Project design document form for CDM project activities

(Version 05.0)

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

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Ventika Wind Farm
Version number of the PDD	5.0
Completion date of the PDD	01/09/2014
Project participant(s)	Ventika S.A. de C.V. CEMEX International Finance Company CO2 Global Solutions International S.A.
Host Party	Mexico United Kingdom of Great Britain and Northern Ireland
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectorial Scope 1.Energy industries. ACM0002 Version 12.3.0, Consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Estimated amount of annual average GHG emission reductions	245,556

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

The project involves the production of 126.0 MW of energy using wind power. The wind farm will be located in General Bravo municipality, in the state of Nuevo León, Mexico.

Prior to the start of the implementation of the project activity no other facilities exists in the area where the wind farm is going to be installed. These lands do not have any specific current use, so the project will not affect any human activities.

The proposed project activity is the installation of a new grid-connected renewable power plant/unit, according version 12.3.0 the baseline scenario is the following:

Electricity delivered to the grid[1] *by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"* Version 02.2.1.

The majority of the electricity produced in Mexico is obtained by burning fossil fuels. This provokes considerable Greenhouse Gases (GHG) emissions, especially of carbon dioxide, situation that contributes to the Global Warming phenomenon. In order to mitigate this condition several projects that promote the usage of renewable energies have been conceived and materialized in Mexico. However, fossil fuels´ burning is still the mainstream technology for energy production in Mexico. Nonetheless, this country offers promising wind conditions in some areas, which makes the installation of wind turbines a feasible method for energy production.

The usage of wind power to produce the 126.00 MW would avoid the GHG emissions derived from fossil fuel burning technologies. In this scenario, the energy required would be produced by Ventika Wind Farm, avoiding CO_2 emissions (245,556 tCO_2e/year) and offering General Bravo municipality and the surrounding cities the generation of potential commercial activities, and job opportunities.

The energy sector has historically been a relevant global GHG emitter; and developing countries, such as the Host Party, are directly dependent on old technologies for energy production. One efficient solution to change this situation is the transition of power generation technologies from the ones based on fossil fuels to those that take advantage of renewable resources, such as wind power, hydro power, geothermal power, solar power, wave power or tidal power. Although these kinds of technologies imply a higher cost economically speaking, they offer a lower environmental cost. This economic limitation is one of the largest obstacles renewable energy faces. However, with the consideration of the potential CERs it may become an appealing alternative to current technologies.

In addition to lower GHG emissions, other environmental and social benefits derived from this project activity would include:

- Enhancement of local grid performance; there will be fewer incidences of voltage drops and local power shortages through the use of local energy resources (wind).
- New jobs can be created in the area; particularly during the construction phase of the wind farm, and afterwards the jobs required for maintenance and operation during the expected service life of the wind farm.
- Less dependence and depletion of fossil fuels as energy sources.
- Reduction of non-GHG emissions from replaced power generation.

The proposed project reduces greenhouse gas emissions by the means of producing energy that would be otherwise be generated by fossil fuel burning. Due the characteristics of the project activity the project is related to the Sectorial Scope 1 of the CDM "Energy industries". The project will only include the CO_2 emissions for the baseline and will only take in consideration the area where the wind power plant will be

[1] In this case the grid is the National Interconnected System (as Spanish Sistema Interconectado Nacional – SIN)

installed. The baseline will consider the usual energy producing method of the National Interconnected System.

The project participants are aware of the environmental impact of current power generation technologies. This is one of the main reasons to propose this project activity, which would promote sustainable development and represent a more environmentally friendly alternative. Nonetheless, the companies are also aware of the fact that the project will be economically detrimental unless it can count with the CDM approval so that the potential CERs can be a real incentive for the project to materialize.

A.2. Location of project activity

A.2.1. Host Party

>> Mexico

A.2.2. Region/State/Province etc.

>> Nuevo Leon

A.2.3. City/Town/Community etc.

>> General Bravo

A.2.4. Physical/Geographical location

>> The project will be placed in a windy area near the municipality of General Bravo, located in the Mexican state Nuevo Leon. The central coordinates of the farm are: +25.7796 -98.7231; and the area where it will be developing is of 3,800 ha.

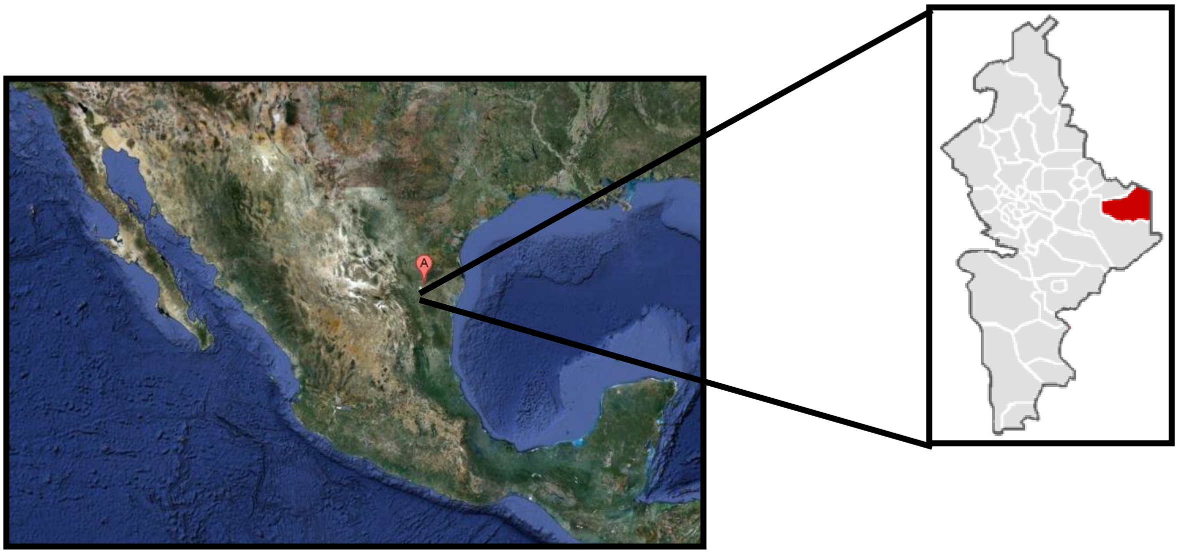

Figure 1. Location of the project.

The wind turbines are expected to be located in the following position:

Turbine	Geographic Coordinates
1	+25.8014 -98.7733
2	+25.8028 -98.7692
3	+25.8040 -98.7653
4	+25.8051 -98.7617
5	+25.8087 -98.7560
6	+25.8096 -98.7530
7	+25.8107 -98.7501
8	+25.8121 -98.7472
9	+25.8134 -98.7445
10	+25.7715 -98.7685
11	+25.7731 -98.7654

12	+25.7745 -98.7623
13	+25.7760 -98.7593
14	+25.7821 -98.7494
15	+25.7844 -98.7451
16	+25.7976 -98.7076
17	+25.7990 -98.7050
18	+25.7610 -98.7263
19	+25.7636 -98.7252
20	+25.7663 -98.7241
21	+25.7690 -98.7231
22	+25.7714 -98.7215
23	+25.7738 -98.7200
24	+25.7759 -98.7180
25	+25.7780 -98.7160
26	+25.7802 -98.7140
27	+25.7827 -98.7122
28	+25.7853 -98.7101
29	+25.7877 -98.7082
30	+25.7900 -98.7055
31	+25.7821 -98.6950
32	+25.7841 -98.6929
33	+25.7609 -98.7163
34	+25.7611 -98.7124
35	+25.7622 -98.7101
36	+25.7636 -98.7082
37	+25.7651-98.7059
38	+25.7671-98.7043
39	+25.7680 -98.7009
40	+25.7696 -98.6986
41	+25.7719 -98.6952
42	+25.7734 -98.6928

Table 1. Location of the wind turbines[2].

A.3. Technologies and/or measures

>> The technology required for the exploitation of wind resources is a very basic one; it uses the principle of transforming mechanical energy into electricity. Since it uses only wind power to generate electricity it does not produce GHG emissions and it is a safe technology that can be used in several countries. The energy generated can be injected to the national electricity grid and be used as conventional electricity.

The wind turbines were selected by considering the highest energy yield that could be generated from the usable wind resource.

The best wind turbine model, based on the available wind resource assessment performed in the area by Ereda giving a result of 37.58% of net plant load factor. The following table shows the location of the meteorological towers:

Meteorological Tower	Geographic Coordinates
1	+25.7399 -98.7248
2	+25.7607 -98.7250
3	+25.7736 -98.7622
4	+25.7677 -98.6959
5	+25.8016 -98.7505
6	+25.7877 -98.7084
7	+25.7447 -98.6848

Table 2. Location of the meteorological towers.

[2] Data of the wind resource study, using the following link in order to convert the UTM coordinates to Decimal coordinates. http://www.engineeringtoolbox.com/utm-latitude-longitude-d_1370.html

This assessment resulted in the selection of the AW 116/3000 MW ACCIONA Windpower turbines. Based on this selection Ventika Wind Farm will have the following characteristics:

Total Power Capacity	126.00	MW
No. of turbines	42	-
Blade length	56.7	M
Number of blades	3	-
Rotor Speed Range	12.3	rpm
Rotor diameter	116	M
Nominal power per turbine	3.0	MW
Tower Height	118.2	M
Generation per year	414,792	MWh/year
Transmission line length	14.8	Km
Transmission line Voltage	230	kV
Capacity factor	37.58%	-
Equivalent annual operating hours	3,292	Hrs/year
Cut-in-cut-out wind	3	m/s
Project life time	20	years[3]

Table 3. Technical information.

The baseline scenario is the same as the existing prior to the project implementation. This scenario makes the assumption that the 126.00 MW would be produced in the conventional way, which in this case would be using fossil fuels. This would produce a considerable amount of GHG emissions.

It is important to state that there is a possibility of a project expansion, this expansion depend of different variables than cannot secure that this will happen, the PP want to clarify this issue in order to be available to make a change of the capacity of the project activity.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Mexico	Ventika S.A. de C.V. (Private entity)	No
United Kingdom of Great Britain and Northern Ireland	CEMEX International Finance Company (Private entity)	No
United Kingdom of Great Britain and Northern Ireland	CO2 Global Solutions International S.A. (Private entity)	No

A.5. Public funding of project activity

>> No public funding will be used for this project activity.

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

B.1. Reference of methodology and standardized baseline

>> For the project activity, the approved baseline methodology used is ACM0002 Version 12.3.0, *Consolidated baseline methodology for grid-connected electricity generation from renewable sources.*

This methodology draws upon the following tools:

[3] http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php

- *Tool for the demonstration and assessment of additionality Version 06.1.0;*
- *Combined tool to identify the baseline scenario and demonstrate additionality Version 4.0.0;*
- *Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion Version 2;*
- *Tool to calculate the emission factor for an electricity system Version 02.2.1.*

B.2. Applicability of methodology and standardized baseline

>> The methodology ACM0002 version 12.3.0 is applicable under the following conditions[4]:

"Grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant)"

The proposed project activity involves the installation of a new power plant for renewable electricity generation that will be connected to the National Interconnected System.

"The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit"

The project activity consist in the installation of a wind power plant unit, therefore, the project activity complies with the applicability condition.

"In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity"

The project activity consist in the installation of a new wind power plant, therefore, the last condition of applicability does not apply because the project activity doesn't consist in a capacity addition, retrofit or replacement.

"In case of hydro power plants, at least one of the following conditions must apply:

- *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or.*
- *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or*
- *The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity."*

This applicable condition is in the case of a hydro power plant, for this reason this condition does not apply to this project activity.

In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply:

- *The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2.*

[4] UNFCCC-CDM. ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Version 12.3.0. Available at:

http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

- *All reservoirs and hydro power plants are located at the same river and where are designed together to function as an integrated project1 that collectively constitutes the generation capacity of the combined power plant.*
- *The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity.*
- *The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15MW.*
- *The total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less that 10% of the total installed capacity of the project activity from multiple reservoirs*

This applicable condition is in the case of a hydro power plant, for this reason this condition does not apply to this project activity.

The methodology is not applicable to the following:

"Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site."

"Biomass fired power plants."

"Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2".

The project activity consist in the installation of a facility that generates electricity based on the wind, which at the same time implies that the project activity does not involve the use of fossil fuels, in addition to the fact that is neither a biomass fired power plant nor a hydro power plant.

