. In particular, indicate in the diagram the emission sources and GHGs included in the project boundary and the data and parameters to be monitored.

Source		Gas	Included	Justification/Explanation
Baseline scenario	Source 1	CO_2		
		CH_4		
		N_2O		
		…		
	Source 2	CO_2		
		CH_4		
		N_2O		
		…		
	…	CO_2		
		CH_4		
		N_2O		
		…		
Project scenario	Source 1	CO_2		
		CH_4		
		N_2O		
		…		
	Source 2	CO_2		
		CH_4		
		N_2O		
		…		

Source		Gas	Included	Justification/Explanation
	…	CO_2		
		CH_4		
		N_2O		
		…		

B.4. Establishment and description of baseline scenario

1. Explain how the baseline scenario is established in accordance with applicable provisions for establishment and description of baseline scenarios in the Project standard and the selected methodology(ies).
2. Where the procedure in the selected methodology(ies) involves several steps, describe how each step is applied and transparently document the outcome of each step. Explain and justify key assumptions and rationales. Provide and explain all data used to establish the baseline scenario (variables, parameters, data sources, etc.). Provide all relevant documentation and/or references.
3. Provide a transparent description of the baseline scenario as established above.
4. Where the selected standardized baseline standardizes the baseline scenario, describe the baseline scenario in accordance with the selected standardized baseline.
5. The full description of the technology of the baseline scenario is to be provided in section A.3 above.
6. Note that section B.4 above and section B.5 below are complementary. Some of the steps undertaken in one section may overlap with the steps undertaken in the other section depending on the procedures used to establish the baseline scenario and demonstrate additionality. If the “Combined tool to identify the baseline scenario and demonstrate additionality” is used, replicate the same information in both sections. In this case, make a reference to the other section where the description is contained.

B.5. Demonstration of additionality

1. Demonstrate that the project activity is additional in accordance with the selected methodology(ies), where applicable, the selected standardized baseline(s) and applicable provisions for demonstration of additionality in the Project standard. Where the procedure in the selected methodology(ies) and/or tool involves several steps, describe how each step is applied and transparently document the outcome of each step. Indicate clearly the method selected to demonstrate additionality (e.g. investment analysis or barrier analysis). Present in a transparent manner, in the form or in a separate appendix, with all data used (variables, parameters, data sources, etc.), how the additionality of the project activity is demonstrated.
2. Where the additionality criteria (e.g. positive lists of technologies) in the selected standardized baselines(s) are used, justify how the project activity meets the additionality criteria (e.g. how the technology to be implemented or implemented by the project activity is justified as one of the technologies listed in the positive list).
3. Where investment analysis is used, list all relevant assumptions and parameters used in the analysis. Where benchmark analysis is used, clearly indicate the benchmark. Where cost comparison is used, describe the scenarios compared.
4. Where the barriers are involved in demonstrating additionality, only select the most relevant barriers. With key facts and/or assumptions and the rationale, justify the credibility of the barriers. Provide relevant documentation or references.
5. If the start date of the project activity is prior to the date of publication of the PDD for the global stakeholder consultation, provide evidence of the prior consideration of the CDM in accordance with applicable provisions related to the demonstration of prior consideration of the CDM in the Project standard.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

1. Explain how the methods or methodological steps in the selected methodology(ies) and, where applicable, the selected standardized baseline(s), for calculating baseline emissions, project emissions, leakage and emission reductions are applied. Clearly state which equations will be used in calculating emission reductions.
2. Explain and justify all relevant methodological choices, including:

(a) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) include different scenarios or cases, indicate and justify which scenario or case applies to the project activity (e.g. which scenario in ACM0006 is applicable);

(b) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) provide different options to choose from (e.g. which methodological approach is used to calculate the "operating margin" in ACM0002), indicate and justify which option is chosen for the project activity;

(c) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) allow different default values, indicate and justify which of the default values have been chosen for the project activity.

