Gold Standard for the Global Goals
Key Project Information & Project Design Document (PDD)

Version 1.1 – August 2017

Gold Standard

KEY PROJECT INFORMATION

Title of Project:	InfraVest Taiwan Wind Farms Bundled Project 2011
Brief description of Project:	The project involves the development of four wind farms in Taiwan: • InfraVest Fongwei Wind farm project, Taiwan a 13.8 MW (6 x 2.3 MW) onshore wind farm located in Hsinfong Township, Hsinchu County; • InfraVest Longwei Wind farm project, Taiwan a 44.1 MW (18 x 2.3 MW + 3 x 0.9 MW) onshore wind farm in Houlong Township, Miaoli County • InfraVest Chungwei Wind farm project, Taiwan a 29.9 MW (13 x 2.3 MW) onshore wind farm in Dajia and Da-An Townships, Taichung County; • InfraVest Tauwei Wind farm project, Taiwan a 4.6 MW onshore wind farm in Guanyin Township, in Taoyuan County. The project in total comprises 42 wind turbines and the total installed capacity of the proposed bundled project is 92.4 MW. At full capacity, the aggregated output of the project is expected to be of 250,866 MWh/yr, which is to be delivered to the state-owned power grid, Taipower grid, displacing part of the electricity supplied by the power grid currently dominated by fossil fuel-fired power plants.
Expected Implemetation Date: Expected duration of Project:	27/12/2009 20 years and 0 months
Project Developer:	InfraVest Wind Power Group
Project Representative:	South Pole Carbon Asset Management Ltd.
Project Participants and any communities involved:	InfraVest Wind Power Group South Pole Carbon Asset Management Ltd.
Version of PDD: Date of Version:	01 22/09/2020
Host Country / Location:	Taiwan
Certification Pathway (Project Certificatin/Impact Statements & Products	Project Certificatin
Activity Requirements applied: (mark GS4GG if none relevant)	Renewable Energy Activity Requirements, version 1.2
Methodologies applied:	ACM0002 Grid-connected electricity generation from renewable sources, Version 20.0
Product Requirements applied:	GHG Emissions Reductions Sequestration Product Requirements, version 1.2
Regular/Retroactive:	Regular
SDG Impacts:	1 – SDG7 2 – SDG8 3 – SDG13
Estimated amount of SDG Impact Certified	SDG7 – 250,866 MWh/yr

	SDG8 – 49 persons SDG13 – 170,338tCO_2/yr

SECTION A. Description of project

A.1. Purpose and general description of project

The InfraVest Taiwan Wind Farms Bundled Project 2011(hereinafter referred to as "the project") is a bundled project of four wind farms projects:

- InfraVest Fongwei Wind Farm Project, Taiwan: a 13.8 MW (6x2.3 MW) onshore wind farm located in Hsinfong Township (therefore also called Hsinfong Wind Farm), Hsinchu County, which comprises 6 wind turbines (hereafter: **Fongwei Wind Farm**).
- InfraVest Longwei Wind Farm Project, Taiwan: a 44.1 MW (18x2.3 MW + 3x0.9 MW) onshore wind farm located in Houlong Township (therefore also called Houlong Wind Farm), Miaoli County, which comprises 21 wind turbines (hereafter: **Longwei Wind Farm**).
- InfraVest Chungwei Wind Farm Project, Taiwan: a 29.9 MW (13x2.3 MW) onshore wind farm located in Dajia and Da-An Townships, Taichung County, which covers Taichung phases I and III, and Dafong sites, and which comprises 13 wind turbines (hereafter: **Chungwei Wind Farm**). There are another 20 wind turbines also located in Dajia and Da-An Townships, Taichung County, which belong to the same project owner. But these 20 turbines belong to the project owner's another GS VER project (GS472), which was already registered in 2010. Therefore, the 13 wind turbines in Chungwei Wind Farm under the project are the capacity addition to the existing grid-connected renewable power plant (project GS472).
- InfraVest Tauwei Wind Farm Project, Taiwan: a 4.6 MW (2x2.3 MW) onshore wind farm located in Guanyin Township (also called Hsinwu Wind Farm), Taoyuan County, which comprises 2 wind turbines (hereafter: **Tauwei Wind Farm**). There are another 19 wind turbines also located in Guanyin Township, Taoyuan County, which belong to the same project owner. But these 19 turbines belong to the project owner's another GS VER project (GS612), which was already registered in 2011. Therefore, the 2 wind turbines in Tauwei Wind Farm under the project are the capacity addition to the existing grid-connected renewable power plant (project GS612).

Wind Farm Name	Unit Capacity (MW)	Numbers of units	Overall installed Capacity (MW)	Estimated Electricity generation (MWh)	Wind turbine ID No. (already installed and start operating)*	Installed Capacity (MW)	First turbine Operation start date
Fongwei	2.3	6	13.8	35,314	2, 4A, 5, 6, 10	11.5	26/09/2011
Longwei	2.3	18	41.4	105,943	8, 10, 13, 14, 15, 16, 19, 20-1, 21, 22, 23, 24, 25, 26,	41.4	27/04/2012

					B01, 56, 30, 48		
	0.9	3	2.7	6,909	12, 18-1,55	2.7	
Chungwei	2.3	3	6.9	20,493	12, 18, 19, 20, 28, 32A, 33A, 34, 35, 36-2, 37, 60, 68	29.9	31/10/2011
	2.3	9	20.7	61,479			
	2.3	1	2.3	6,831			
Tauwei	2.3	2	4.6	13,897	39, 40	4.6	04/07/2011
Total	-	42	92.4	250,866	-	90.1	-

*For Fongwei wind farm, still one wind turbine not being installed during this monitoring period. The construction of the remaining turbine of Fongwei is planned to complete by 2021, and operation will start in 2022.

The above-mentioned four wind farms are constructed and operated by InfraVest Wind Power Group (hereafter refer as "InfraVest"), which is a subsidiary of Germany based VWind AG. The project in total comprises 42 wind turbines and the total installed capacity of the bundled project is 92.4 MW. At full capacity, the aggregated output of the project is expected to be of 250,866 MWh/year, which is to be delivered to the state-owned power grid, Taipower grid ("TPG"), displacing part of the electricity supplied by the power grid currently dominated by fossil fuel-fired power plants. Accordingly, the project will lead to carbon dioxide emission reduction. The annual emission reductions are estimated as 170,338 tCO_2e/year, and the total emission reductions for the second crediting period of 7 years are estimated as 1,192,366 tCO_2e.

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 purpose of 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 contributes to alleviate the 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;
- technology and know-how transfer 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. Eligibility of the project under Gold Standard

The project activity meets the eligibility criteria as per section 3.1.1 of GS4GG Principles & Requirements document as described below:

- The project applies methodology ACM0002, Version 20.0[1], which is an approved methodology under Gold Standard.
- The project type is power generation using Wind Energy which is an eligible project type as it is in accordance with 2.1.2 a) and 2.1.2 b) of the Eligible Project Types & Scope under Renewable Energy Activity Requirements.
- The project activity results in displacement of electricity from thermal power stations while contributing to sustainable development of Taiwan. Hence, the project contributes to the Gold Standard Vision and Mission.
- Wind power is an approved project type and does not require approval from Gold Standard.
- This project activity is not associated with geo-engineering or energy generated from fossil fuel or nuclear, fossil fuel switch, nor does it enhances or prolongs such energy generation.
- The project does not involve any ODA financing. This project is not eligible of receiving ODA, since Taiwan is not a member of OECD.

General Eligibility Criteria under Renewable Energy Activity Requirements
Project Type: As discussed above, the project type is eligible.
Project Location: The project is located in Taiwan. Thus, the project is eligible.
Project scale: The project activity is 92.4 MW Wind Energy project and thus qualifies under large scale projects.

A.3. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

The project owner (InfraVest Wind Power Group) has full and uncontested legal ownership of the emission reductions that are generated under this Gold Standard project, and has legal rights concerning changes in use of resources required to service the project. The legal ownership of the project lies with InfraVest Wind Power Group via the following documents:
1. Power Purchase Agreements signed with TPG in the name of project owner
2. Electricity receipts from TPG

[1] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

A.4. Location of project

A.4.1. Host Country

Taiwan

A.4.2. Region/State/Province etc.

Hsinchu County, Miaoli County, Taichung County and Taoyuan County

A.4.3. City/Town/Community etc.

Hsinfong Township, Houlong Township, Dajia and Da-An Townships, and Guanyin Township

A.4.4. Physical/Geographical location

The locations of the wind farms are all in West Taiwan. Fongwei Wind Farm is located at the coastal land of Hsinfong Township, Hsinchu County. Hsinchu County is located in northwestern Taiwan, and is connected with Taoyuan County in north, Miaoli County in south, Taiwan Strait in the west and the Snow Mountains (Dabajian Mountain) in the east. Hsinchu County is surrounded by mountains on three sides.

Longwei Wind Farm is located in the west coastal land of Houlong Township, Miaoli County. Miaoli County is located in mountainous and hilly areas of central and northern Taiwan.