Additionally, the applicability conditions of the tools referred in this methodology have been taken into account. As per the "Tool to calculate the emission factor for an electricity system" version 02.2.1[5]:

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.

This project activity will not be conducted in an Annex I country, then this tool does apply to the Mexican electricity system.

Finally, the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 02 states the following[6]:

This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.

Methodology ACM0002 version 12.3.0 specifies that the project emissions from fossil fuel combustion in the year y ($PE_{FF,y}$) should be calculated as part of the project emissions (PE_y), then the applicability condition is also met.

In summary, the project activity complies all the applicability conditions (that apply to the project) of the methodology ACM0002 version 12.3.0 and the tools of the same methodology.

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[5] UNFCCC-CDM. Tool to calculate the emission factor of an electricity system. Version 02.2.1.

Available at: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[6] UNFCCC-CDM. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion- Version 02. Available at: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

B.3. Project boundary

	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. All power plants interconnected to the national grid are included.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project scenario	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from noncondensable gases contained in geothermal steam.	CO_2	No	Not applicable to the proposed project activity.
		CH_4	No	Not applicable to the proposed project activity.
		N_2O	No	Not applicable to the proposed project activity.
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable to the proposed project activity.
		CH_4	No	Not applicable to the proposed project activity.
		N_2O	No	Not applicable to the proposed project activity.
	For hydro power plants, emissions of CH_4 from the reservoir. For geothermal power plants, fugitive emissions of CH_4 and CO_2 from noncondensable gases contained in geothermal steam.	CO_2	No	Not applicable to the proposed project activity.
		CH_4	No	Not applicable to the proposed project activity.
		CO_2	No	Not applicable to the proposed project activity.

Table 4. Sources and gases included in the project boundary.

The flow diagram of the project boundary is presented in the following figure:

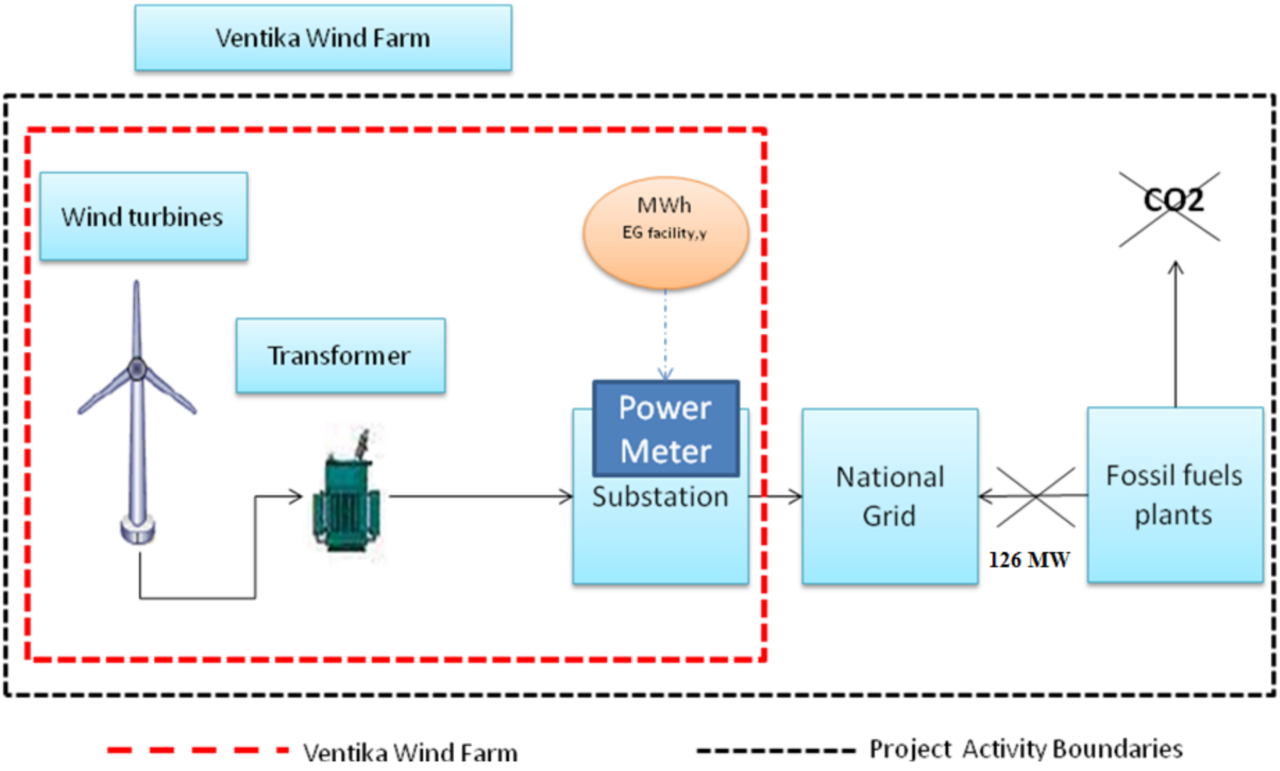

Figure 2. Flow diagram of the project boundary

B.4. Establishment and description of baseline scenario

>> The major part of the energy in the country is produced based on technologies that utilize fossil fuels for energy production and this has been that way for a long time. According to the projection elaborated by SENER within the Electricity Sector Outlook 2010 - 2025 for the electricity generation in Mexico organized per technology type, the use of fossil fuels prevails in the next fifteen years. The productions percentages for 2009 and the forecast for 2025 are shown in table 5.

	2009	2025
Fossil Fuel	81%	72%
Nuclear	5%	3%
Geothermal	3%	2%
Wind power	0%	2%
Hydropower	11%	10%
Free	0%	11%
Total (GWh)	235,107	414,604
Total low/cost must run (%)	19%	28%

Table 5. Source: SENER "Prospectiva del sector eléctrico 2010-2025. Graph 55 p. 163"

The forecast for power installed in Mexico for 2014 is 55,420 MW, which is the year where the operations will be commissioned, so the impact of 126.00 MW would not account for more than 0.2273% of the system's generation mix of electricity.

An important issue is that the capacity factor for a wind farm is considerably lower than for the fossil fuel power plants, this is due the uncertainty of wind availability. Project activity provides 37.58% of the capacity factor, therefore wind power should be considered as an additional energy source for the grid because the main one is the generation based on fossil fuels.

From the above and in consistence with the methodology ACM0002 ver. 12.3.0 for the *"installation of a new grid-connected renewable power plant/unit"*, it can be concluded that the baseline

scenario is the "*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 (where most of them are fossil fuel power plants), as reflected in the combined margin (CM) calculations described in the Tool to calculate the emission factor for an electricity system"*. In absence of the project activity the clients of the project participant will continue consuming the energy from the Mexican grid.

Date of completion of baseline study: 12/02/2013

B.5. Demonstration of additionality

>> **Timeline of events prior the development of the project activity**

Date	Event	Support/Reference
05/09/2011	Signature of the Usufruct Contract for the land use.	Contract of Usufruct for the land use of the wind farm.
28/09/2011	Contract with CO2 Solutions.	Contract with CO2 Solutions to analyze the financial flow for the project.
31/10/2011	Wind turbine quotation.	Quotation of the wind turbines, the additional quotes for the investment analysis (land contract, transmission costs, sales price, etc.).
01/11/2011	The investment analysis done. Prior Consideration of the CDM of the project Ventika Wind Farm is sent to UNFCCC and the Mexican DNA (Interministerial Commission on Climate Change).	The investment analysis was finalized to decide that the project activity requires the CDM revenues. The copies of the e-mails sent to UNFCCC and the Mexican DNA, regarding the CDM Consideration.
02/11/2011	The UNFCCC confirmed the reception of the Prior Consideration of the CDM.	Copy of confirmation e-mail, where the UNFCCC corroborates the reception of the Prior CDM Consideration to CO2 Solutions.
03/11/2011	Date that Interministerial Commission on Climate Change confirm the reception of the Prior Consideration of the CDM.	Copy of confirmation e-mail, where the Interministerial Comission on Climate Change corroborates the reception of the Prior CDM Consideration.
03/11/2011	Date of the stakeholder meeting in the Rancho Las Adjuntas", a farm inside the property in which the project activity will be placed.	Photographs of the meeting, list of attendance, surveys answer by the attendees.
25/11/2011	Start of validation process of the project activity with UNFCCC.	Web page of UNFCCC in the section "Validation".
08/12/2011	Electricity generation permit granted by the Energy Regulating Commission (CRE).	Permit of the CRE.

16/01/2012	Site visit for the project activity according to the procedures of UNFCCC.	Memorandum with the observation notes elaborated by the DOE.
10/02/2012	Wind turbine quotation updated.	The type of technology was changed and a new quote was obtained at this date.
24/09/2012	Date in which was issued the wind study taking into account the change in the technology.	Wind study of the project activity.
08/10/2012	Environmental permit granted by the SEMARNAT.	Permit of the SEMARNAT.
28/12/2012	Registration of the Project Activity by UNFCCC	https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1356678953.67/view
21/03/2013	Change of Technology	Letters of notification to the project developers.
03/06/2013	Management decision and official starting date of the project activity with the change of the technology	EPC contract copy between Ventika S.A. de C.V. and Acciona

Table 6. Timeline of events prior the development of the project activity

As it can see in the timeline of the project activity, the consideration of the CDM has been taken into account since the beginning of the development of the project activity, the Prior CDM Consideration was sent before the starting date of the project activity. Ventika S.A. de C.V. always considered the CDM incentives due to the economical barriers that the project faces (this will be demonstrated in the investment analysis).

The project activity had updates in the type of the technology and in the hectares of the land after the start of Validation; therefore the wind study and the wind turbine quotation had to be updated. It is important to remark that the IRR in the version 1 of the economic model (11.86%, used for the PDD in public consultation) and the final version (10.88%) is below than the benchmark value (13.66%), this proves that the project activity needs the incentives of the CDM for its development (for further details, please see sub-step 2c of the analysis of the additionality of the project). Due the project request a change of PDD the new IRR of the project is 11.46% which continues to be below the benchmark.

Analysis of the additionality of the project

The next table shows the official forecast of the Mexican electricity generation mix; the electric generation in the next years will be based mainly in fossil fuels; that is why the project activity will reduce GHG emissions because in absence of the project the 126.00 MW would be consumed from the national grid. The project is expected to reduce 1,718,892 tCO_2 during the 7 years of the first crediting period.

Power (MW)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	% as of 2025
Mobile Plants	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0.0%

Power (MW)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	% as of 2025
Coal	3,278	3,278	3,278	3,278	3,308	3,308	3,308	3,308	3,308	3,308	3,308	3,308	3,308	3,308	3,308	3,308	4.2%
CC	18,038	18,272	18,506	20,396	20,672	22,286	23,714	24,785	26,367	27,850	30,342	31,403	32,347	31,638	31,954	31,714	40.5%
CC/ New generation technologies	0	0	0	0	0	0	0	0	520	520	1,121	2,734	2,734	4,736	5,316	6,715	8.6%
Internal Combustion	211	222	275	319	330	373	373	416	416	509	509	509	516	516	516	516	0.7%
Dual	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2.7%
Wind	187	592	592	1,200	1,400	1,804	2,108	2,108	2,108	2,108	2,108	2,108	2,108	2,108	2,108	2,108	2.7%
Geo	890	916	891	853	883	912	912	1,012	1,022	1,022	1,097	1,097	1,097	1,097	1,097	1,067	1.4%
Hydro	11,503	11,523	12,273	12,273	12,273	12,273	12,273	12,948	12,948	13,329	13,329	13,749	13,749	14,424	14,914	14,914	19.1%
Nuclear	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	1,561	2.0%
Clean New Generation	0	0	0	0	0	0	0	0	0	0	0	786	1,486	4,372	5,772	6,899	8.8%
Solar photovoltaic (pilot)	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0.0%
Conventional termal	12,299	12,111	12,111	11,111	10,495	10,495	9,895	9,727	9,152	8,836	7,708	7,388	7,068	5,436	5,120	5,120	6.5%
Gas turbine	2,232	1,946	1,946	2,478	2,390	2,305	2,410	2,317	2,274	2,274	2,274	2,274	2,274	2,274	2,274	2,218	2.8%
Total	52,301	52,525	53,541	55,578	55,420	57,425	58,663	60,290	61,784	63,425	65,465	69,025	70,357	73,578	76,048	78,248	100%

Table 7. Source: Sener. "Prospectiva del sector eléctrico 2010-2025 Cuadro 40 p. 160".