B.6.2. Data and parameters fixed ex ante

1. Include a compilation of information on the data and parameters that are not monitored during the crediting period but are determined before the registration and remain fixed throughout the crediting period. Do not include data that become available only after the registration of the project activity (e.g. measurements after the implementation of the project activity) here but include them in the table in section B.7.1 below.
2. The compilation of information may include data that are measured or sampled, and data that are collected from other sources (e.g. official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.). Do not include data that are calculated with equations provided in the selected methodology(ies) or default values specified in the methodology(ies) in the compilation.
3. For each piece of data or parameter, complete the table below, following these instructions:
   (a) "Value(s) applied": Provide the value applied. Where a time series of data is used, where several measurements are undertaken or where surveys have been conducted, provide detailed information in Appendix 4. below. To report multiple values referring to the same data and parameter, use one table. If necessary, use reference(s) to electronic spreadsheets;
   (b) "Choice of data": Indicate and justify the choice of data source. Provide clear and valid references and, where applicable, additional documentation in Appendix 4. below;
   (c) "Measurement methods and procedures": Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. More detailed information can be provided in Appendix 4. below;
   (d) "Purpose of data": Choose one of the following:
      (i) Calculation of baseline emissions;
      (ii) Calculation of project emissions;
      (iii) Calculation of leakage.

(Copy this table for each piece of data and parameter.)

Data / Parameter:	
Unit:	
Description:	
Source of data:	
Value(s) applied:	
Choice of data or Measurement methods and procedures:	
Purpose of data:	
Additional comment:	

B.6.3. Ex ante calculations of emission reductions

1. Provide a transparent ex ante calculation of baseline emissions, project emissions (or, where applicable, direct calculation of emission reductions) and leakage expected during the crediting period, applying all relevant equations provided in the selected methodology(ies) and, where applicable, the selected standardized baseline(s). For data or parameters available before registration, use values contained in the table in section B.6.2 above.

2. For data/parameters not available before registration and monitored during the crediting period, use estimates contained in the table in section B.7.1 below. If any of these estimates has been determined by a sampling approach, provide a description of the sampling efforts undertaken in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities".
3. Document how each equation is applied, in a manner that enables the reader to reproduce the calculation. Where relevant, provide additional background information and/or data in Appendix 4. below, including relevant electronic spreadsheets.
4. Provide a sample calculation for each equation used, substituting the values used in the equations.

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

1. Summarize the results of the ex ante calculation of emission reductions for all years of the crediting period, using the table below.

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year A				
Year B				
Year C				
Year …				
Total				
Total number of crediting years				
Annual average over the crediting period				

B.7. Monitoring plan

1. Through sections B.7.1, B.7.2 and B.7.3 below, provide a detailed description of the monitoring plan of the project activity developed in accordance with the applicable provisions in the Project standard and the monitoring requirements of the selected methodology(ies).

B.7.1. Data and parameters to be monitored

1. Include specific information on how the data and parameters that need to be monitored in the selected methodology(ies) and, where applicable, the selected standardized baseline(s) would actually be collected during monitoring. Include here data that are determined only once for the crediting period but that will become available only after registration of the project activity (e.g. measurements after the implementation of the project activity).
2. For each piece of data or parameter, complete the table below, following these instructions:
   (a) "Source of data": Indicate the source(s) of data that will be used for the project activity (e.g. which exact national statistics). Where several sources are used, justify which data sources should be preferred;
   (b) "Value(s) applied": The value applied is an estimate of the data/parameter that will be monitored during the crediting period, but is used for the purpose of calculating estimated emission reductions in section B.6 above. To report multiple values referring to the same data and parameter, use one table. If necessary, use reference(s) to electronic spreadsheets;
   (c) "Measurement methods and procedures": Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
   (d) "QA/QC procedures": Describe the Quality Assurance (QA)/Quality Control (QC) procedures to be applied, including the calibration procedures, where applicable;

(e) "Purpose of data": Choose one of the following:
  (i) Calculation of baseline emissions;
  (ii) Calculation of project emissions;
  (iii) Calculation of leakage.