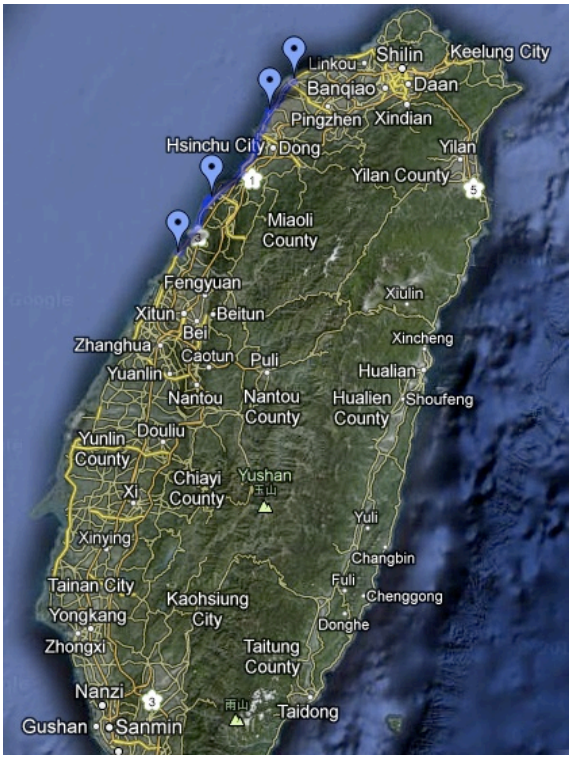
Chungwei Wind Farm is located in the coastal land of Dajia and Da-An Townships, Taichung County. Dajia and Da-An Townships are in the northwest of Taichung County and connected with Taiwan Strait in the west.

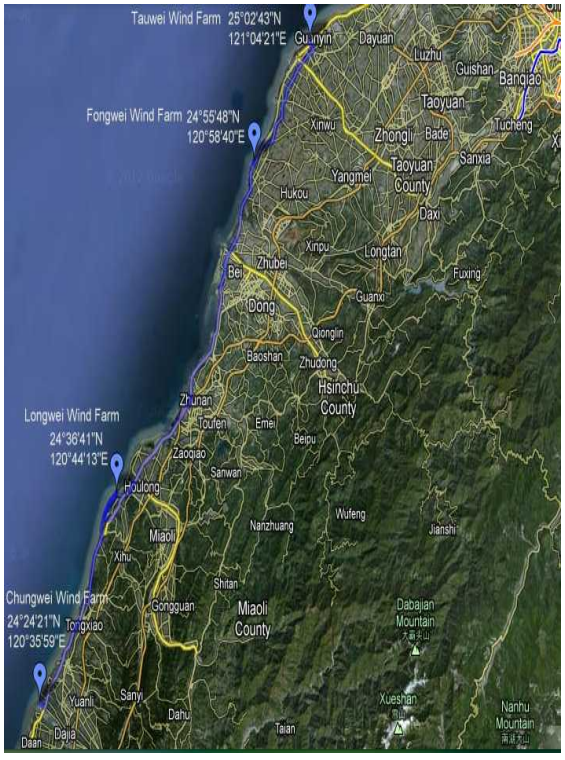
Tauwei Wind Farm is located in the west coastal land of Guanyin Townships, Taoyuan County. Taoyuan County is located in north-western Taiwan, close to the Taipei metropolitan area; with the majority of terrains are the hill terraces.

The project activities are distributed in these zones, which are at the geographical positions of:

Wind Farm Name	Coordinates for center of farm
Tauwei Wind Farm	25°02′43″N, 121°04′21″E
Fongwei Wind Farm	24°55′48″N, 120°58′40″E
Longwei Wind Farm	24°36′41″N, 120°44′13″E
Chungwei Wind Farm	24°24′21″N, 120°35′59″E

Figure A-1 shows the geographical locations of the project.





A.5. Technologies and/or measures

Part of 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) (Fongwei and Longwei Wind Farms), and part of the project activity is a grid-connected renewable power generation project activity involving capacity additions (Chungwei and Tauwei Wind Farms). 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, 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 39 Enercon E-70 wind turbines with the unit capacity of 2.3 MW and 3 Enercon E-44 wind turbines with the unit capacity of 0.9 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; and wind turbines type Enercon E-44 is used, with 44 m diameters and 55 m hub heights.

The technical data of the turbine units of turbine type E-70 and E-44 are given in the tables below.

Table 1. Characteristics of the wind turbine E-70

Wind Turbine Type:	E-70			
Site:	Fongwei	Longwei	Chungwei	Tauwei
Rated Power:	2300 kW			
Number of turbines	6	18	13	2
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			

Table 2. Characteristics of the wind turbine E-44

Wind Turbine Type:	E-44
Site:	Longwei
Rated Power:	900 kW
Number of turbines	3
Output voltage	400 V
Rotor diameter:	44 m
Hub Height:	55 m
Generator:	Enercon direct-drive synchronous annular generator
Grid feeding:	ENERCON converter
Technical lifetime	20 years

The turbines in Fongwei wind farm site are connected to Taipower grid at SongLin S/S Substation through 11.4 kV transmission lines. In Longwei wind farm site, 18 turbines are connected to Taipower 69 kV grid through the Gongguan-Miaozi 69 kV line #1 connection station, and 3 turbines are connected to Taipower 11.4 kV grid at Houlong S/S Substation by 2 lines separately. The turbines in Chungwei wind farm site are connected to Taipower 69 kV grid through 22.8kV/69kV transformer. The turbines in Tauwei wind farm site are connected to Taipower 161 kV grid through Guanyin wind farm. Each wind farm utilizes bi-directional watthour meters measuring electricity supplied to Taipower grid.

A.6. Scale of the project

The project is a large scale project utilizing wind power to generate electricity. The total installed capacity of the project is 92.4 MW. This is large scale project as the capapcity is greater than stipulated limited of Type I for small scale project of 15 MW.

A.7. Funding sources of project

The project is financed by the project owner.
There is no public funding from Annex 1 countries and no Official Development Assistance (ODA) involved in the project activity, since Taiwan is not a member of OECD.

A.8. Assessment that project complies with 'gender sensitive' requirements

Question 1: Does the project reflect the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy? Explain how.

The project reflects the key gender issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy.

The project is a renewable energy project and It does not discriminate among gender. The project does not adversely impact women or men.

Question 2: Does the project align with existing country policies, strategies and best practices? Explain how.

The project is aligned its labour policies which does not discriminate on gender[2].The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination.

Question 3: Does the project address the questions raised in the Gold Standard Safeguarding Principles & Requirements document? Explain how.

The project addresses the questions raised in the Gold Standard Safeguarding Principle & Requirements.
The project being a wind project does not reduce access to or control of resources for women. The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination. The project doesn't reproduce or further deepen discrimination against women. The project leads to increased availability of electricity in the regional grid thereby uplifiting the living standards. The project is aligned its labour policies which apply the principles of nondiscrimination, equal treatment, and equal pay for equal work[3].

Question 4: Does the project apply the Gold Standard Stakeholder Consultation & Engagement Procedure, Requirements & Guidelines? Explain how.

Yes. The project is currently seeking for crediting period renewal.

The PO has implemented continuous input / grievance mechanism expression process, as discussed with local stakeholders. The continuous input / grievance mechanism is as below.

	Method Chosen (include all known details e.g. location of book, phone,	Justification

[2] https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=N0030001

[3] https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=N0030001

	number, identity of mediator)	
Continuous Input / Grievance Expression Process Book	Grievance expression book in local villages	kept by the leader of the villages
Telephone access	+886-2-2395-4886 (for project owner) +86 158 1052 7065 (for GS expert)	Phone and mobile are very common for local residential. Local stakeholders can call the working staff of the project owner and GS expert to express their comments, suggestion and complaint.
Internet/email access	info@infra-vest.com (for project owner) help@goldstandard.org annyta.luo@goldstandard.org (for GS expert)	Local stakeholders can send email to the project owner and GS expert to express their comments, suggestion and complaint.

SECTION B. Application of selected approved Gold Standard methodology

B.1. Reference of approved methodology

Approved methodology applied: ACM0002 "Grid-connected electricity generation from renewable sources" (Version 20.0)
Reference:
https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG
Sectoral Scope: 01

The methodology was applied with the following tools:

- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, version 03.0.1
- Tool to calculate the emission factor for an electricity system, version 07.0;

Further information pertaining to the methodology can be obtained at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodology

Justification for the choice of the selected methodology is given below in the table:

No.	Applicability Condition	Justification
1	This methodology applies to project activities that include retrofitting, rehabilitation (or refurbishment), replacement or capacity addition of an existing power plant or construction and operation of a Greenfield power plant.	Part of 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) (Fongwei and Longwei Wind Farms); Part of the project activity is a grid-connected renewable power generation project activity involving capacity additions (Chungwei and Tauwei Wind Farms)
2	This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity is the installation of two new wind plants, and capacity additions of another two wind power plants.
3	The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The project activity is the installation of two new wind plants, and capacity additions of another two wind power plants.

4	In case of hydro power plants, one of the following conditions must apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	The project is not a hydro power plant.
5	In the case of integrated hydro power projects, project proponent shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all	The project is not a hydro power plant.

	possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
6	The methodology is not applicable to the following: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	(a)The project does not involve switching from fossil fuels to renewable energy sources at the site of the project activity; (b) The project is not a biomass fired power plant.
7	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance.	For the capacity additions of another two wind power plants under this project, the most plausible baseline scenario, as a result of the identification of baseline scenario, is the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. Please refer to B.4 baseline scenario for details.