According to long-term forecasting of the Mexican energy system, wind power installations will become 2.70% (not including the power capacity of the proposed project activity) in 2025 and 2.52% in 2014 that as pointed out before will be the start-up year of this project. Thus, power produced from this project will have no impact in the baseline calculations. The Mexican energy system will be mainly based on Combined Cycle and Thermal Power Plants. The estimations percentage on hydro power will reach approximately 19.10% by 2025.

It is important to remark that it is unlikely that the wind farms projected in this forecast still are implemented in case they do not receive any kind of additional economical incentive such as the CERs for CDM projects.

Even though in Mexico, especially in the southwest zone there is good quality wind available, wind power generation is not an attractive investment in a business-as-usual scenario.

To demonstrate the project activity additionality, the "Tool for demonstration and assessment of additionality" was applied, following all steps defined. These steps will demonstrate that the proposed project activity is not the baseline scenario.

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

Definition of alternative scenarios to the project activity that otherwise could be implemented in absence of the Project Activity.

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

The project activity consists in the installation of a wind farm for clean energy generation that will be exported to the Mexican electricity grid for its consumption. The alternatives would be that other power plants provided the electricity to the grid; the alternatives include:

1. *The proposed project activity undertaken without being registered as a CDM project activity; a wind farm with an installed capacity of 126.00MW with an annual production of 414,792 MWh developed without the CERs incentive.*

The wind farm could not be developed without the incentive of the CDM registration due to technical and economical obstacles. No wind farms in Mexico have been developed without the CERs incentive. Other renewable sources for power generation are not a likely baseline scenario as it has been already explained.

2. *Continuation of the current situation: Ventika S.A. de C.V. does not implement the project; hence the national grid consumers will continue using the electricity from the national grid with a higher emission factor.*

This is the most plausible alternative scenario to the project.

3. *The same power generation through power plants from renewable sources like biomass or minihydro power plants.*

Due to the size of the project activity, hydropower plants could only be a viable alternative if there was either a group of minihydro power plants or at least one large hydropower plant, moreover, hydro is unlikely to happen because the installed capacity expected for 2014 (starting year of the project activity) in the zone will be the same at the moment of the project activity (Source: *"Electricity Sector Outlook 2010-2025, Prospectiva del sector eléctrico 2010-2025"*). As per the prospective no biomass power plants are included in the forecasting for the installed capacity for 2014 or later, also the technological and economical barriers related to biomass power plants (supply infrastructure, biomass management and preparation, high transportation costs, etc) would prevent the implementation of this type of project unless an additional incentive (i.e. the CDM registration) is available, therefore a biomass power plant is not a likely baseline scenario.

Outcome of Step 1a: Therefore, the baseline scenario would be the continuation of the current practice, i.e. Ventika S.A. de C.V. does not develop the wind farm and its consumers continue using electricity coming from the national grid.

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

In México, when the government considers the construction of a new power plant, public tenders are called by the CFE. The public tender winner is determined by CFE considering the minimum cost per MWh offered. Thus, any kind of project coming from renewable sources would have to compete against conventional energies within a certain price context, making this an unfeasible venture for wind farm and renewable energy projects. In order to encourage private investors to develop power plants from renewable sources, the Regulatory Energy Commission ("Comisión Reguladora de Energía", CRE) has created different formulas with intention of promoting the participation in public tenders.

These formulas are described in article 36 of the "Public Service of Electrical Energy Law" ("Ley del Servicio Público de Energía Eléctrica") and can be found at:< http://www.cre.gob.mx/documento/46.pdf>

- Self-supply ("autoabastecimiento"): For self-supply purposes, it is possible to create a company co-owned by the power generator and the consumer following some specific rules. The energy not used by the consumer can be stored in a "virtual storage" managed by CFE, so real-time generation does not have to match exactly with real-time consumption. Total excess energy generated and not used by the consumers has to be sold to CFE at a marginal price "Costo total de corto plazo".
- Cogeneration ("cogeneración"): For power generation combined with steam or other thermal energy production or both. It is mandatory that the efficiency of the total of electricity generation and heat consumption are higher than each part independently.
- Independent production ("producción independiente"): It is mandatory to sell the energy to CFE at a fixed price, and to be included in CFE expansion plans.
- Small energy producers ("pequeña producción"): This applies for power plants smaller than 30 MW of installed capacity.

Even alternatives 1 and 3 can be developed using this formula of Self-consumption to comply with national regulations; this alternatives cannot be developed by the reasons explained in section Sub-step 1a; and taking into account that the project activity is not financially feasible without the revenue from the sale of certified emission reductions (CER's), the investment analysis will be used for the demonstration of the project additionality.

The alternative 2 (continuation of the current situation) is in consistency with mandatory laws and regulations because the generation and distribution of energy in Mexico is regulated by CFE and it is a government entity.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

The alternative of the project activity is the supply of electricity from the national grid so the benchmark analysis (Option III) will be used to analyze the project activity. The benchmark approach is used in

circumstances where the baseline does not require investment or is outside the direct control of the project developer, in this case Ventika S.A. de C.V.

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

For the benchmark analysis, the IRR is considered the most suitable indicator for the project type. The project IRR pre-tax will be used, because it is the most conservative approach.

According to the “Tool for the demonstration and assessment of additionality” (Version 06.1.0) option a) was used to determine the discount rate and benchmark used for the benchmark analysis.

(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;

In order to estimate an adequate discount rate to evaluate the project activity financial feasibility the following was considered:

- The project activity will be 100% finance by Ventika S.A. de C.V.
- Government bond rates: The Bank of Mexico indicates that the fixed rate bond for 20 years for Mexico is 7.89%[7].
- Country risk: There are several methods for estimating the country risk premium, for the benchmark analysis of our project it will be use the values reported in the study of February 2010 by Aswath Damodaran from the Stern School of Business. Stern School of Business is one of the USA premier management education schools and research centers[8]. In this study it is mentioned that the risk premium for Mexico is of 5.77%. [9]
- Technology risk: In Mexico there is no information available about reliable technology risk premium values related to renewable and/or wind energy project. Hence, as a conservative approach, this risk was not considered for the benchmark value.
- The land that will be used for the substation will be bought. While the land that will hold the turbines will be a lease.

Benchmark = Government bond rates + Country risk + Technology risk.

From the above the total benchmark value would be 13.66%.

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

The list of entities that would consume the energy generated by Ventika Wind Farm is not defined yet. For this reason and considering a conservative approach the unit power price used for this project evaluation represents what otherwise would be the default power price in the country. This information was obtained from the Federal Electricity Commission (“Comisión Federal de Electricidad”, CFE), calculated from an average from December 2010 to November 2011 for HTL (High Tension Line) using the price set for base, medium and peak electricity cost depending of the hour of the day. The result of this calculation can be found in the table below.

As it was mentioned at the beginning of the section B.5., the technology and hectares of the land were updated by the Project Participant once that the project activity started the Validation as CDM; therefore the economic model needs to be updated too with the intention to be according with the reality of the project. The IRR of the economic model version 1 was of 11.86% and the updated IRR is 10.88% this new technology version IRR is 11.46%, all IRR values are below than the benchmark (13.66%) and it has been consistently proved that the project activity needs the CDM incentives. The data of the investment analysis version 1 are the following:

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[7] Average of January to November 2011.

http://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CF107&sector=22&locale=es

[8] http://www.stern.nyu.edu/

[9] Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2010 Edition

Annual Production (MWh/year)	498,269
Average Sales Price (US$/MWh)	78.64
Annual Income (US$)	60,436,672
Total Investment (US$)	335,953,103
Average Annual Operational Costs (US$)	10,293,983
Project duration (years)	20
IRR (%) without CERs sales	11.86%
IRR (%) with CERs sales (14.20 US$/t$CO_2$)	13.17%

Table 8. Financial Characteristics for the investment analysis at the start of the validation process.

The updated project investment analysis, on a 20-year Project basis, is the following:

Annual Production (MWh/year)[10]	412,349
Average Sales Price (US$/MWh)[11]	78.64
Annual Income (US$) [12]	50,015,171
Total Investment (US$)[13]	278,362,600
Average Annual Operational Costs[14] (US$)	11,323,243
Project duration (years)[15]	20
IRR (%) without CERs sales	10.88%
IRR (%) with CERs sales (14.18 US$/t$CO_2$)	12.21%

Table 9. Financial Characteristics.

The new investment analysis using the Acciona Technology is the following:

Annual Production (MWh/year)[16]	414,792
Average Sales Price (US$/MWh)[17]	78.64
Annual Income (US$) [18]	52,070,782
Total Investment (US$)[19]	265,700,400
Average Annual Operational Costs[20] (US$)	11,930,098
Project duration (years)[21]	20
IRR (%) without CERs sales	11.46%
IRR (%) with CERs sales (14.18 US$/t$CO_2$)	12.58%

[10] Calculation of the capacity factor value (37.90%) reported in the wind study and the installed capacity of the wind farm (124.20 MW).

[11] Calculation based in the Federal Electricity Commission (“Comisión Federal de Electricidad”, CFE) tariffs.

[12] Incomes average of the 20 years of commercial operation based in the sales price and taking into account the Mexican inflation by the Central Bank of Mexico ("Banxico").

[13] Based in quotes of the wind turbine (Siemens), and additional quotes as the land payment, construction of road, environmental studies and measurement towers.

[14] Average Annual Operational Costs includes: O&M costs, land rent and transmission costs, based in quotes and contracts that are specified in the economic model of the project activity.

[15] Wind Farm facts show that the typical lifetime of a wind farm is 20 years; this value is based directly in the lifetime of the wind turbine.

[16] Calculation of the capacity factor value (37.58%) reported in the wind study and the installed capacity of the wind farm (126.00 MW).

[17] Calculation based in the Federal Electricity Commission (“Comisión Federal de Electricidad”, CFE) tariffs.

[18] Incomes average of the 20 years of commercial operation based in the sales price and taking into account the Mexican inflation by the Central Bank of Mexico ("Banxico").

[19] Based in quotes of the wind turbine (Acciona), and additional quotes as the land payment, construction of road, environmental studies and measurement towers.

[20] Average Annual Operational Costs includes: O&M costs, land rent and transmission costs, based in quotes and contracts that are specified in the economic model of the project activity.

[21] Wind Farm facts show that the typical lifetime of a wind farm is 20 years; this value is based directly in the lifetime of the wind turbine.

Table 10. Financial Characteristics.

The IRR of the project activity without the CER's incomes (11.46%) is below the financial benchmark (13.66%), demonstrating that the project activity by itself is not economically feasible. If the Project activity obtained the status of "Registered" and therefore got the incentive of the potential carbon credits, the project IRR with CER's (12.58%) would still be below the benchmark value (13.66%). The environmental and sustainable development contribution to the country and the derived image and economical benefits that Ventika S.A. de C.V. will acquire derived from the project activity registration as a CDM project activity are a substantial and important incentive for the project implementation.

The official forecast of the Mexican electricity mix for 2014 shows an expected Wind installed capacity of 1,400 MW (2.53% of total installed capacity) vs. 20,672 MW (37.30%) for Combined Cycle. For year 2025 the installed capacity of Wind is 2,108 MW (2.69%) and Combined Cycle reach 31,714 MW (40.53%).

	2014		**2025**	
	MW	% total installed capacity	MW	% total installed capacity
Wind	1,400	2.53%	2,108	2.69%
CC	20,672	37.30%	31,714	40.53%
Total installed capacity	55,420		78,248	

Table 11. Source: Sener. "Prospectiva del sector eléctrico 2010-2025 Cuadro 40 p. 160".

With the expected percentages of installed capacity for wind and Combined Cycle it can be seen that the new planned capacity additions by CFE are intended to be mainly fossil fuel fired power plants since the percentage of CC increase 3.23% in 11 years; however, Wind power increase 0.16% for the same 11 years.

This underlines that wind farms cannot be considered business-as-usual in Mexico neither at the present time nor at a future; this is a result of several factors such as the high CC technology efficiency, the common practice in the operation and maintenance of this type of power plants and that the CC is the cheapest power generation technology; hence, this represents an additional obstacle in the financing, development and implementation of the wind farms technology in Mexico.