3. Provide any relevant further background documentation in Appendix 5. below.

(Copy this table for each piece of data and parameter.)

Data / Parameter:	
Unit:	
Description:	
Source of data:	
Value(s) applied:	
Measurement methods and procedures:	
Monitoring frequency:	
QA/QC procedures:	
Purpose of data:	
Additional comment:	

B.7.2. Sampling plan

1. If data and parameters monitored in section B.7.1 above are to be determined by a sampling approach, provide a description of the sampling plan in accordance with the recommended outline for a sampling plan in the "Standard for sampling and surveys for CDM project activities and programme of activities".

B.7.3. Other elements of monitoring plan

1. Describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage generated by the project activity. Clearly indicate the responsibilities and institutional arrangements for data collection and archiving. Provide any relevant further background information in Appendix 5. below.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

1. Provide the date of completion of study on application of the selected methodology(ies) and, where applicable, the selected standardized baseline(s) to the project activity in the format of DD/MM/YYYY.
2. Provide contact information of the person(s)/ entity(ies) responsible for the application of the selected methodology(ies) and, where applicable, the selected standardized baseline(s) to the project activity and indicate if the person(s)/ entity(ies) is also a project participant(s) in Appendix 1. below.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

1. State the start date of the project activity, in the format of DD/MM/YYYY, describe how this date has been determined, and provide evidence to support this date.

C.1.2. Expected operational lifetime of project activity

1. State the expected operational lifetime of the project activity in years and months.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

1. State the type of crediting period chosen for the project activity (renewable or fixed).
2. For a renewable crediting period, indicate whether it is the first, second or third.

C.2.2. Start date of crediting period

1. State the start date of crediting period of the project activity in the format of DD/MM/YYYY.

C.2.3. Length of crediting period

1. State the length of the crediting period of the project activity in years and months.

SECTION D. Environmental impacts

D.1. Analysis of the environmental impacts

1. Provide a summary of the analysis of the environmental impacts of the project activity and references to all related documentation.

D.2. Environmental impact assessment

1. If an environmental impact assessment is required, provide conclusions and references to all related documentation.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

1. Describe the process by which comments from local stakeholders have been invited for the project activity.

E.2. Summary of comments received

1. Identify stakeholders that have made comments and provide a summary of these comments.

E.3. Report on consideration of comments received

1. Provide information demonstrating that all comments received have been considered.

SECTION F. Approval and authorization

1. Indicate whether the letter(s) of approval from Party(ies) for the project activity is available at the time of submitting the PDD to the validating DOE. 2. If so, provide the letter(s) of approval along with the PDD.

Appendix 1. Contact information of project participants and responsible persons/ entities

1. For each organisation listed in sections A.4 and B.7.4 above, complete the table below, with the following mandatory fields: Project participant and/or responsible person/ entity, Organization, Street/P.O. Box, City, Postcode, Country, Telephone, Fax, e-mail and Name of contact person. Copy and paste the table as needed.

Project participant and/or responsible person/ entity	☐ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	
Street/P.O. Box	
Building	
City	
State/Region	
Postcode	
Country	
Telephone	
Fax	
E-mail	
Website	
Contact person	
Title	
Salutation	
Last name	
Middle name	
First name	
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2. Affirmation regarding public funding

1. If applicable, attach the affirmation obtained from Parties included in Annex 1 providing public funding to the project activity.

Appendix 3. Applicability of methodology and standardized baseline

1. Provide any further background information on the applicability of the selected methodology(ies) and, where applicable, the selected standardized baseline(s).

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

1. Provide any further background information on the ex ante calculation of emission reductions. This may include data, measurement results, data sources, etc.

Appendix 5. Further background information on monitoring plan

1.	Provide any further background information used in the development of the monitoring plan. This may include tables with time series data, additional documentation of measurement equipment, procedures, etc.

Appendix 6. Summary of post registration changes

1.	Provide a summary of the post registration changes.

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Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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