In addition, the applicability conditions of tools referred has been demonstrated as follows:

No.	Applicability conditions in tool "Tool to calculate the emission factor for an electricity system"	Justification

1	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	OM, BM and CM are estimated using the tool for calculating baseline emissions for the project. The project supply electricity to TPG.
2	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	The project supply electricity to TPG. The emission factor is calculated for grid power plants only.
3	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project is located in Taiwan, a non-Annex I country.
4	Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	No biofuel is involved in the project.

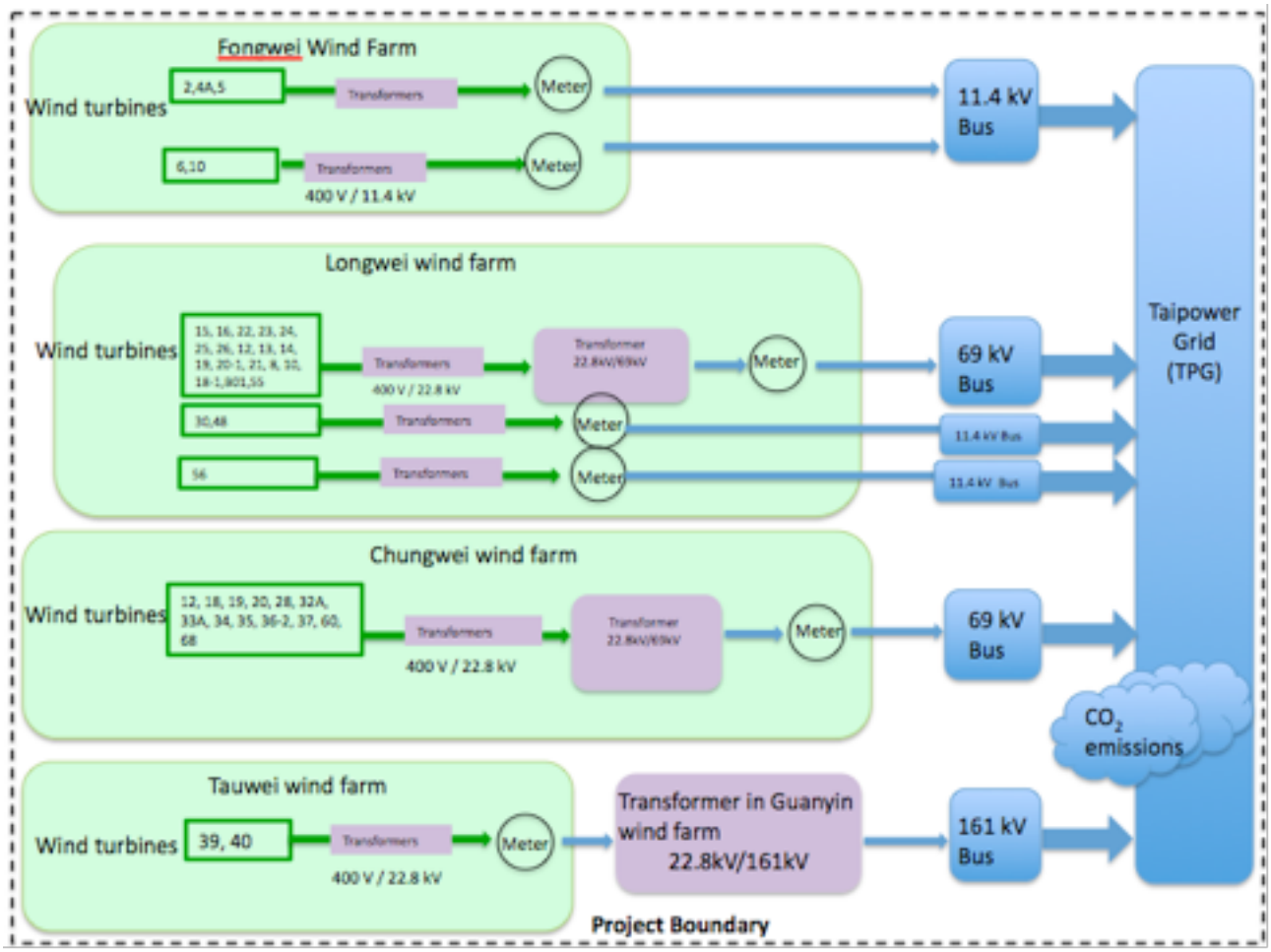
No.	Applicability conditions in tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period"	Justification
1	This tool provides a stepwise procedure to assess the continued validity of the baseline	The project adopted the procedure to assess the continued

	and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.	validity of the baseline at the renewal of a crediting period.

B.3. Project boundary

According to the applied methodology ACM0002, the spatial extent of the project boundary includes the project power plant/unit and all power plants/units 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 as described in flow chart below, is defined as the InfraVest Fongwei, Longwei, Chungwei and Tauwei wind farms and the Taipower grid, and all power plants connected to Taipower grid.

The wind turbines serial numbers for turbines already installed and stared operating are included in the chart. For Fongwei wind farm, there is still one wind turbine not being installed and the construction is planned to be completed in 2021.For Longwei, Chungwei and Tauwei wind farms, constructions have already been completed.



The greenhouse gases and emission sources included in or excluded from the project boundary are shown in following table.

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	Emission Sources of Project Activity	CO_2	No	Excluded, as per ACM0002
		CH_4	No	Excluded, as per ACM0002
		N_2O	No	Excluded, as per ACM0002

B.4. Establishment and description of baseline scenario

The applied methodology ACM0002 determines the baseline scenario through the following:

For Fongwei and Longwei Wind Farms:

If the project activity is the installation of a Greenfield power plant, the baseline scenario is 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 "Tool to calculate the emission factor for an electricity system".

As Fongwei and Longwei Wind Farms under the bundled project activity are the installation of new grid-connected renewable power plants, so the baseline scenario described above is applied for these two wind farms.

For Chungwei and Tauwei Wind Farms:

If the project activity is a capacity addition to existing grid-connected renewable energy power plant/unit, the baseline scenario is the existing facility that would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$), and electricity delivered to the grid by the added capacity 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 "Tool to calculate the emission factor for an electricity system". From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and no emission reductions are assumed to occur.

As Chungwei and Tauwei Wind Farms under the bundled project activity are the capacity additions to existing grid-connected renewable power plants, so the baseline scenario described above is applied for these two wind farms.

The generated electricity of the project will be delivered to Taipower, which is dominated by fossil fuel fired plants. The baseline scenario for this project activity is the equivalent electricity service provided by Taipower Grid with the grid emission factor estimated ex-ante as per the "Tool to calculate the emission factor for an electricity system".

Based on the Methodological Tool " Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1)", the follow steps for assess the validity of the current baseline for the next crediting period:

Step 1: Assess the validity of the current baseline for the next crediting period
The Procedures for the renewal of the crediting period of a registered Gold Standard project activity require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

If the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2.

The current baseline, i.e., the equivalent electricity supplied by TPG, complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, so go to Step 1.2.

Step 1.2: Assess the impact of circumstances
Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario.

In the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period.

The baseline scenario for the project is to import equivalent electricity from Taipower. The situation for TPG was the electricity generation dominated by thermal plant in the previous crediting period, the years of latest data available for TPG in the previous crediting period and in this renewed crediting period.

Evaluate whether the conditions used to determine the baseline emissions in the previous crediting period are still valid. Assess the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions;

The baseline emissions have changed based on the latest methodology ACM0002 and Tool to calculate the emission factor for an electricity system. TPG is dominated by thermal power, the electricity delivered to TPG from other power plants will not impacted the tariff by the new fuels or raw materials.

If the new circumstances make a continued validity of the current baseline not plausible, then the current baseline needs to be updated for the subsequent crediting period.

There is not the new circumstances occurred, so the baseline would not be updated.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

This sub-step is discussing the use of equipment in baseline scenario. In this project activity, the baseline scenario is the equivalent electricity generated by the project activity would be imported from the TPG, which was not an investment activity, and no current equipment was used. So this is not applicable.

Assess whether the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity, as determined in the CDM-PDD or CDM-PDD-REN, exceeds the crediting period for which renewal is requested.

This is not applicable.

Take into consideration the market penetration of different technologies. Evaluate the penetration rate of different technologies that are available in the market and evaluate how they could affect the baseline.

This is not applicable.

If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation.

This is not applicable.

Step 1.4: Assessment of the validity of the data and parameters

Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:

• Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;

For renewal of the crediting period, the updated IPCC 2006 was adopted.

• Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity.

The emission factors are updated.

If any of the data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, the current baseline needs to be updated for the subsequent crediting period.

The data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period, which are not valid anymore, so the data and parameters need to be updated for the subsequent crediting period.

If the application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline as well as data and parameters are still valid for the subsequent crediting period, then this

baseline, data and parameters can be used for the renewed crediting period. Otherwise, proceed to Step 2.

The current baseline still valid, but the data and parameters are need to updated, so it proceeds to Step 2.