Sub-step 2d. Sensitivity Analysis

Other indicators as total investment, electricity prices, operation and maintenance (O&M), and transmission cost were selected for sensitivity analysis. These financial indicators fluctuated within the range of -10% to +10%. The impact of the electricity prices on IRR is most significant.

	-10%	**-5%**	**0%**	**5%**	**10%**
Investment	13.38%	12.59%	11.86%	11.18%	10.56%
Sales electricity price	10.12%	11.00%	11.86%	12.69%	13.51%
O&M	12.08%	11.97%	11.86%	11.75%	11.64%
Transmission Cost	11.91%	11.89%	11.86%	11.83%	11.80%
Plant Load Factor	10.18%	11.03%	11.86%	12.67%	13.46%

Table 12. Financial Parameters at the start of the validation process.

	-10%	**-5%**	**0%**	**5%**	**10%**
Investment	12.34%	11.58%	10.88%	10.23%	9.63%
Sales electricity price	8.54%	9.44%	10.88%	11.15%	11.98%
O&M	11.20%	11.04%	10.88%	10.72%	10.56%
Transmission Cost	10.94%	10.91%	10.88%	10.85%	10.82%
Plant Load Factor	9.15%	10.03%	10.88%	11.71%	12.52%

Table 13. Financial Parameters registered project.

	-10%	**-5%**	**0%**	**5%**	**10%**
Investment	12.81%	12.11%	11.46%	10.86%	10.30%

Sales electricity price	9.80%	10.65%	11.46%	12.25%	13.01%
O&M	11.63%	11.54%	11.46%	11.38%	11.29%
Transmission Cost	11.52%	11.49%	11.46%	11.43%	11.40%
Plant Load Factor	9.86%	10.68%	11.46%	12.22%	12.95%

Table 14. Financial Parameters post registration changes.

The sensitivity analysis shows that even though the investment, electricity, O&M, transmission costs and plant load factor increase or decrease, the benchmark value is not reached by the project IRR; therefore, the additionality of the project activity is clearly demonstrated based on the Investment analysis, Step 2.

To reach the benchmark at the start of the validation process the investment shall diminish in 15.55% (about 31 million USD). This is not probably to happen because all the investment information is obtained from the final and signed contracts; therefore, this value cannot decrease. About the operating costs and transmission cost if this cost is neglected it cannot reach the benchmark, however it is not probably to happen because in the case of the land rent cost there is a signed contract, O&M and transmission costs depends directly to the number of turbines and the generation respectively. In the other hand, to reach the benchmark the plant load factor shall increase in 14.95 % (43 % of capacity factor). It is not probably to happen because this is a high capacity factor even for the zones as Oaxaca that has the higher potential of wind in the country. In reference to the sales price, to reach the benchmark the sales price shall increase in 14.40% (89.96 USD/MWh). It is not probably to happen because the tariff is defined according the CFE tariff, moreover a conservative approach was used for the sales tariff calculation because no discount over the CFE tariffs was applied, as is the common practice in the county for this kinds of projects.

<u>Step 3. Barrier analysis</u>

N/A

<u>Step 4. Common practice analysis</u>

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

Following the *“Guidelines on common practice version 02.0”* we proceed to develop the common practice analysis.

Stepwise approach for Common Practice

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

The Capacity of the project is of 126.00 MW. The applicable output range +/- 50% of the capacity of the project activity is the following:

Range (+)	189.00	MW
Range (-)	63.00	MW

Table 15. Applicable Output range +/- 50%.

Step 2: Identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

a) The projects are located in the applicable geographical area;
b) The projects apply the same measure as the proposed project activity;
c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

In the table below the projects that are applicable are presented, the applicable geographical area is the entire host country (México) according to the Guidelines on common practice.

Plant	Capacity	Type	Registred	N_{all}	N_{diff}	Start Date
El Novillo (Plutarco Elías Calles)	135	Hydropower	NO	1	1	B2001[22]
Comedero (Raul Marsal)	100	Hydropower	NO	1	1	B2001
Bucurato	92	Hydropower	NO	1	1	B2001
San Carlos (Agustín Olachea)	104	Internal Combustion	NO	1	1	B2001
Baja California Sur I	79	Internal Combustion	NO	1	1	2002
Punta Prieta II	113	Thermoelectric	NO	1	1	B2001
Humaya	90	Hydropower	NO	1	1	B2001
La Amistad	66	Hydropower	NO	1	1	B2001
Cupatitzio	72	Hydropower	NO	1	1	B2001
Lerma (Tepuztepec)	74	Hydropower	NO	1	1	B2001
Necaxa	109	Hydropower	NO	1	1	B2001
Lerma (Campeche)	150	Thermoelectric	NO	1	1	B2001
Poza Rica	117	Thermoelectric	NO	1	1	B2001
Nachi-Cocom	79	Thermoelectric/Gas turbine	NO	1	1	B2001
La Venta II	85	Wind Farm	YES	0	0	2005
La Ventosa	80	Wind Farm	YES	0	0	2008
Eléctrica del Valle de México	68	Wind Farm	YES	0	0	2008
La Venta III	101	Wind Farm	NO	1	0	2010
Oaxaca I	101	Wind Farm	YES	0	0	2009
Oaxaca II	101	Wind Farm	YES	0	0	2010
Oaxaca III	101	Wind Farm	YES	0	0	2010
Oaxaca IV	101	Wind Farm	YES	0	0	2010

Table 16. Plant in the applicable geographical area. Source: SENER. “Prospectiva del sector eléctrico 2010-2025. Table 5 p. 203 and Table 7, p. 79 ”Prospectiva del sector eléctrico 2003 – 2012 Table 16, p. 59”, UNFCCC website: http://cdm.unfccc.int/Projects/projsearch.html and the Mexican Association of Wind Energy “Asociación Mexicana de Energía Eólica (AMDEE)” http://www.amdee.org/

Step 3: Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

See the Table above. N_{all} = 15.

Step 4: Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

See the Table above. N_{diff} = 14.

Step 5: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

N_{all} =	15

[22] The reference B2001 is used for projects that had started operations before the first Electricity Sector report publication on year 2001, as it can be confirmed at the Electricity Sector Outlook 2002-2011, table 10, page 47

N_{diff} =	14
N_{all}-N_{diff}=	1
F=	0.067

Table 17. Results of the analysis.

The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3.

As it is presented in the table below the factor F is of 0.067 and N_{all}-N_{diff} is of 1, we conclude with this that the proposed project activity is not a common practice within a sector in the applicable geographical.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

>> The baseline scenario represents the electricity that would otherwise have been generated by the operation of the grid-connected power plants and by the addition of new generation sources.

According to the methodology ACM0002 v.12.3.0 the emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \tag{1}$$

Where:

ER_y	Emissions reductions in year *y* (tCO_2e)
BE_y	Baseline emissions in year *y* (tCO_2)
PE_y	Project emissions in year *y* (tCO_2e)

Baseline emissions

The baseline scenario represents the electricity that would have otherwise been generated by the operation of the grid-connected power plants and by the addition of new generation sources.

The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \tag{2}$$

Where:

BE_y	Baseline emission in year *y* (tCO_2)
$EG_{PJ,y}$	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)
$EF_{grid,CM,y}$	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)

For the quantity of net energy generation ($EG_{PJ,y}$), option a) "Greenfield renewable energy power plants" is applicable, because the project activity is a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity, and

$$EG_{PJ,y} = EG_{facility,y} \tag{3}$$

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

Therefore, the quantity of net energy generation that is produced and fed into the grid for the project activity is 414,792 MWh

For the calculation of the emission factor, which will yield the total equivalent CO2 emission reduction for the whole crediting period, a Combined Margin (CM) will be used, in accordance with the "Tool to calculate the emission factor for an electricity system ver. 02.2.1".

The steps to following for calculate emission factor are:

1. Identify the relevant electricity systems.
2. Choose whether to include off-grid power plants in the project electricity system (optional).
3. Select an operating margin (OM) method.
4. Calculate the operating margin emission factor according to the selected method.
5. Calculate the build margin emission factor.
6. Calculate the combined margin (CM) emission factor.

1. Identify the relevant electricity systems.

The regions in the Mexican grid are interconnected; for this, the relevant electric power system is the National Interconnected System (Source: SENER “Prospectiva Sector Eléctrico 2010-2025”), moreover the public information of the Mexican Energy Ministry “SENER” is for type of fuel for consumption and fuel share and technology for gross generation and power share, not for regions.

For determining the Operating Margin (OM) emission factor, it is necessary to determine the net electricity imports. There are no imports from other systems inside Mexico. The Mexican electricity imports and exports with other electric systems in other countries (imports from USA and exports to Belize) are:

	2007	**2008**	**2009**
Imports (MWh)	1,451,000	1,452,000	1,249,000
Exports (MWh)	277,000	351,000	346,000
Net Exchange (MWh)	**1,174,000**	**1,101,000**	**903,000**

Table 18. Source: SENER. “Prospectiva del sector eléctrico 2010-2025. Cuadro 16 p. 101”

For imports from an on-line electricity system located in another country, the emission factor is 0 tCO2/MWh in order to ensure a conservative approach. Electricity exports will not be subtracted from electricity generation data used for calculating the baseline emission factor.

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

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.

Ventika S.A. de C.V. has chosen Option I and only grid power plants are included in the calculation. Option I corresponds to the calculation procedure contained in earlier versions of the “Tool to calculate the emission factor for an electricity system”.

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

The Operating Margin refers to the current energy generation mix installed in Mexico. The total fuel consumption for generation is divided into the different types of power plants, in order to determine the weighted average of the actual CO2 emissions in Mexico.

For its calculations, the simple OM method has been selected from the four options options proposed in the *“Tool to calculate the emission factor for an electricity system (ver. 02.2.1)”*. Dispatch data analysis would be more accurate and therefore preferable, but this method cannot be applied for this project due to the lack of available published data. To be able to use the Dispatch data analysis method, the hourly generation-weighted average emissions per electricity unit (tCO2/MWh) of a set of plants in the top 10% of the grid system dispatch order is needed. For confidentiality reasons, hourly-based dispatch order generation is not publicly available, so this method cannot be used for calculating the Operating Margin emission factor.

The reason for selecting the simple OM method over the other two methods (simple adjusted OM or Average OM) is that the low-cost/must-run resources in Mexico are well below 50% of total grid generation in the average of the five most recent years. The average of Hydroelectric, Geothermal, Nuclear and Wind for the last five years is 20.80%.

	Power	Power	Power	Power	Power

	share 2005	share 2006	share 2007	share 2008	share 2009
Dual	6.52%	6.16%	5.75%	2.92%	5.23%
Combined cycle	33.51%	40.46%	44.15%	45.72%	48.45%
Gas turbine	0.62%	0.68%	1.15%	1.19%	1.59%
Coal	8.39%	7.97%	7.78%	7.54%	7.18%
Internal Combustion	0.36%	0.38%	0.49%	0.52%	0.53%
Nuclear	4.93%	4.83%	4.48%	4.16%	4.47%
Standard Thermoelectric	29.72%	23.07%	21.28%	18.37%	18.34%
Hydroelectric	12.61%	13.46%	11.63%	16.49%	11.25%
Wind	0.00%	0.00%	0.11%	0.11%	0.11%
Geothermic	3.33%	2.97%	3.18%	2.99%	2.87%
Low cost/must run	**20.88%**	**21.26%**	**19.40%**	**23.74%**	**18.69%**

Table 19. Source: SENER. “Prospectiva del sector eléctrico 2010-2025. Cuadro 20. p. 117”

Low-cost/must-run resources are defined as power plants with low marginal generation costs. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.[23] Coal is not included under the low-cost/must-run category, because the Mexican coal-fired power plants cannot be considered must-run plants (for example, the largest coal-fired plant, Carbón II in Nava, in 2008 produced with a capacity factor of 71.5% - this being clearly over what a must-run plant would achieve). Therefore the Simple OM method can be used to calculate the baseline emissions.

In addition, data for calculating the emission factor using the simple OM method are very robust and reliable. In accordance with the approved methodology chosen, the simple OM method has been finally chosen to determine the relevant operating margin.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante* 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 emissions 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 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

- *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 first option has been chosen because the yearly statistics provided by SENER that are necessary to calculate the OM *ex-post* are typically published at the end of the year after the end of the reporting year, leading to large delays between emissions reduction in one hand and monitoring, verification and issuance of CERs on the other. Another reason to choose this option is that *ex-ante* monitoring is simpler for the project development and also for the emission reduction verification.