Step 2: Update the current baseline and the data and parameters

This step is only applicable if any of the Steps 1.1, 1.2, 1.3 and/or 1.4 showed that the current baseline needs to be updated.

Step 2.1: Update the current baseline

Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

This should be not applicable, as the baseline is not changed.

Step 2.2: Update the data and parameters

If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4.

The data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period, which are not valid anymore, so the data and parameters need to be updated for the subsequent crediting period.

So the scenario prior to the project in second crediting period of the project is the same as the baseline scenario. According ACM0002, the baseline emissions is the product of electrical energy baseline $EG_{PJ,y}$ expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor. The emission factor is calculated in a transparent and conservative manner as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system". The calculations are presented in Appendix 3.

B.5. Demonstration of additionality

This section has been assessed and validated in the first crediting period.

B.6. Sustainable Development Goals (SDG) outcomes

B.6.1. Relevant target for each of the three SDGs

SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all （Affordable and Clean Energy）
Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix

SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all
（Decent Work and Economic Growth）
Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

SDG 13: Take urgent action to combat climate change and its impacts（Climate Action）
Target 13.B: Promote mechanisms for raising capacity for effective climate changerelated planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

B.6.2. Explanation of methodological choices/approaches for estimating the SDG outcome

SDGs	Method
SDG 7 Affordable and Clean Energy	Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix Indicator 7.2.1: Renewable energy share in the total final energy consumption Monitoring Parameter: $EG_{facility,y}$ Quantity of net electricity generation supplied by the project plant/unit to the grid in year y $EG_{PJ\_Add,y}$ 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 Monitoring Method: Electricity meters Calculation Method: $EG_{facility,y}$ / $EG_{PJ\_Add,y}$ = $EG_{Export,y} - EG_{Import,y}$, $EG_{Export,y}$ Quantity of electricity generation supplied by the project plant/unit to the grid in year y and $EG_{Import,y}$ Quantity of electricity consumption of the project plant/unit from the grid in year y
SDG 8 Decent Work and Economic Growth	Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young

	people and persons with disabilities, and equal pay for work of equal value Indicator 8.5.1: Average hourly earnings of female and male employees, by occupation, age and persons with disabilities. Monitoring Parameter: Quality of employment and Quantitative employment and income generation Monitoring Method: Records keeping Calculation Method: N/A
SDG 13 Climate Action	Target13.B: Promote mechanisms for raising capacity for effective climate change–related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities Indicator13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities Monitoring Parameter: ER_y emission reduction in year y Monitoring Method: Electricity meters Calcualtion Method: Details as below.

For SDG 13, the applied methodology ACM0002 is applied in the project in the following four steps:

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:

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

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 "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

As per ACM0002, Fongwei and Longwei Wind Farms under the project activity are the installations of new grid-connected renewable power plants at sites where no renewable power plant was operated prior to the implementation of the project activity, 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)

According to ACM0002, Chungwei and Tauwei Wind Farms under the project activity are the capacity additions to existing renewable energy power plants. In the case of wind, solar, wave or tidal power plants/units, it is assumed that the addition of new capacity does not significantly affect the electricity generated by existing plants/units. In this case, the electricity fed into the grid by the added power plants/units shall be directly metered and used to determine $EG_{PJ,y}$.

$EG_{PJ,y} = EG_{PJ\_Add,y}$
Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EG_{PJ\_Add,y}$ = 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 (MWh/yr)

$EG_{facility,y} / EG_{PJ\_Add,y} = EG_{Export,y} – EG_{Import,y}$
Where:
$EG_{Export,y}$ = Quantity of electricity generation supplied by the project plant/unit to the grid in year y $EG_{Import,y}$ = Quantity of electricity consumption of the project plant/unit from the grid in year y

3. Leakage

According to ACM0002, no leakage emissions are considered.

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:

$ER_y = EG_{facility,y} * EF_{grid,CM,y}$ (for Fongwei and Longwei Wind Farms)
$ER_y = EG_{PJ\_Add,y} * EF_{grid,CM,y}$ (for Chungwei and Tauwei Wind Farms)

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 (tCO_2e/MWh)
$EF_{grid,BM,y}$	Build margin emission factor (tCO_2e/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 0.661 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.7 33 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. The result of the Baseline Emission Factor ($EF_{grid,CM,y}$) calculation is 0.679 tCO_2e/MWh. The calculations are presented in Appendix 3.

B.6.3. Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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 A2 in Appendix 3

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	/

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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 A3 in Appendix 3
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	/

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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.6.0.4 – Industrial Development Bureau, Ministry of Economic Affairs, Taiwan R.O.C.[4]
Value(s) applied	Please refer to the table of GHG Emission Factor Inventory v.6.0.4
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.6.0.4 provides directly emission factor by unit of mass or volume in which is equal to the product of $NCV_{i,y}$ and $EF_{CO2,i,y}$

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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.6.0.4 – Industrial Development Bureau, Ministry of Economic Affairs, Taiwan R.O.C.
Value(s) applied	Please refer to the table of GHG Emission Factor Inventory v.6.0.4
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	The GHG Emission Factor Inventory v.6.0.4 provides directly emission factor by unit of mass or volume in which is equal to the product of $NCV_{i,y}$ and $EF_{CO2,i,y}$

[4] GHG Emission Factor Inventory v.6.0.4, https://ghgregistry.epa.gov.tw/Tool/tools.aspx?Type=1

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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 3
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	/

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
Data/parameter	$CAP_{source,y}$
Unit	MW
Description	Installed capacity by different sources from 2004 till 2019 (MW)

Source of data	Statistic data of power generation capacity and total generation (available data of year 2004 ~ 2019) published by Bureau of Energy, Ministry of Economic Affairs
Value(s) applied	Step 5 Substep 2 in Appendix 3
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	/

Relevant SDG Indicator	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
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.6.4. Ex ante estimation of outcomes linked to each of the three SDGs

SDGs	Ex ante estimation of outcomes
SDG 7 Affordable and Clean Energy	Baseline outcomes: 0 Project outcomes: The net generation supplied by the project to the grid is estimated to be 250,866 MWh/yr, which could replace the equavillent electricity from fossil fuel based grid.
SDG 8 Decent Work and Economic Growth	Baseline outcomes: 0 Project outcomes: The project provides employment opportunities for women and men. The project provides health

	insurance and labor insurance for the employee. Working hours and staff's salary is in compliance with applicable regulations. The project organizes employee trainings about topics of technical knowledge and design, safety and procedures.
SDG 13 Climate Action	Baseline outcomes: 0 Project outcomes: The project will directly contribute by reducing 170,338 tons of CO_2 equivalent every year. The estimation is as below.

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.6.2, the final result for calculating this project's emission reduction is the following:

$ER_y = EG_{facility,y} * EF_{grid,CM,y}$ (for Fongwei and Longwei Wind Farms)

$ER_y = EG_{PJ\_Add,y} * EF_{grid,CM,y}$ (for Chungwei and Tauwei Wind Farms)

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	250,866	MWh/year

$EG_{PJ\_Add,y}$	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		MWh/year
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor	0.679	tCO_2e/MWh
ER_y	Emission reductions annually	170,338	tCO_2e/year

B.6.5. Summary of ex ante estimates of each SDG outcome

SDG 7 Affordable and Clean Energy

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	250,866 MWh	250,866 MWh
Year 2	0	250,866 MWh	250,866 MWh
Year 3	0	250,866 MWh	250,866 MWh
Year 4	0	250,866 MWh	250,866 MWh
Year 5	0	250,866 MWh	250,866 MWh
Year 6	0	250,866 MWh	250,866 MWh
Year 7	0	250,866 MWh	250,866 MWh
Total	0	1,756,062 MWh	1,756,062 MWh
Total number of crediting years	7		
Annual average over the crediting period	0	250,866 MWh	250,866 MWh

SDG 8 Decent Work and Economic Growth

Year	Baseline estimate	Project estimate	Net benefit
Year in second crediting period	0	49 persons	49 persons

SDG 13 Climate Action

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	170,338 tCO_2e	170,338 tCO_2e
Year 2	0	170,338 tCO_2e	170,338 tCO_2e

Year 3	0	170,338 tCO_2e	170,338 tCO_2e
Year 4	0	170,338 tCO_2e	170,338 tCO_2e
Year 5	0	170,338 tCO_2e	170,338 tCO_2e
Year 6	0	170,338 tCO_2e	170,338 tCO_2e
Year 7	0	170,338 tCO_2e	170,338 tCO_2e
Total	0	1,192,366 tCO_2e	1,192,366 tCO_2e
Total number of crediting years	7		
Annual average over the crediting period	0	170,338 tCO_2e	170,338 tCO_2e

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Relevant SDG Indicator	SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption
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	250,866 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 TPG 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 TPG 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 TPG conducts the payment to the project owner for purchasing electricity generated by the proposed project and the project owner sends the invoice to TPG. As for Chungwei wind farm, the electricity meter monitors the electricity amount of not only the proposed project but also part of the electricity from another project owner's project (GS472). For separation of electricity between Chungwei wind farm and GS472, the automatic electricity record system (SCADA, owned by the project owner) has been used. The generation electricity data of each wind turbine would be recorded by SCADA and the recorded data would be submitted to TPG. TPG would separate the electricity value from the electricity meter based on the recorded data and then issue the receipts to the project owner for Chungwei wind farm under the proposed project.
Monitoring frequency	Continuously
QA/QC procedures	Meter reading records will be crosschecked with the electricity receipts. The electricity meter 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	/

Relevant SDG Indicator	SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption

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	0
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 TPG 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 TPG 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 TPG conducts the payment to the project owner for purchasing electricity generated by the proposed project and the project owner sends the invoice to TPG. As for Chungwei wind farm, the electricity meter monitors the electricity amount of not only the proposed project but also part of the electricity from another project owner's project (GS472). For separation of electricity between Chungwei wind farm and GS472, the automatic electricity record system (SCADA, owned by the project owner) has been used. The generation electricity data of each wind turbine would be recorded by SCADA and the recorded data would be submitted to TPG. TPG would separate the electricity value from the electricity meter based on the recorded data and then issue the receipts to the project owner for Chungwei wind farm under the proposed project.
Monitoring frequency	Continuously
QA/QC procedures	Meter reading records will be crosschecked with the electricity receipts. The electricity meter 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	/

Relevant SDG Indicator	SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption
Data / Parameter	$EG_{facility,y}$ $EG_{PJ\_Add,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Calculated by the difference of $EG_{Export,y} – EG_{Import,y}$
Value(s) applied	250,866 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 with the electricity receipts, and calculation will be double checked and verified.
Purpose of data	Calculation of baseline emissions
Additional comment	/

Relevant SDG Indicator	SDG Indicator 8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities.
Data / Parameter	Quantitative employment and income generation
Unit	Persons
Description	The project provides employment to permanent staffs for wind farms operation and all staff will be fairly compensated (above the required minimum wage). The minimum salary is regulated by relevant Act[5] in Taiwan. Since the labor insurance premiums are relative to the employee's compensation, salaries of relevant employees can be found in the labor insurance list (HR records), which were provided to the DOE during the previous verification.
Source of data	EIA reports

[5] http://ilo.ch/dyn/natlex/docs/ELECTRONIC/37871/86524/F1327838296/CHN37871%20Eng%202018.pdf

Value(s) applied	49
Measurement methods and procedures	HR records.
Monitoring frequency	Annually
QA/QC procedures	/
Purpose of data	/
Additional comment	/

Relevant SDG Indicator	SDG Indicator 13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.
Data / Parameter	ER_y
Unit	tCO_2/yr
Description	Emission reduction in year y
Source of data	Calculated
Value(s) applied	170,338
Measurement methods and procedures	The ex-post emission reduction is calculated according to the registered PDD description.
Monitoring frequency	Each verification
QA/QC procedures	/
Purpose of data	/
Additional comment	/

Safeguarding Principle	Safeguarding Principle 3 – Environment, ecology and land use
Data / Parameter	Air Quality
Unit	N/A
Description	Atmospheric pollutants abatements

Source of data	Taipower's announcement related to its SOx, NOx and TSP emissions[6]
Value(s) applied	N/A
Measurement methods and procedures	Calculated
Monitoring frequency	Annually
QA/QC procedures	Calculated annually, based on SOx, NOx and TSP averaged emission factors publicly announced by the grid. The project owner is responsible for keeping the generation data. The data is then collected and calculated by South Pole Carbon Asset Management Ltd.
Purpose of data	/
Additional comment	/

Safeguarding Principle	Safeguarding Principle 3 – Environment, ecology and land use
Data / Parameter	Other pollutants
Unit	N/A
Description	Installation of airtight windows
Source of data	Interview records
Value(s) applied	N/A
Measurement methods and procedures	N/A
Monitoring frequency	Annually
QA/QC procedures	The local stakeholder will be interviewed annually. The project owner will keep all records.
Purpose of data	/
Additional comment	The resident airtight windows were provided in 2013 and 2014.

Safeguarding Principle	Safeguarding Principle 3 – Environment, ecology and land use
Data / Parameter	Biodiversity
Unit	N/A

[6] https://www.taipower.com.tw/tc/page.aspx?mid=216, updated continuously.

<table>
<tr><td>Description</td><td>Plants re-plantation</td></tr>
<tr><td>Source of data</td><td>EIA reports</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Wind Farm</th><th>Total Target Area</th><th>Completion progress</th></tr>
<tr><td>InfraVest Fongwei Wind Farm Project</td><td>6340.97</td><td>104%</td></tr>
<tr><td>InfraVest Longwei Wind Farm Project</td><td>18992.31</td><td>100%</td></tr>
<tr><td>InfraVest Chungwei Wind Farm Project</td><td>5709</td><td>100%</td></tr>
<tr><td>InfraVest Tauwei Wind Farm Project</td><td>1200</td><td>100%</td></tr>
</table>
No negative impact observed
</td></tr>
<tr><td>Measurement methods and procedures</td><td>N/A</td></tr>
<tr><td>Monitoring frequency</td><td>Annually</td></tr>
<tr><td>QA/QC procedures</td><td>According to the letters from the Forestry Bureau for the re-plantation, Chungwei and Tauwei have met the governmental requirements and the future re-plantation maintenance will be transferred to local government. The project owner will not take any responsibility of re-plantation maintenance of the project any more. According to the letters from the Forestry Bureau for the re-plantation of Fongwei and Longwei has met the governmental requirements, and the project owner will keep all records and photos.</td></tr>
<tr><td>Purpose of data</td><td>/</td></tr>
<tr><td>Additional comment</td><td>/</td></tr>
</table>

Safeguarding Principle	Safeguarding Principle 3 – Environment, ecology and land use
Data / Parameter	Landscape and visual impact
Unit	N/A
Description	The overall color of wind towers is mainly white or light-color and the surroundings of wind towers are greened.
Source of data	Interview records
Value(s) applied	No complaint about the landscape and visual impact.
Measurement methods and procedures	N/A
Monitoring frequency	Annually

QA/QC procedures	The local stakeholder will be interviewed annually. The project owner will keep all records.
Purpose of data	/
Additional comment	/

Safeguarding Principle	Safeguarding Principle 3 – Environment, ecology and land use
Data / Parameter	Electromagnetic interference and radiation
Unit	N/A
Description	Installation of relevant antenna or devices for user in need
Source of data	Interview records
Value(s) applied	No complaint about the electromagnetic impact and no requirement of installation of relevant antenna or devices has been received from residents by the project owner.
Measurement methods and procedures	N/A
Monitoring frequency	Annually
QA/QC procedures	The local stakeholder will be interviewed annually. The project owner will keep all records.
Purpose of data	/
Additional comment	/

B.7.2. Sampling plan

Not applicable.

B.7.3. Other elements of monitoring plan

1. Electricity meters:

Electricity generation ($EG_{Export,y}$) and consumption ($EG_{Import,y}$) are measured continuously by bi-directional meters installed at 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[7]:

[7] The wind turbines serial numbers for turbines already installed and stared operating are included in the diagram. For Fongwei wind farm, there is still one turbine are planned to be installed. Since the project construction has not been fully complete, the line diagram will be subject to future changes.

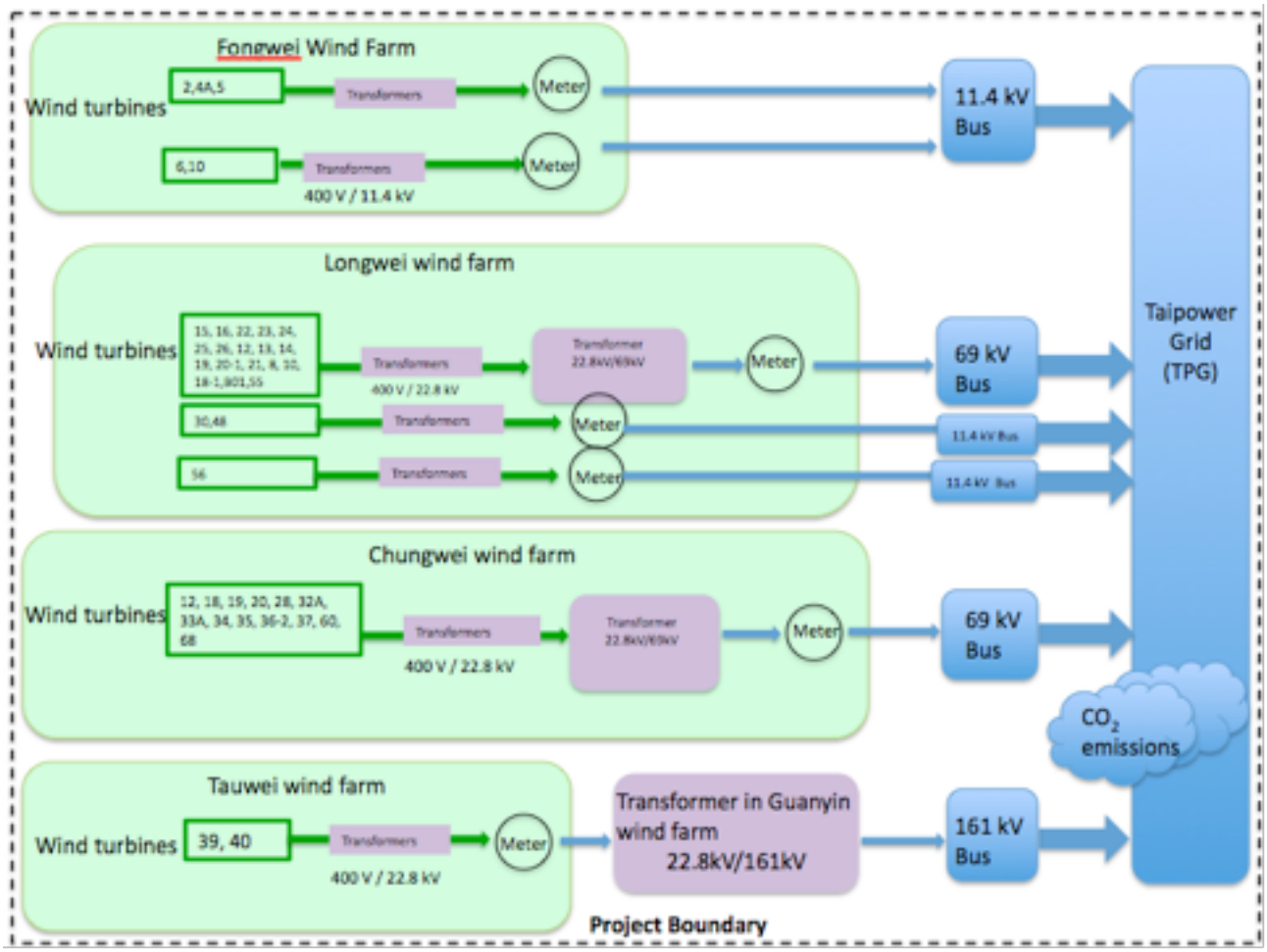
Fongwei Wind Farm:
Two bi-directional electricity meters are located in Fongwei wind farm 11.4 kV Switchroom, before connection to Taipower 11.4 kV grid at SongLin S/S Substation respectively.