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

For calculating the Simple OM, the generation-weights average emission per electricity unit (tCO2/MWh) of all generating sources serving the system excluding the low-cost/must-run generation units is used. It may be calculated:

[23] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf page 5

- 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).

Option B is used because total net electricity generation of all power plants serving the system as well as the fuel types and total fuel consumption of the project electricity system are available. Information needed for the Option A is not available.

$$EF_{grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_y} \quad \textbf{(4)}$$

Where:

$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh).
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit).
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit).
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ).
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh).
i	All fossil fuel types combusted in power sources in the project electricity system in year *y.*
y	The relevant year as per the data vintage chosen in Step 3.

The years for calculating the Simple OM are 2007, 2008 and 2009 (based on the most recent data available at time of submission of the CDM-PDD to the DOE for validation).

$EF_{CO2,i,y}$ (in tC/TJ) can be found in the Reviewed 2006 IPCC Guidelines for Greenhouse Gas Inventories: Workbook,. Data for $FC_{i,y}$ can be found in TJ/day in the three Outlook Reports (*Prospectivas)* so total annual consumption per fuel source can be calculated multiplying by 365.

5. Calculate the build margin (BM) emissions factor.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, for this project is calculated ex-post and as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \textbf{(5)}$$

Where:

$EF_{grid,\ BM,\ y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,\ y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,\ m,\ y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

In short, the $EF_{grid,BM,y}$ was calculated according the "Tool to calculate the emission factor of an electricity system" version 02.2.1, the sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh).
b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh)
c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}).

$SET_{\geq 20\%}$ has been selected as the SET_{sample} to calculate the BM because generation of five power plants built most recently is lower than 20% of the system generation; the plants built in the year 2009 have a gross generation of 235 GWh that is the 0.11% of total annual generation.

For the calculation of the Build Margin according to the "Tool to calculate the emission factor for an electricity system" there are two options to calculate the build margin.

Option 1: For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

The option chosen for the build margin is option 1. The build margin will be ex-ante during the first crediting period.

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

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

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

Since Mexico has more than 10 registered CDM projects, the option a) has been chosen in order to calculate the combine margin.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(6)}$$

Where:

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

For wind and solar projects, the default weights are as follows: w_{OM} = 0.75 and w_{BM} = 0.25 (due to their intermittent and non-dispatchable nature).

For the calculation of these two terms (BM and OM), the information used can be found in the *Prospectiva del sector eléctrico 2010-2025; 2009-2024; 2008-2017*, prepared by the *Secretaría de energía*. These documents can be accessed at http://www.energia.gob.mx/portal/Default.aspx?id=1433.

Project emissions

The proposed project is not based on hydroelectric or geothermic energy, and therefore it is not necessary to consider the greenhouse gas emissions of the project, this asseveration is in accordance with the guidelines established by the ACM0002 ver.12.3.0 methodology:

"For most renewable power generation project activities, PE_y=0"

The project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{(14)}$$

Where:

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

Fossil Fuel Combustion ($PE_{FF,y}$)

For geothermal and solar thermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

This emission source does not apply to this project activity due that there will not be any use of fossil fuels for electricity generation.

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

For geothermal project activities, project participants shall account fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam[24]. Non- condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4.

In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all non-condensable gases entering the power plant are discharged to atmosphere via the cooling tower. Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.

[24] In the case of retrofit or replacement projects at geothermal plants, this methodology does not account for baseline emissions from release of non-condensable gases from produced steam or fossil fuel combustion. Project proponents are welcome to propose revisions to this methodology to account for these baseline emissions.

$PE_{GP,y}$ is calculated as follows:

$$PE_{GP,y} = (w_{steam,CO2,y} + w_{steam,CH4,y} * GWP_{CH4}) * M_{steam,y} \quad \textbf{(15)}$$

Where:

$PE_{GP,y}$	= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e).
$w_{steam,CO2,y}$	= Average mass fraction of carbon dioxide in the produced steam in year y (tCO_2/t steam).
$w_{steam,CH4,y}$	= Average mass fraction of methane in the produced steam in year y (tCH_4/t steam)
GWP_{CH4}	= Global warming potential of methane valid for the relevant commitment period (tCO_2e/tCH_4)
$M_{steam,y}$	= Quantity of steam produced in year y (t steam)

This emission source does not apply to the project activity due that there will be developed a wind farm not a geothermal power plant*.*

<u>Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)</u>

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

<u>(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:</u>

$$\mathrm{PE}_{\mathrm{HP,y}} = \frac{EF_{\mathrm{Res}} \cdot TEG_y}{1000} \quad \textbf{(16)}$$

Where:

$PE_{HP,y}$	=	Project emissions from reservoirs of hydro power plants in year y (tCO_2e)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants ($kgCO_2e/MWh$)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

(b) <u>If the power density of the project activity (PD) is greater than 10 W/m^2:</u>

$$\mathrm{PE}_{\mathrm{HP,y}} = 0 \quad \textbf{(17)}$$

The power density of the project activity (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(18)}$$

Where:

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

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

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

These emissions sources do not apply to the project activity due that a wind farm will be developed not a hydropower facility; no water reservoirs are planned in the conception of this wind farm.

Additionally, the project due to the project is not related to geothermal power plant or with the consumption of fuels. The project emissions are considered as 0.

Based on the following sentence taken from the ACM0002 version 12.3.0 methodology description the value of PE_y was considered zero:

This project activity is not related with the development of a geothermic plant or hydro power plant, in conclusion the project emission of the project is considered zero (PE_y=0)

Leakage

The methodology ACM0002 ver.12.3.0 mentions the following:

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

In conclusion the leakage emissions are considered zero.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**$EF_{grid,CM,y}$**
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data	Revised 2006 IPCC and Electricity Sector Outlooks publications: 2010-2025, 2009-2016, 2008-2017.
Value(s) applied	0.592
Choice of data or Measurement methods and procedures	Calculated according to the "Tool to calculate the emission factor for an electricity system" Version 02.2.1
Purpose of data	Calculate the emission factor of the grid.
Additional comment	The value will be keep fixed for the entire crediting period.

Data / Parameter	**$FC_{i,y}$**
Unit	TJ/annum
Description	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*
Source of data	Electricity Sector Outlooks: 2010-2025, 2009-2016, 2008-2017
Value(s) applied	Year 2007 = 1,652,355 TJ Year 2008 = 1,717,099 TJ Year 2009 = 1,830,492 TJ

Choice of data or Measurement methods and procedures	Data for $FC_{i,y}$ can be found in the three Electricity Sector Outlooks Reports, so total annual consumption per fuel source can be calculated.
Purpose of data	Calculate the emission factor of the grid.
Additional comment	Notice that the units indicate that the Net Calorific Value of fossil fuel type *i* in year *y* ($NCV_{i,y}$) is already integrated.

<table>
<tr><td>Data / Parameter</td><td>$\mathbf{NCV_{i,y}}$</td></tr>
<tr><td>Unit</td><td>GJ/mass or volume unit</td></tr>
<tr><td>Description</td><td>Net calorific value (energy content) of fossil fuel type i in year y</td></tr>
<tr><td>Source of data</td><td>SENER, México, National Energy Balance 2009.[25]</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><td>Fuel Oil</td><td>41.12</td><td>GJ/m^3</td></tr>
<tr><td>Natural Gas</td><td>0.040</td><td>GJ/m^3</td></tr>
<tr><td>Diesel</td><td>35.802</td><td>GJ/m^3</td></tr>
<tr><td>Coal (national)</td><td>19.405</td><td>GJ/Ton</td></tr>
<tr><td>Coal (imported)</td><td>25.284</td><td>GJ/Ton</td></tr>
</table>
</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>Local net calorific values per fuel type are used. Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option).</td></tr>
<tr><td>Purpose of data</td><td>Calculate the emission factor of the grid.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data / Parameter	$\mathbf{EF_{CO2,i,y}}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied	75.5 for Fuel Oil 54.3 for Natural Gas 72.6 for Diesel 87.3 for Coal
Choice of data or Measurement methods and procedures	As indicated in the “Tool to calculate the emission factor for an electricity system” Version 02.2.1
Purpose of data	Calculate the emission factor of the grid.
Additional comment	-

Data / Parameter	$\mathbf{EG_y}$

[25] Document available at: <http://www.sener.gob.mx/res/1791/Balance_Nacional_2009.pdf>

Unit	MWh
Description	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*
Source of data	Electricity Sector Outlooks: 2010-2025, 2009-2016, 2008-2017
Value(s) applied	211,454,000 in year 2007 215,276,000 in year 2008 214,488,000 in year 2009
Choice of data or Measurement methods and procedures	Taking into account the indications of the “Tool to calculate the emission factor for an electricity system” Version 02.2.1
Purpose of data	Calculate the emission factor of the grid.
Additional comment	-

Data / Parameter	$EG_{m,y}$
Unit	MWh
Description	Net electricity generated by power plant *m* in year *y*
Source of data	Electricity Sector Outlooks: 2010-2025
Value(s) applied	Values provided in Appendix 4
Choice of data or Measurement methods and procedures	BM: Ex ante, following the guidance in Step 5 of the “Tool to calculate the emission factor for an electricity system” Version 02.2.1
Purpose of data	Calculate the emission factor of the grid.
Additional comment	-

Data / Parameter	Plant load factor
Unit	Percentage %
Description	The plant load factor determined by a third party contracted by the project participants.
Source of data	Study of a third party contracted by the project participants.
Value(s) applied	37.58%
Choice of data or Measurement methods and procedures	Study of a third party contracted by the project participants.
Purpose of data	Calculation of the electricity generation of the project.
Additional comment	

B.6.3. Ex ante calculation of emission reductions

>> **Baseline emissions.**

In order to calculate the baseline emissions it is necessary to obtain the emission factor of the grid, the emission factor is composed of two parts: Operating Margin (OM) and Build Margin (BM), and it is calculated according the “Tool to calculate the emission factor for an electricity system” .

The Operating Margin emission factor ($EF_{grid,OM,simple,y}$) is the generation-weighted average emissions per electricity unit of all generating sources serving the system, not including low-cost/must-run power plants/units. It is calculated ex-ante using net electric generation for the past 3 years (2007, 2008 and 2009) using the following equation:

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

(8)

Using the "Tool to calculate the emission factor for an electricity system", we take data of the specific energy consumption by fuel type directly calculated by SENER in *Prospectiva del sector eléctrico 2010-2025; Prospectiva del sector eléctrico 2009-2024 and Prospectiva del sector eléctrico 2008-2017*. The emission coefficient factor by fuel type is determined in tCO_2/TJ instead of tCO_2/mass or volume.

- The Operating Margin emission factor calculation for 2007 is 0.644 tCO_2/MWh (see details in Appendix 4).
- The Operating Margin emission factor calculation for 2008 is 0.6681 tCO_2/MWh (see details in Appendix 4).
- The Operating Margin emission factor calculation for 2009 is 0.675 tCO_2/MWh (see details in Appendix 4).

The 3-year weighted average Operating Margin is 0.662 tCO_2/MWh (see details in Appendix 4).

The Build Margin is calculated based on yearly statistics provided by the Mexican Energy Ministry SENER (*Prospectiva del Sector Eléctrico 2010 – 2025, Prospectiva del Sector Eléctrico 2009 – 2024, Prospectiva del Sector Eléctrico 2008 – 2017*, available at http://www.sener.gob.mx/portal/Default.aspx?id=1433. These statistics provide data on newly built plants (name, capacity, type of plant, location) as well as production data (total capacity, type of fuel used, plant load factor) for the most recent year.

Methodology:
Since the source used does not provide public information on the exact date when new plants went online for every year, the following approach was taken:

Definitions:
y : is the most recent year for which statistics on electricity production at plant level are available.

Calculation:
a) Order all the plants that were most recently commissioned according to the following criteria:

1. Year of commissioning, starting with the most recent year,
2. Plants with same year of commissioning by carbon intensity (emission factor per unit of electricity produced), starting with the lowest carbon intensity,
3. Plants with same year of commissioning and same carbon intensity by electricity generation in year y.