Longwei Wind Farm:
One bi-directional electricity meter is located in Longwei wind farm 69 kV Switchroom, primary side of the 22.8kV/69kV Transformer, and before connection to the Gongguan-Miaozi 69 kV line #1 connection station; and the other two meters are installed in Longwei wind farm 11.4 kV Switchroom, before connection to Taipower 11.4 kV grid at HouLong S/S Substation respectively

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

Tauwei Wind Farm:
One bi-directional electricity meter is located in Tauwei wind farm switchroom, before the electricity generated by Tauwei is connected with Guanyin wind farm, then to Taipower 161 kV grid.

The turbines in Fongwei wind farm site are connected to Taipower grid at SongLin S/S Substation through 11.4 kV transmission line. In Longwei wind farm site, 18 turbines are connected to Taipower 69 kV grid through the Gongguan-Miaozi 69 kV line #1 connection station, and 3 turbines are connected to Taipower 11.4 kV grid at Houlong S/S Substation by 2 lines separately. The turbines in Chungwei wind farm site are connected to Taipower 69 kV grid through 22.8kV/69kV transformer. The turbines in Tauwei wind farm site are connected to Taipower 161 kV grid through Guanyin wind farm. Electricity Connection Diagram with meters locations for each wind farm is attached as below:



2. Responsibility of Parties

Two parties are involved: InfraVest (project owner), TPG (grid company).

InfraVest is in charge of overall wind projects operation & maintenance.

TPG and InfraVest are responsible for monitoring.

3. Data Monitoring & Management Procedures:

The monitoring is done according to the following procedures:

1. Data from electricity meters are recorded remotely and digitally at the TPG office. Taipower's personnel download the electric data.
2. TPG 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. TPG pays the money to InfraVest for the confirmed export amount and receives export invoices from InfraVest. InfraVest pays to TPG for the confirmed import amount and receives import invoices from TPG.

GS VER monitoring training for the staffs will be provided.

4. Quality assurance and quality control procedures

The meter specification complies with The Weight and Measures Act, Regulation no. CNMV 46, 'Technical Specification for Verification and Inspection of Electricity Meters'[8]. The accuracy class of the electricity meters used for the project activity would be at least 0.5%, in line with the official standard error for electricity meter (MOF) at ±0.5%[9].

The official period of validity for the *electronic electricity meter* in this project is determined as 8 years. Request for calibration, error check and adjustment can be made by the project owner at its own expense. Taipower's calibration procedures are in accordance to and governed by the Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs, Taiwan R.O.C. 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[10]. In case of meter performance failure or malfunction, TPG and the project owner would follow the Power Purchase Agreement (PPA) clause 6: TPG 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.[11]

[8]The Weight and Measures Act www.bsmi.gov.tw/wSite/public/Attachment/f1224657229438.doc Technical Specification for Verification and Inspection of Electricity Meters

http://www.bsmi.gov.tw/wSite/public/Attachment/f1224657229438.doc Clause 3.9.3

[9] The Weight and Measures Act www.bsmi.gov.tw/wSite/public/Attachment/f1224657229438.doc

Technical Specification for Verification and Inspection of Electricity Meters

http://www.bsmi.gov.tw/wSite/public/Attachment/f1224657229438.doc Clause 3.3.4 Table 4

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

[11] Please refer to the Power Purchase Agreement (PPA) of the project activity.

SECTION C. Duration and crediting period

C.1. Duration of project

C.1.1. Start date of project

27/12/2009 (First equipment contract was signed for Chungwei Wind Farm; this is the earliest date of equipment contracts of four wind farms)

C.1.2. Expected operational lifetime of project

20 years and 0 months

C.2. Crediting period of project

Renewable crediting period. This is the second crediting period.

C.2.1. Start date of crediting period

The start date of second crediting period is 01/02/2021. The first crediting period is from 01/02/2014 to 31/01/2021.

C.2.2. Total length of crediting period

Seven years

SECTION D. Safeguarding principles assessment

D.1. Analysis of social, economic and environmental impacts

Safeguarding principles	Assessment questions	Assessment of relevance to the project (Yes/potentially/no)	Justification	Mitigation measure (if required)
1 Human Rights	The Project Developer and the Project shall respect internationally proclaimed human rights and be complicit in	No	The project respects internationally proclaimed human rights. Taiwan has its own legislation in place prohibiting the violation of human rights principle and it actively enforces the compliance of such principle. Taiwan ratified two UN human rights treaties—the International	N/A

	violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights.		Covenant on Civil and Political Rights and the International Covenant on Economic, Social, and Cultural Rights—and passed the implementing law to bring relevant regulations and practice into line with the treaties. The widely recognized democracy, political freedom, and human rights watchdog organization, Freedom House rates Taiwan as among the most "Free" nations in Asia (labelled as green), with a 1 in Political Rights and a 1 in Civil Liberties (scale of 1-7, with 1 being the highest) 2017 report: https://freedomhouse.org/sites/default/files/Freedom_in_the_World_2017_complete_book.pdf	
	The Project shall not discriminate with regards to participation and inclusion.	No	This project does not discriminate with regards to participation and inclusion. The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination. Specifically regarding the gender equality, detailed enforcement rules are regulated in 'Gender Equality in Employment Act' (http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL015149 http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL015150), and in case of lawsuit occurrence, legal aid could be provided as in accordance to	N/A

			'Regulations for Providing Legal Aid in Lawsuits Concerning Gender Equality in Employment Act' (http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL015152)	
2 Gender Equality and Women's Rights	The Project shall not directly or indirectly reinforce gender-based discrimination and shall not lead to/contribute to adverse impacts on gender equality and/or the situation of women. Specifically, this shall include (not exhaustive): (a) Sexual harassment and/or any forms of violence against women – address the multiple risks of gender-based violence, including sexual exploitation or	No	As a project combined of positive environmental, economic, and sustainable development benefits, the project is to generate clean electricity from the wind sources to replace fossil fuel power. The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination. Specifically regarding the gender equality, detailed enforcement rules are regulated in 'Act of Gender Equality in Employment Act' (https://www.global-regulation.com/law/taiwan/9330939/act-of-gender-equality-in-employment.html), and in case of lawsuit occurrence, legal aid could be provided as in accordance to 'Regulations for Providing Legal Aid in Lawsuits Concerning Gender Equality in Employment' (http://ilo.ch/dyn/natlex/docs/ELECTRONIC/89080/102136/F226397527/CHN89080%20ENG.pdf).	N/A

	human trafficking. (b) Slavery, imprisonment, physical and mental drudgery, punishment or coercion of women and girls. (c) Restriction of women's rights or access to resources (natural or economic). (d) Recognise women's ownership rights regardless of marital status – adopt project measures where possible to support to women's access to inherit and own land, homes, and other assets or natural resources.			
	Projects shall apply the principles of nondiscriminati on, equal	No	Qualifed local residents, both men and women, are recruited to work for the project. Before the project came into operation, stakeholders'	N/A

	treatment, and equal pay for equal work, specifically: (a) Where appropriate for the implementation of a Project, paid, volunteer work or community contributions will be organised to provide the conditions for equitable participation of men and women in the identified tasks/activities. (b) Introduce conditions that ensure the participation of women or men in Project activities and benefits based on pregnancy, maternity/paternity leave, or marital status. (c) Ensure that these conditions do not limit the		consultation was conducted to collect comments from the local people, including both men and women. The details can be seen in registered passport. During previous monitoring periods, stakeholder interviews were conducted to collect comments about noise, landscape view and electromagnetic interference and radiation of the project from the local people, including both men and women. The details can be seen in previous monitoring reports.	

	access of women or men, as the case may be, to Project participation and benefits.			
	The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks.	No	The project abides the rules of equality accordingly. Specifically regarding the gender equality, detailed enforcement rules are regulated in 'Act of Gender Equality in Employment Act' (https://www.global-regulation.com/law/taiwan/9330939/act-of-gender-equality-in-employment.html).	N/A
3 Community Health, Safety and Working Conditions	The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community.	No	The Project's purpose is to supply electricity from the wind farms to replace fossil fuel power. It is beneficial to local people. The Project applies an automated wind power generating facility, equipped with a remote controlling system. Therefore, most of the employees work in indoor environment (at the office), instead of having to standby at the wind farm site. In case of on-site monitoring and device maintenance - since wind turbine does not generate any type of pollutants, employees are not exposed to unsafe or unhealthy environment. The project owner's office space complies with the detailed principles of working environment as described in 'Enforcement Rules of Labour	N/A

			Safety and Health at Workplace, Taiwan R.O.C.': http://law.moj.gov.tw/LawClass/LawAllIf.aspx?PCode=N0060001	
4 – Cultural Heritage, Indigenous Peoples, Displacement and Resettlement				
4.1 Sites of Cultural and Historical Heritage	Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g., knowledge, innovations, or practices)?	No	According to the EIA reports,the Project area does not include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture.	N/A
4.2 Forced Eviction and Displacement	Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	As described in the EIA reports, the Project is constructed distanced to residential area, thus the Project does not require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial).	N/A
4.3 Land Tenure and Other Rights	Does the Project require any change to land tenure arrangements and/or other rights?	No	As described in the EIA reports, the Project is constructed distanced to residential area, and there is no need of resettlement. Thus it does not require any change to land tenure arrangements and/or other rights.	N/A

	For Projects involving land-use tenure, are there any uncertainties with regards land tenure, access rights, usage rights or land ownership?	No.	N/A	N/A
4.4 Indigenous Peoples	Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No indigenous peoples present in or within the area of influence of the Project.	N/A
5 Corruption	The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects.	No	The project is owned by a private equity company, and there is no governmental subsidy disbursed to the project. Therefore, the Project does not involve, complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects. Moreover, Taiwan was ranked 35 out of 180 countries surveyed in Transparency International's Worldwide Corruption Perceptions Index http://en.wikipedia.org/wiki/Corruption_Perceptions_Index .	N/A

6 – Economic Impacts				
6.1 Labour Rights	The Project Developer shall ensure that there is no forced labour and that all employment is in compliance with national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Where these are contradictory and a breach of one or other cannot be avoided, then guidance shall be sought from	No	Forced or compulsory labour is regulated in the Labour Standards Act (http://law.moj.gov.tw/eng/LawClass/LawAll.aspx?PCode=N0030001). The project fully respects the employees' rights in accordance with all labour related laws endorsed within Taiwan R.O.C. Law compliance is subject to government's inspection and ruling. The Project complies with national labour and occupational health and safety laws, obligations under international law, and the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Labour rights are protected in the Labour Standards Act (http://law.moj.gov.tw/eng/LawClass/LawAll.aspx?PCode=N0030001). The right to unionize, bargain collectively are highly protected by Labor Union Law: http://laws.cla.gov.tw/Eng/FLAW/FLAWDAT01.asp?lsid=FL014918. The project fully respects the employees' freedom and rights and all related laws endorsed within Taiwan R.O.C. Law. Law compliance is subject to government's ruling. Working agreements between the company and individual	N/A

	Gold Standard. It requires that; (a) (b) Workers shall be able to establish and join labour organisations. Working agreements with all individual workers shall be documented and implemented. These shall, at minimum, comprise: i. Working hours (must not exceed 48 hours per week on a regular basis), AND ii. Duties and tasks, AND iii. Remuneration (must include provision for payment of overtime), AND iv. Modalities on health insurance, AND v. Modalities on termination of		workers are documented and implemented. The employment model applied is locally and culturally appropriate.	

	the contract with provision for voluntary resignation by employee, AND vi. Provision for annual leave of not less than 10 days per year, not including sick and casual leave.			
	Child labour, as defined by the ILO Minimum Age Convention is not allowed. The Project Developer shall use adequate and verifiable mechanisms for age verification in recruitment procedures. Exceptions are children for work on their families' property as long as: (a) Their compulsory schooling (minimum of 6 schooling	No	In Taiwan, there is a comprehensive definition of child labour in terms of age limitation, working hours, etc. Such employment regulations are described in Labour Standard Act Chapter 5: http://law.moj.gov.tw/eng/LawClass/LawAll.aspx?PCode=N0030001 The Project requires a limited number of skilled employees to operate, maintain, and manage the wind farm, as opposed to manufacturing industries, which may require abundant low-skilled labour. Therefore, the project does not employ and is not complicit in any form of child labour. According to the Employee employment contract, it could be confirmed that the Project does not employ any child labour.	N/A

	years) is not hindered, AND (b) The tasks they perform do not harm their physical and mental development, AND (c) The opinions and recommendations of an Expert Stakeholder shall be sought and demonstrated as being included in the project design. (d) The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures.		All equipment in the Project are operated properly according to the work prodedures and safety regulation rules. The Project organizes employee training with topics surrounding technical, environmental/safety code, and operational/maintenance procedures. The Project has established emergency preparedness and response procedure, which also regulates the documentation and reporting of accidents and incidents. Thus the Project owner ensures the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures.	
6.2 Negative Economic Consequences	Does the project cause negative economic	No	The project could supply job opportunities to local people, thus is good to local economy. As the Project's purpose is to	N/A

	consequences during and after project implementation, e.g., for vulnerable and marginalised social groups in targeted communities?		supply energy from the wind farms, there is no potential risks of the project to the local economy.	
7 – Climate and Energy				
7.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No	The Project will reduce the emission of 170,338 tCO_2e compared to the Baseline Scenario as it replaces electricity generated from fossil fuel fired power plants with zero emissions electricity from the wind farms.	N/A
7.2 Energy Supply	Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	No	The Project's purpose is to supply energy from the wind farms. It may use some electricity from a regional grid, TPG, when the equipments are in maintenance. It does not use energy from a local grid or power supply or fuel resource that provides for other local users.	N/A
8 – Water				
8.1 Impact on natural water patterns and flow	Will the Project affect the natural or pre-existing pattern of	No	The Project's purpose is to supply energy from the wind farms. Therefore the impact of the Project on the natural or pre-existing pattern of watercourses,	N/A

	watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?		ground-water and/or the watershed(s) is negligible.	
8.2 Erosion and/or water body stability	Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	No	The Project's purpose is to supply energy from the wind farms. Therefore the impact of the Project on the erosion and/or water body stability is negligible.	N/A
	Is the Project's area of influence susceptible to excessive erosion and/or water body instability?	No	The Project's purpose is to supply energy from the wind farms. Therefore the project's area of influence is not susceptible to excessive erosion and/or water body instability.	N/A
9 - Environment, ecology and land use				
9.1 Landscape modification and soil	Does the Project involve the use of land and soil for production of crops or other products?	No	The project is a wind power project. It does not involve the use of land and soil for production of crops or other products.	N/A

9.2 Vulnerability to Natural Disaster	Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project is not susceptible to and does not lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions.	N/A
9.3 Genetic Resources	Could the Project be negatively impacted by the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project is not negatively impacted by the use of GMOs.	N/A
9.4 Release of pollutants	Could the Project potentially result in the release of pollutants to the environment?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project does not potentially result in release of pollutants to the environment.	N/A

9.5 Hazardous and Non-hazardous Waste	Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project does not involve the manufacture, trade, release, and/or use of hazardous and non-hazardous chemicals and/or materials.	N/A
9.6 Pesticides and fertilizers	Will the Project involve the application of pesticides and/or fertilisers?	No	The project is a wind power project. Therefore the Project does not involve the application of pesticides and/or fertilizers.	N/A
9.7 Harvesting of forests	Will the Project involve the harvesting of forests?	No	The project is a wind power project. It does not involve the harvesting of forests	N/A
9.8 Food	Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project does not modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives.	N/A
9.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The Project's purpose is to supply energy from the wind farms. Therefore the Project does not involve animal husbandry.	N/A
9.10 High Conservation Value	Does the Project physically affect	No	The project is a wind power project. It does not physically affect or alter largely intact or	N/A

Areas and Critical Habitats	or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?		High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified.	
9.11 Endangered Species	Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)?	No	There are no endangered species identified as potentially being present within the Project boundary (including those that may route through the area).	N/A
	Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	No	The project would not potentially impact other areas where endangered species may be present through transboundary affects.	N/A

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from stakeholders

tbc

E.2. Summary of comments received

tbc

E.3. Report on consideration of comments received

tbc

Appendix 1. Contact information of project participants

Organization name	InfraVest Wind Power Group
Registration number with relevant authority	/
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

Organization name	South Pole Carbon Asset Management Ltd.
Registration number with relevant authority	/
Street/P.O. Box	Technoparkstr. 1
Building	/
City	Zurich
State/Region	/
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	+ 41 43 501 35 99
Direct tel.	+ 41 43 501 35 50
Personal e-mail	r.heuberger@southpolecarbon.com

Appendix 2. Summary of post registration design changes

No post registration design changes.