Plant 1 is therefore the plant with the lowest emission factor that was commissioned in the last year in which new plants were commissioned.

b) Calculate the contribution of each technology to the total generation in year *y*. Add the fraction from technology 1 following the order defined in a) until the cumulative fraction reaches 20% for the first time. The plants included in this group define the sample to be analyzed.

c) Calculate the average emission factor of the sample, weighted with the generation in year y. The result of this approach applied to the situation in Mexico with most recent data (See details in Appendix 4).

Excluded from the analysis are all power plants for which no plant specific data is available in the official statistics. The following plants have been used to calculate the BM:

Plant Name	Technology	Capacity (MW)
Additions 2009		
Iztapalapa	GT	32
Coapa	GT	32
Santa Cruz	GT	32
Magdalena	GT	32
San Lorenzo Potencia	CC	133
San Lorenzo Potencia	CC	133
San Lorenzo Potencia	CC	116.1
Additions 2008		
Humeros	GEO	5
Ciudad del Carmen	GT	16
Ciudad del Carmen	GT	17
Additions 2007		
La Venta II	Wind	83.3
El Cajón (Leonardo Rodríguez Alcaine)	HID	375
El Cajón (Leonardo Rodríguez Alcaine)	HID	375
Tamazunchale (PIE)	CC	1135
Río Bravo (Emilio Portes Gil)	CC	33
Río Bravo (Emilio Portes Gil)	CC	33
Río Bravo (Emilio Portes Gil)	CC	145.1
Ecatepec (LFC)	GT	32
Remedios (LFC)	GT	32
Victoria (LFC)	GT	32
Villa de Flores (LFC)	GT	32
Cuautitlán (LFC)	GT	32
Coyotepec (LFC)	GT	32
Coyotepec (LFC)	GT	32
Vallejo (LFC)	GT	32
Holbox	IC	0.8
Holbox	IC	0.8
Additions 2006		
Tuxpan V (PIE)	CC	495
Valladolid III (PIE)	CC	525
Altamira V (PIE)	CC	1121
Chihuahua II (El Encino)	CC	65.3
Atenco (LFC)	GT	32
Additions 2005		
Ixtaczoquitlán	HID	1.6
Botello	HID	9
Hermosillo	CC	93.3
Rio Bravo IV	CC	500
La Laguna II	CC	498
Yécora	IC	0.7
Hol Box	IC	0.8
Additions 2004		
El Sauz	CC	128
Tuxpan (Pdte. Adolfo López Mateos)	GT	163
San Lorenzo Potencia	GT	266
Rio Bravo III (PIE)	CC	495

Table 20. New power plants installed. Source: SENER. "Prospectiva del sector eléctrico 2010-2025 Cuadro 17 p.103; "Prospectiva del sector eléctrico 2009-2024 Cuadro 18 p.96; Prospectiva del sector eléctrico 2008-2017 Cuadro 19 p.101; Prospectiva del sector eléctrico 2007-2016 Cuadro 19 p.77; Prospectiva del sector eléctrico 2006-2015 Cuadro 13 p.57 and Prospectiva del sector eléctrico 2005-2014 Cuadro 14 p.51. Abbreviations: HID: Hydropower plant; Geo: Geothermal plant, CC: Combined cycle plant, fuelled with natural gas, GT: Gas turbine, fuelled with natural gas. IC: Internal Combustion.

The technical data of typical power plants are given in the source as follows:

	Capacity (MW)	Efficiency (%)
Gas turbine	41.9	37.67
	102.2	**40.67**
	84.4	29.85
	186.9	33.14
	266.3	35.57
	39.4	37.67
Internal Combustion	**42.2**	**45.07**
	2 x 18.4	44.19
	3 x 3.6	37.81
Combined Cycle	281.90	51.08
	566.5	51.24
	849.2	51.30
	400.0	52.76
	799.8	**52.86**

Table 21. Technical data of typical fossil power plants of the types installed in the last years. Best-in-class values are highlighted. Source: SENER. "Prospectiva del sector eléctrico 2010-2025 Chart 52 p.185"

The BM factor is calculated as the average emission factor for the power plants capacity additions in the electricity system that comprises 20% of the system generation (MWh) and that have been built most recently.

Total annual generation for the power plants in 2009: 214,488,000 MWh.

Using a conservative approach, the most efficient example (lowest emission factor) of the respective technology will be taken for all new power plants installed. Therefore, for combined cycle plants an efficiency of 52.86% will be used, 40.67% for gas turbines and 45.07% for internal combustion power plants. In those cases where the statistics show a combination of gas turbine and combined cycle, a combined cycle is assumed (for details on the calculation see Appendix 4).

From all these calculations, the BM factor used is:

BM factor: **0.379** tCO_2/MWh (See details in Appendix 4)

Calculate the baseline emission factor EF

The baseline emission factor is calculated as the weighted average of the Operating Margin emission factor and the Building Margin emission factor. For wind and solar projects, the default weights are as follows: w_{OM} = 0.25 and w_{BM} = 0.75 (owing to their intermittent and non-dispatchable nature).

Thus, the *ex-ante* baseline emission factor will be: 0.75*0.662 + 0.25* 0.379 = **0.592** tCO2/MWh

This baseline emission factor is the same emission factor for all the years in the crediting period.

Project emissions

The proposed project is not based on hydroelectric or geothermic energy, and therefore it is not necessary to consider the greenhouse gas emissions of the project, this asseveration is in accordance with the guidelines established by the ACM0002 ver.12.3.0 methodology:

"For most renewable power generation project activities, PE_y=0"

The project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{(14)}$$

Where:

PE_y	Project emissions in year *y* (tCO_2e)
$PE_{FF,y}$	Project emissions from fossil fuel consumption in year *y* (tCO_2)

$PE_{GP,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e)
$PE_{HP,y}$	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e)

Fossil Fuel Combustion ($PE_{FF,y}$)

For geothermal and solar thermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

This emission source does not apply to this project activity due that there will not be any use of fossil fuels for electricity generation.

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

For geothermal project activities, project participants shall account fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam[26]. Non- condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4.

In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all non-condensable gases entering the power plant are discharged to atmosphere via the cooling tower. Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.

$PE_{GP,y}$ is calculated as follows:

$$PE_{GP,y} = (W_{steam,CO2,y} + W_{steam,CH4,y} * GWP_{CH4}) * M_{steam,y} \quad \textbf{(15)}$$

Where:

$PE_{GP,y}$	= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e).
$w_{steam,CO2,y}$	= Average mass fraction of carbon dioxide in the produced steam in year y (tCO_2/t steam).
$w_{steam,CH4,y}$	= Average mass fraction of methane in the produced steam in year y (tCH_4/t steam)
GWP_{CH4}	= Global warming potential of methane valid for the relevant commitment period (tCO_2e/tCH_4)
$M_{steam,y}$	= Quantity of steam produced in year y (t steam)

This emission source does not apply to the project activity due that there will be developed a wind farm not a geothermal power plant.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

[26] In the case of retrofit or replacement projects at geothermal plants, this methodology does not account for baseline emissions from release of non-condensable gases from produced steam or fossil fuel combustion. Project proponents are welcome to propose revisions to this methodology to account for these baseline emissions.

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

<u>(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:</u>

$$\mathrm{PE}_{\mathrm{HP,y}} = \frac{EF_{\mathrm{Res}} \cdot TEG_y}{1000} \quad \textbf{(16)}$$

Where:

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

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants ($kgCO_2e/MWh$)

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

(a) <u>If the power density of the project activity (PD) is greater than 10 W/m^2:</u>

$$\mathrm{PE}_{\mathrm{HP,y}} = 0 \quad \textbf{(17)}$$

The power density of the project activity (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(18)}$$

Where:

PD = Power density of the project activity (W/m^2)

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

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

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

These emissions sources do not apply to the project activity due that a wind farm will be developed not a hydropower facility; no water reservoirs are planned in the conception of this wind farm.

Additionally, the project due to the project is not related to geothermal power plant or with the consumption of fuels. The project emissions are considered as 0.

Based on the following sentence taken from the ACM0002 version 12.3.0 methodology description the value of PE_y was considered zero:

This project activity is not related with the development of a geothermic plant or hydro power plant, in conclusion the project emission of the project is considered zero (PE_y=0)

Leakage

The methodology ACM0002 ver.12.3.0 mentions the following:

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

In conclusion the leakage emissions are considered zero.

Emission Reductions:

The emissions reduction by the project activity is the difference between the baseline emissions, project emissions and emissions due to leakage. Since, according to the methodology ACM0002 Version 12.3.0 and as it has been explained in B.6.1, there are no project emissions and there are no emissions due to leakage, the emissions reductions will be equal to the baseline emissions. These baseline emissions are equal to the baseline emission factor multiplied by the energy generation.

Baseline emission factor: **0.592** tCO2/MWh
Annual generation: 414,792 MWh
Baseline Emissions: 245,556 tCO2/year

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2016	115,041	0	0	115,041
2017	245,556	0	0	245,556
2018	245,556	0	0	245,556
2019	245,556	0	0	245,556
2020	245,556	0	0	245,556
2021	245,556	0	0	245,556
2022	245,556	0	0	245,556
2023	130,515	0	0	130,515
Total	1,718,892	0	0	1,718,892
Total number of crediting years				
Annual average over the crediting period	245,556	0	0	245,556

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$\mathbf{EG_{facility,y}}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant to the grid in year *y*.
Source of data	Project activity site, Electricity meters at CFE substation.
Value(s) applied	414,792. This value is estimated according the wind resource study of the project.

Measurement methods and procedures	Net electricity supplied by the project activity to the grid. Continuous measurement and at least monthly recording. The metering equipment shall comply with CFE regulations and will be properly calibrated annually by CFE. Extra information of the meters: • Number of meters: 2 meters outside wind farm (1 main, 1 backup) in the interconnection point. • Type: bidirectional • Accuracy class: Max error 0.2 % • Calibration frequency: 1 years Measurement: Continuously measurement (5 minutes) and monthly recording. Double check purposes shall be done by receipt of sales. Calibrated metering shall comply according to CFE specifications, and if applicable, it shall be performed by CFE entity.
Monitoring frequency	Daily
QA/QC procedures	The metering equipment will be properly calibrated and checked annually for accuracy, as per Mexican law and/or PPA, to ensure that any error resulting from such equipment shall not exceed +/- 0.2% of full-scale rating. To guarantee QA/QC, it will be double checked by receipts of electricity sales.
Purpose of data	Calculation of credit emission reductions.
Additional comment	The data will be archived electronically. Archived data will be kept during the crediting period and two years later.

B.7.2. Sampling plan

>> The parameter monitored in section B.7.1. are not going to be determined by a sampling approach.

B.7.3. Other elements of monitoring plan

>> The project meets the applicability criteria under the monitoring methodology, ACM0002 v. 12.3.0 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. This methodology is designed for Power plants using wind resources, among others.

According to the applicable methodology, the data that should be monitored, archived electronically and kept at least for 2 years after the end of the crediting period is the quantity of net electricity generation supplied by the project plant to the grid in year *y.* This information will be available in the power meters installed in the substation; the measurement will be continuous and recorded monthly. However, cross check will be done using the receipts of sales.

For this purpose and in accordance with monitoring methodology, the information that needs to be monitored shall include the electricity generation from the proposed project activity, measured from the on-site control room. Electricity losses related to transportation will not be considered since CFE is the owner of the transmission line; therefore they are responsible of those electricity losses. Total electricity generation will be monitored by Ventika S.A. de C.V., at the end of every month. An annual report of total generation for each year will be produced by Ventika S.A. de C.V. Data will be obtained from the power meters located at the Ventika substation. These meters comply with the Mexican Law. CFE defines the local standards and parameters to be followed in the electricity generation sector.

The Monitoring Plan defines the following tasks

- Responsibilities of the members of the monitoring team (operations, technical, CDM and maintenance teams).
- Energy generation measure and emissions reduction calculation procedure (for detailed information refer to Appendix 5).
- Elaboration of the monitoring report.

The Monitoring Plan will be implemented over the 7-year crediting periods of project activity. All data and evidences collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the crediting period.

Monitoring the generation output from the project activity (MWh)

In order to monitor the generation output of the wind farm, the measurement systems from the control panel of the wind farm will be used. To check the generation output, the electricity measured will be compared with the electricity bill.