Appendix 3. Further background information on ex ante calculation of emission reductions

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

STEP 1. Identify the relevant electric system

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.

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)[12], 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", 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.
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 A1 Net Calorific Values ($NCV_{i,y}$) multiplied by ($EF_{co2,i,y}$) of fossil fuel used for OM and BM calculation

Fuel Type	Emission Factor	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**	$KgCO_2/Kg$
Other Petroleum Products	**2.72**	$KgCO_2/L$

[12] Energy Balances in Taiwan, http://www.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

Natural Gas	1.82	$KgCO_2/M^3$
Refinery Gas	1.82	$KgCO_2/M^3$

According to the experts[13], coal should not be considered as low cost/must run. Thus only nuclear, biomass, hydro, geothermal electricity, solar photovoltaic and wind power plants are included as low-cost/must-run resources, hereafter referred as lc-mr, which turns out to be between 13.60% and 19.11% of the total electricity generation on average during years 2015 and 2019:

Table A2: Gross and Net Electricity Generation in Taiwan[14]

	Units	2015	2016	2017	2018	2019
Total electricity generation	MWh	257,327,618	263,028,336	268,654,630	271,268,513	268,488,494
Total low-cost/must-run	MWh	49,167,852	46,605,827	36,542,856	41,052,790	47,000,307
Total Power plant Own Use	MWh	11,536,575	11,508,349	11,806,263	12,217,554	12,446,257
Total LCMR power Plant Own Use	MWh	0	0	0	0	0
share of LCMR	MWh	19.11%	17.72%	13.60%	15.13%	17.51%

The baseline methodology allows a choice among four methods for the calculation of OM emission factor;

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM

[13] According to Dr. Chung-Huang Huang (黃宗煌教授), a professor at Department of Economics, National Tsing Hua University, coal power plants are not 'low-cost' in calculation of Operating Margin because when evaluating the total costs of the electricity generation technologies, the external costs also have to be taken into account besides the internal costs (such as the operational cost, construction cost, etc). With the external costs included in the calculation, the total social cost (internal cost + external cost) of coal power plants is proved to be higher than that of renewable power generation. Furthermore, when the grid was going to reduce power plant operation during the lower load demand period, the coal-fired power plants are prioritized to undertake such function. Thus, coal cannot be considered as 'low-cost / must-run'.

[14] Energy Balances in Taiwan, http://www.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

Since the average share of electricity generation by lc-mr plants for five most recent years is found to be less than 50%, option (a) is chosen. The simple OM emission factor can be calculated using either of the two 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 for the 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 crediting period renewal validation, is used. Monitoring and recalculation of the emission factor during the crediting period and third 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, TPG 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*" 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:

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 A3 Amount of fuel type i consumed by power plants/units in year y

		Fuel	Units	Public Electricity Plants	Public Cogeneration Plants	Autoproducer Cogeneration Plants
2017	Solid	Bituminous Coal-Steam Coal	t	26,012,164	1,265,369	10,535,183
		Sub-Bituminous Coal	t	11,099,616	0	365,279
		Coke Oven Gas	km^3	0	0	678,012
		Blast Furnace Gas	km^3	0	0	7,616,994

		Oxygen Steel Furnace Gas	km^3	0	0	727,921
	Liquid	Refinery Gas	km^3	0	0	99,296
		Diesel Oil	kL	140,903	0	2,831
		Residual Fuel Oil	kL	2,664,692	15,568	56,261
		Petroleum Coke	t	0	0	96,755
		Other Petroleum Products	kL	0	0	16,720
	Gas	Natural Gas	km^3	0	0	2,165
		LNG	km^3	17,734,477	0	75,894
2018	Solid	Bituminous Coal-Steam Coal	t	25,963,707	752,496	12,447,100
		Sub-Bituminous Coal	t	10,646,055	0	271,994
		Coke Oven Gas	km^3	0	0	719,402
		Blast Furnace Gas	km^3	0	0	8,073,869
		Oxygen Steel Furnace Gas	km^3	0	0	740,297
	Liquid	Refinery Gas	km^3	0	0	286,097
		Diesel Oil	kL	95,337	0	1,629
		Residual Fuel Oil	kL	1,604,280	12,443	99,209
		Petroleum Coke	t	0	0	104,890
		Other Petroleum Products	kL	0	0	14,859
	Gas	Natural Gas	km^3	0	0	701
		LNG	km^3	17,647,706	0	92,509
2019	Solid	Bituminous Coal-Steam Coal	t	24,920,367	688,512	11,983,427
		Sub-Bituminous Coal	t	9,993,123	0	233,030
		Coke Oven Gas	km^3	0	0	772,505
		Blast Furnace Gas	km^3	0	0	7,702,513
		Oxygen Steel Furnace Gas	km^3	0	0	689,226
	Liquid	Refinery Gas	km^3	0	0	309,566
		Diesel Oil	kL	81,444	0	1,661
		Residual Fuel Oil	kL	1,106,185	2,280	90,859
		Other Petroleum Products	kL	0	0	13,034
	Gas	Natural Gas	km^3	0	0	2,746
		LNG	km^3	17,068,306	0	86,648

Source from the Energy Balance Sheets in Taiwan
(http://www.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145)

Table A4 The total CO_2 emissions by fuels of 2017, 2018 and 2019

Total Emission in 2017	tCO_2	145,747,717
Total Emission in 2018	tCO_2	144,142,470
Total Emission in 2019	tCO_2	136,636,818

Thus, the results of Operating Margin are:

$EG_{grid,OM,y}$ (2017)	tCO_2/MWh	0.662
$EG_{grid,OM,y}$ (2018)	tCO_2/MWh	0.661

$EG_{grid,OM,y}$ (2019)	tCO_2/MWh	0.654
Average $EG_{grid,OM,y}$ (2017~2019)	tCO_2/MWh	0.661

The result of Operating Margin is **0.661** 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[15] which was approved by CDM EB[16], since it is impossible to separate the different generation technology capacities based on coal, oil or gas fuel etc from the generic term "thermal power" in the present energy statistics, the following calculation measures 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,

[15] 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.

[16] 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.

liquid, and gas fuel consumption for power generation is determined; then this ratio is multiplied 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[17]. In terms of vintage of data, Option 1 is chosen:
Build margin emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of PDD submission to the DOE for crediting period renewal validation.

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.

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 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.

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

Table A5 The total CO_2 emissions by fuel of 2019 ($FC_{i,y}$)

	Fuel	Units	Emission (tCO_2e)	λ
Solid	Bituminous Coal-Steam Coal	t	73,725,274	-
	Sub-Bituminous Coal	t	19,314,136	
	Coke Oven Gas	M^3	330,079	-
	Blast Furnace Gas	M^3	3,574,837	
	Oxygen Steel Furnace Gas	M^3	509,446	-
	Sub-total	-	97,453,771	71.32%
Liquid	Refinery Gas	M^3	366,270	-
	Diesel Oil	L	210,711	-
	Residual Fuel Oil	L	3,540,943	-
	Other Petroleum Products	L	23,100	-
	Sub-total	-	4,141,025	3.03%
Gas	Natural Gas	M^3	3,253	-
	LNG	M^3	35,038,770	-
	Sub-total	-	35,042,023	25.65%
Total		-	136,636,818	100%

Data Source: Energy Balances in Taiwan by Taiwan's Bureau of Energy[18]

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,

[18] Energy Balances in Taiwan, http://www.moeaboe.gov.tw/ECW/populace/web_book/WebReports.aspx?book=B_CH&menu_id=145

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

$CAP_{Thermal}$ = the total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

The below is shown the Installed Capacity of TPG:

	Installed capacity in 2004	Installed capacity in 2005	Installed capacity in 2019	Newly added installed capacity from 2004 till 2019	Proportion against newly added installed capacity
	(MW)	(MW)	(MW)	(MW)	
	A	B	C	D=C-A	$I_{THERMAL}/I_{TOTAL}$
Hydro	4,501.0	4,501.0	4,652.4	151.4	1.942%
Nuclear	5,144.0	5,144.0	3,872.0	-1,272.0	-16.318%
Thermal	17,943.7	19,231.1	26,425.6	8,481.9	108.814%
Renewable Energy	2.4	17.8	436.0	433.6	5.562%
Share in 2019 installed capacity	22.03%	18.35%			
Total	27,591.1	28,893.9	48,881.5	7,794.9	100.000%

Source: Electricity Generation Installed Capacity (Year 2004-2019) [19]

The result of Build Margin is **0.733** tCO_2e/MWh.

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

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

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

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

The operating margin emission factor ($EF_{grid,OM,y}$) of Taiwan is 0.661 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.733 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.

[19] https://www.moeaboe.gov.tw/ECW/populace/home/TextSearch.aspx?menu_id=2314&cx=015675351803128794028%3awwbfwea98s0&q=%e7%99%bc%e9%9b%bb%e8%a3%9d%e7%bd%ae%e5%ae%b9%e9%87%8f%e7%b5%b1%e8%a8%88%e8%a1%a8