Responsibilities of the members of the Monitoring Team

The responsibilities of each element of the Monitoring Team are the following:

1. Operation Team:
   - Obtain the monthly readings registered (1 main and 1 back up) by the meters and report them in a spreadsheet to the Technical Team.
   - Archive the data in electronic format.
2. Technical Team (Ventika S.A. de C.V. and CO2 Global Solutions International S.A.):
   - Check & authorize monitoring data and transfer it to the CDM Team.
   - In case of identifying any deviation it will determine the correspondent corrective measures to be taken.
3. CDM Team (Ventika S.A. de C.V. and CO2 Global Solutions International S.A.)
   - Archive the data used for the emissions reduction calculation.
   - Conduct calculations.
   - Elaborate the monitoring report.
4. Maintenance Team
   - Conduct the maintenance of the measuring system.
   - Execute any corrective action indicated by the Technical Department to ensure the correct function of the measuring system.

Elaboration of the monitoring report

The monitoring report will use data collected in the period defined by the project participants once the project gets registered. As mentioned above the CDM Team will be in charge of the elaboration of the monitoring report and the final emissions reduction calculation. To accomplish its responsibility, the CDM Team will also calculate the emission factor and will coordinate the other areas of the Monitoring Team to follow the procedures to ensure QA/QC of data.

1. Grid emission factor.
Operating margin emission factor: The operating margin is considered ex-ante (further information can be found in section B.6.3 and in Appendix 4).

Build margin emission factor: The build margin is considered ex-ante (further information can be found in section B.6.3 and in Appendix 4).

2. Quality assurance (QA) and quality control (QC) of data.
Quality of data used in the estimation of CO_2 emissions reduction is controlled and/or assured by means of:

2.1. Using internal controls:

- Measuring of energy delivered by the wind farm will be carried out according to the CFE procedures.
- The power meters (main and backup power meters) will comply with CFE technical requirements.
- Preventive and corrective maintenance of the measurement system shall be performed.

2.2. Undertake data validations:

- Cross check will be conducted between the data of Ventika Wind Farm and the data registered by the CFE.
- In case the main meter fails, backup meter readings will be used. After the main meter is repaired, the main meter measurements will be used again.
- In the case of a malfunction of both meters the information of the energy generated will be obtained from the CFE.
- Information registered will be archived and compared every month with data of the CFE. In case of identifying differences exceeding 0.2%, Ventika Wind Farm will be reviewed and the lowest value will be used to estimate emission reductions as a conservative approach.

A detailed operational and management structure for monitoring of emission reductions of the project will be provided in the CDM Manual at a later stage, but before operation. All personnel involved in the monitoring will be trained and Ventika S.A. de C.V shall manage and procure this responsibility.

This figure describes the operational and management structure that will monitor emissions reductions generated by the project activity

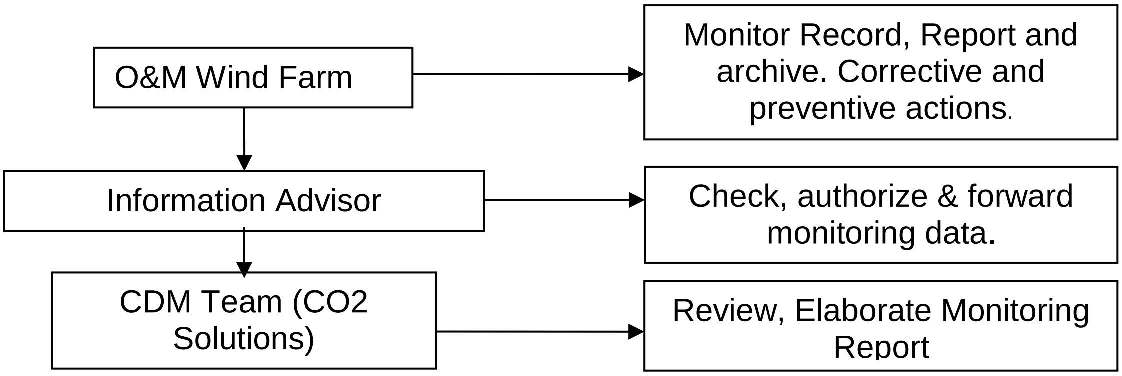

Figure 3. Operation and Management structure.

The project will require new personnel to operate the project activity and to conduct maintenance of the facilities. Each position requires specific training that will be conducted by personnel of Ventika S.A.de C.V.

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

>> 01/09/2014
Alejandro Eliud Araizaga Esquivel
Parter Consultant CO2 Solutions
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SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>> 03/06/2013
The starting date of the project activity is the date when the project participant signed the purchase contract of the wind turbines.

C.1.2. Expected operational lifetime of project activity

>> The expected operational lifetime is of 20 years 0 months. [27] [28]

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[27] Wind Farm facts show that the typical lifetime of a wind farm is 20 years; this value is based directly in the lifetime of the wind turbine.

Wind Measurement International. Operational and Maintenance Costs for Wind Turbines.

Available at: http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php

[28] In the particular case of Siemens wind turbines, the following reference support that the lifetime of the wind turbines is 20 years.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

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

C.2.2. Start date of crediting period

>> 14/07/2016

C.2.3. Length of crediting period

The crediting period for the project activity is 7 years 0 months.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>> Ventika S.A. de C.V. elaborated the Environmental Impact Assessment, EIA (Manifiesto de Impacto Ambiental, MIA); and it was approved by SEMARNAT on October 08, 2012 with the permit number S.G.P.A./D.G.I.R.A./D.G./8111.

Due to the change of technology the project participant request the change of environmental permit; this change was approved by SEMARNAT of July 05, 2013 with the permit number S.G.P.A./D.G.I.R.A./D.G./04718.

As conclusion of the EIA, the construction and operation of the project activity will have a minimal impact in the regional environmental system and its correct attention regarding the mitigation measures, environmental vigilance and adherence to the applicable regulation, assures that the project activity will reduce and minimize the environmental impacts.

Additionally, according the EIA the project activity will not produce emissions; it does not require water supplies and for this reason it does not generate residual water, moreover the project activity requires a relatively small area in comparatively with other projects for generate the same electric energy.

D.2. Environmental impact assessment

>> After the corresponding revision, the Ventika Wind Farm was approved by SEMARNAT by means of the resolution number: S.G.P.A./D.G.I.R.A./D.G./8111 dated October 08, 2012, under some conditions:

- Ventika S.A. de C.V. must comply with all the control, prevention and mitigation measures mentioned in the Environmental Impact Assessment (EIA). For assure the fulfillment of the obligations, Ventika must incorporate in the Environmental Vigilance Program (Programa de Vigilancia Ambiental, PVA) all the proposed measures, as well as the monitoring of the environmental indicators.
- Ventika S.A. de C.V. must implement the monitoring of birds and bats during the pre-operation, construction and operation. The objective of this monitoring is to know the biodiversity of birds and bats in the site and their behavior.
- A noise study must be elaborated; the objective of this study is to ensure that the noise levels do not disturb the integrity of the species in the zone.
- A flora protection program and wildlife rescue program must be implemented according the EIA.
- Additionally, a soils conservation program must be applied.

Siemens. How can Wind Power reach grid parity?. Available at: http://www.haavind.no/Global/Aktuelt%20og%20Publikasjoner/Kurs%20og%20seminarer/Siemens.pdf

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>> The project activity is located in General Bravo, Nuevo Leon. The land considered for Ventika Wind Farm is an area where population is very scarce, particularly permanent human settlements are not common for several economic and geographical reasons (i.e. the area is highly isolated with almost no commercial activity in the surroundings).

Given this special conditions of the project's location area, the stakeholders consultation was held in "Rancho Las Adjuntas" the 3rd of November of 2011, a farm that is inside the property in which the project activity will be placed. The invitation were done my telephone, due to the fact as it was explained above the population in the place is very scarce. Although the property owners do not live in General Bravo, they facilitated the performance of this event by assisting themselves to this farm and inviting their neighbors and some employees. The reason why this was the manner in which the stakeholders consultation was made is because the project location is a rural environment and practically inhabited, so there are no communication channels. An important part of the property owners and some of the few neighbors that inhabit the zone were interviewed and their comments were recollected in order to fulfill with this transparency requirement.

E.2. Summary of comments received

>> All the stakeholders that participated in the consultation event agreed with the installation of the project activity and expressed their support to this initiative that will bring many benefits to the community. Additional comments also received from this group of people are for instance:

- The project will bring employment development in rural sectors.
- It will promote people's permanence in the location.
- The economical and environmental benefits derived from the project are very relevant
- They wish this kind of projects can be replicated in all the country

In general, the people in the surrounding area consider important the development of this kind of projects because they think that the project will improve the environment and it is a clean way of generating energy.

E.3. Report on consideration of comments received

>> The surveys where review by the project participant. Due to the fact that there were only positive comments about the project there was no need to further actions.

SECTION F. Approval and authorization

>>The letters of approval for the parties that are participating in the project activity have already been obtained. These documents were delivered to the DOE.

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

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Ventika S.A.de C.V.
Street/P.O. Box	Av. Constitución No. 444 Pte.
Building	
City	Monterrey
State/Region	Nuevo León
Postcode	64000
Country	México
Telephone	(+52) 81 8328 3000
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E-mail	infocdm.energy@cemex.com
Website	
Contact person	Patricio González Villarreal
Title	Mr.
Salutation	
Last name	González
Middle name	
First name	Patricio
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	CO_2 Global Solutions International S.A.
Street/P.O. Box	C/Claudio Coello
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State/Region	Madrid
Postcode	28001
Country	Spain
Telephone	(+34) 91 7814148
Fax	(+34) 91 7814148
E-mail	infocdm@co2-solutions.com

Website	www.co2-solutions.com
Contact person	Alfonso Lanseros Valdés
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Salutation	Mr
Last name	Lanseros
Middle name	
First name	Alfonso
Department	CDM Development
Mobile	(+34) 652 79 59 10
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Direct tel.	(+34) 91 426 17 48
Personal e-mail	infocdm@co2-solutions.com

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	CEMEX International Finance Company
Street/P.O. Box	70 Sir Rogerson's Quay
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City	Dublin
State/Region	
Postcode	2
Country	Ireland
Telephone	+353(1)2400 281
Fax	+353(1)8761 978
E-mail	infocdm.energy@cemex.com
Website	
Contact person	Daniel Torre Carrera
Title	Mr.
Salutation	
Last name	Torre Carrera
Middle name	
First name	Daniel
Department	
Mobile	
Direct fax	+353(1)8556 595
Direct tel.	+353(1)8658 779
Personal e-mail	infocdm.energy@cemex.com

Appendix 2. Affirmation regarding public funding

N/A

Appendix 3. Applicability of methodology and standardized baseline

N/A

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

For the calculation of the emission factor, which will yield the total equivalent CO2 emission reduction for the whole crediting period, a Combined Margin (CM) will be used, in accordance with the "Tool to calculate the emission factor for an electricity system ver. 02.2.1".

1. Identify the relevant electricity systems.

The regions in the Mexican grid are interconnected; for this, the relevant electric power system is the National Interconnected System (Source: SENER "Prospectiva Sector Eléctrico 2010-2025"). For further information see the section B.6.

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

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.

Ventika S.A. de C.V. has chosen Option I and only grid power plants are included in the calculation. Option I corresponds to the calculation procedure contained in earlier versions of the "Tool to calculate the emission factor for an electricity system".

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

The reason for selecting the simple OM method over the other two methods (simple adjusted OM or Average OM) is that the low-cost/must-run resources in Mexico are well below 50% of total grid generation in the average of the five most recent years. The average of Hydroelectric, Geothermal, Nuclear and Wind for the last five years is 20.80%. For further information see the section B.6.

	Power share 2005	Power share 2006	Power share 2007	Power share 2008	Power share 2009
Dual	6.52%	6.16%	5.75%	2.92%	5.23%
Combined cycle	33.51%	40.46%	44.15%	45.72%	48.45%
Gas turbine	0.62%	0.68%	1.15%	1.19%	1.59%
Coal	8.39%	7.97%	7.78%	7.54%	7.18%
Internal Combustion	0.36%	0.38%	0.49%	0.52%	0.53%
Nuclear	4.93%	4.83%	4.48%	4.16%	4.47%
Standard Thermoelectric	29.72%	23.07%	21.28%	18.37%	18.34%
Hydroelectric	12.61%	13.46%	11.63%	16.49%	11.25%
Wind	0.00%	0.00%	0.11%	0.11%	0.11%
Geothermic	3.33%	2.97%	3.18%	2.99%	2.87%

Low cost/must run	**20.88%**	**21.26%**	**19.40%**	**23.74%**	**18.69%**

Source: SENER. *"Prospectiva del sector eléctrico 2010-2025. Cuadro 20. p. 117"*

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

For calculating the Simple OM, the generation-weights average emission per electricity unit (tCO2/MWh) of all generating sources serving the system excluding the low-cost/must-run generation units is used. It may be calculated:

- 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:

  d) The necessary data for Option A is not available; and
  e) 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
  f) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Option B is used because total net electricity generation of all power plants serving the system as well as the fuel types and total fuel consumption of the project electricity system are available. Information needed for the Option A is not available.

$$EF_{grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_y} \qquad \textbf{(4)}$$

Where:

$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh).
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit).
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit).
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ).
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh).
i	All fossil fuel types combusted in power sources in the project electricity system in year *y.*
y	The relevant year as per the data vintage chosen in Step 3.

The years for calculating the Simple OM are 2007, 2008 and 2009 (based on the most recent data available at time of submission of the CDM-PDD to the DOE for validation).

$EF_{CO2,i,y}$ (in tC/TJ) can be found in the Reviewed 2006 IPCC Guidelines for Greenhouse Gas Inventories: Workbook,. Data for $FC_{i,y}$ can be found in TJ/day in the three Outlook Reports (*Prospectivas)* so total annual consumption per fuel source can be calculated multiplying by 365.

Emissions calculation 2007				
	Fuel share[29]	**Fuel consumption[30] (TJ)**	**CO_2 Emission Factor (tCO_2/TJ)[31]**	**Emissions CO_2 (tCO_2)**
Fuel Oil	0.2890	477,531	75.5	36,053,560
Natural Gas	0.5200	859,225	54.3	46,655,896
Diesel	0.0050	8,262	72.6	599,805

29 Source from Figure 39 of the Electricity Sector Outlook 2008-2017 [p.149].

30 Source from Figure 39 of the Electricity Sector Outlook 2008-2017 [p.149].

31 Source from values at the lower limit of the uncertainty at a 95% confidence interval of Table 1.4, Chapter 1 of Volume 2 of the 2006 IPCC Guidelines for National GHG Inventories. [p.1.23]

Coal (national)	0.1850	305,686	87.3	26,686,359
Coal (imported)		0.00		0.00
Total		1,652,355 TJ		**109,995,620**

Emissions calculation 2008				
	Fuel consumption (m^3/day or tonne/year)[32]	**Net Calorific Value (TJ/m^3 or TJ/tonne)[33]**	**CO_2 Emission Factor (tCO_2/TJ)[34]**	**Emissions CO_2 (tCO_2)**
Fuel Oil	29,000 m^3/day	0.04112 TJ/m^3	75.5	32,863,990
Natural Gas	71,900,000 m^3/day	0.00004 TJ/m^3	54.3	57,183,285
Diesel	700 m^3/day	0.03580 TJ/m^3	72.6	664,095
Coal (national)	9,100,000 tonne/year	0.01941 TJ/tonne	87.3	15,415,914
Coal (imported)	1,700,000 tonne/year	0.02528 TJ/tonne		3,752,398
Total	1,717,099 TJ			**109,879,683**

Emissions calculation 2009				
	Fuel consumption (m^3/day or tonne/year)[35]	**Net Calorific Value (TJ/m^3 or TJ/tonne)[36]**	**CO_2 Emission Factor (tCO_2/TJ)[37]**	**Emissions CO_2 (tCO_2)**
Fuel Oil	26,500 m^3/day	0.04112 TJ/m^3	75.5	30,030,888
Natural Gas	76,600,000 m^3/day	0.00004 TJ/m^3	54.3	60,921,274
Diesel	1,100 m^3/day	0.03580 TJ/m^3	72.6	1,043,577
Coal (national)	8,500,000 tonne/year	0.01941 TJ/tonne	87.3	14,399,480
Coal (imported)	5,200,000 tonne/year	0.02528 TJ/tonne		11,477,925
Total	1,830,492 TJ			**117,873,144**

[32] Source from Chart 38 of the Electricity Sector Outlook 2009-2024 [p.144].

[33] Source: National Energy Balance 2009, Page 99, Table 34. 1 m3 equal to 0.1598 barrels

[34] Source from values at the lower limit of the uncertainty at a 95% confidence interval of Table 1.4, Chapter 1 of Volume 2 of the 2006 IPCC Guidelines for National GHG Inventories. [p.1.23]

[35] Source from Chart 41 of the Electricity Sector Outlook 2010-2025 [p.164].

[36] Source: National Energy Balance 2009, Page 99, Table 34. 1 m3 equal to 0.1598 barrels

[37] Source from values at the lower limit of the uncertainty at a 95% confidence interval of Table 1.4, Chapter 1 of Volume 2 of the 2006 IPCC Guidelines for National GHG Inventories. [p.1.23]

Generation by sources:

	2007		2008		2009	
	Power share	***MWh***	***Power share***	***MWh***	***Power share***	***MWh***
Dual	5.75%	12,161,569	2.92%	6,282,013	5.23%	11,220,372
Combined cycle	44.15%	93,359,025	45.72%	98,414,858	48.45%	103,910,914
Gas turbine	1.15%	2,424,130	1.19%	2,557,344	1.59%	3,407,439
Coal	7.78%	16,458,809	7.54%	16,235,759	7.18%	15,405,089
Internal Combustion	0.49%	1,035,666	0.52%	1,126,254	0.53%	1,132,164
Nuclear	4.48%	9,475,567	4.16%	8,947,967	4.47%	9,580,057
Standard Thermoelectric	21.28%	44,992,805	18.37%	39,542,092	18.34%	39,331,056
Renewables (Hydro, Geo, Wind …)	14.92%	31,546,429	19.59%	42,168,800	14.22%	30,501,822
Total Generation (MWh)		232,552,000		235,871,000		235,107,000
Self-consumption (MWh)		21,098,000		20,595,000		20,619,000
Net Electricity Generation	100.00%	**211,454,000**	100.00%	**215,276,000**	100.00%	**214,488,000**

Generation by sources. Source: SENER. "*Prospectiva del sector eléctrico 2008-2017 Chart 22 p.111"" Prospectiva del sector eléctrico 2009-2024 Chart 21 p.110" "Prospectiva del sector eléctrico 2010-2025 Chart 20 p.117"*

	2007	2008	2009
Exports (MWh)	1,451,000	1,452,000	1,249,000
Imports (MWh)	277,000	351,000	346,000
Net Exchange (MWh)	1,174,000	1,101,000	903,000

Total generation in baseline (not including low-cost/must-run power plants/units)

	2007	2008	2009
Baseline (MWh)	170,432,004	164,158,320	174,407,033
Baseline + Imports (MWh)	170,709,004	164,509,320	174,753,033

Operating Margin 2007 = 109,995,620/ (170,709,004) = 0.644 tCO_2/MWh
Operating Margin 2008 = 109,879,683/ (164,509,320) = 0.668 tCO_2/MWh
Operating Margin 2009= 117,873,144/ (174,753,033) = 0.675 tCO_2/MWh

	2007	2008	2009
OM (tCO_2/MWh)	0.644	0.668	0.675

OM = 0.6443* (170,709,004.02) + 0.668* (164,509,320.39) + 0.675*((174,753,033.50)) / ((170,709,004.02) + (164,509,320.39)+ (174,753,033.50)) = **0.662 tCO_2/MWh**

Weighted OM (tCO_2/MWh)
0.662

5. ***Calculate the build margin (BM) emissions factor.***

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, for this project is calculated ex-post and as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \textbf{(5)}$$

Where:

$EF_{grid, BM, y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m, y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL, m, y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

In short, the $EF_{grid,BM,y}$ was calculated according the “Tool to calculate the emission factor of an electricity system” version 02.2.1, the sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh).
b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh)
c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}).

$SET_{\geq 20\%}$ has been selected as the SET_{sample} to calculate the BM because generation of five power plants built most recently is lower than 20% of the system generation; the plants built in the year 2009 have a gross generation of 235 GWh that is the 0.11% of total annual generation.

For the calculation of the Build Margin according to the “Tool to calculate the emission factor for an electricity system” there are two options to calculate the build margin.

Option 1: For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

The option chosen for the build margin is option 1. The build margin will be ex-ante during the first crediting period.

Plant Name	Technology	Net Electricity Generation (MWh)	Cumulative percentage (%)	Fuel type	Emission Factor of power unit (tCO2/MWh)	CO_2 Emissions (tCO_2)
Additions 2009						
Iztapalapa	GT	0	0.000%	N.A	0.000	0.00
Coapa	GT	0	0.000%	N.A	0.000	0.00
Santa Cruz	GT	0	0.000%	N.A	0.000	0.00
Magdalena	GT	0	0.000%	N.A	0.000	0.00
San Lorenzo Potencia	CC	230065	0.107%	GAS	0.370	85079.66
San Lorenzo Potencia	CC	0	0.107%	GAS	0.370	0.00
San Lorenzo Potencia	CC	0	0.107%	GAS	0.370	0.00
Additions 2008						
Humeros	GEO	325000	0.259%	N.A	0.000	0.00
Ciudad del Carmen	GT	0	0.259%	GAS	0.481	0.00
Ciudad del Carmen	GT	0	0.259%	GAS	0.481	0.00
Additions 2007						
La Venta II	Wind	0	0.259%	N.A	0.000	0.00
El Cajón (Leonardo Rodríguez Alcaine)	HID	569000	0.524%	N.A	0.000	0.00
El Cajón (Leonardo Rodríguez Alcaine)	HID	0	0.524%	N.A	0.000	0.00
Tamazunchale (PIE)	CC	7916194	4.215%	GAS	0.370	2927464.25
Río Bravo (Emilio Portes Gil)	CC	0	4.215%	GAS	0.370	0.00
Río Bravo (Emilio Portes Gil)	CC	0	4.215%	GAS	0.370	0.00
Río Bravo (Emilio Portes Gil)	CC	258456	4.335%	COM & GAS	0.370	95578.85
Ecatepec (LFC)	GT	0	4.335%	GAS	0.481	0.00
Remedios (LFC)	GT	0	4.335%	GAS	0.481	0.00
Victoria (LFC)	GT	0	4.335%	GAS	0.481	0.00
Villa de Flores (LFC)	GT	0	4.335%	GAS	0.481	0.00
Cuautitlán (LFC)	GT	0	4.335%	GAS	0.481	0.00
Coyotepec (LFC)	GT	0	4.335%	GAS	0.481	0.00
Coyotepec (LFC)	GT	0	4.335%	GAS	0.481	0.00
Vallejo (LFC)	GT	0	4.335%	GAS	0.481	0.00
Holbox	IC	0	4.335%	DI	0.580	0.00
Holbox	IC	0	4.335%	DI	0.580	0.00
Additions 2006						
Tuxpan V (PIE)	CC	3877819	6.143%	GAS	0.370	1434044.76
Valladolid III (PIE)	CC	3658523	7.849%	GAS	0.370	1352947.55
Altamira V (PIE)	CC	8041506	11.598%	GAS	0.370	2973805.51
Chihuahua II (El Encino)	CC	4445639	13.671%	GAS	0.370	1644028.59
Atenco	CC	3877819	6.143%	GAS	0.370	0.00
Additions 2005						

Plant Name	Technology	Net Electricity Generation (MWh)	Cumulative percentage (%)	Fuel type	Emission Factor of power unit (tCO2/MWh)	CO_2 Emissions (tCO_2)
Ixtaczoquitlán	HID	0	13.671%	N.A	0.000	0.00
Botello	HID	0	13.671%	N.A	0.000	0.00
Hermosillo	CC	1534093	14.386%	GAS	0.370	567318.39
Rio Bravo IV	CC	2667775	15.630%	GAS	0.370	986561.97
La Laguna II	CC	3687893	17.349%	GAS	0.370	1363808.78
Yécora	IC	0	17.349%	DI	0.580	0.00
Hol Box	IC	0	17.349%	DI	0.580	0.00
Additions 2004						
El Sauz	CC	4170540	19.294%	GAS	0.370	1542295.04
Rio Bravo III	GT	7061160	22.586%	COM & GAS	0.481	3393940.39
Tuxpan (Pdte. Adolfo López Mateos)	GT	0	22.586%	GAS	0.481	0.00
San Lorenzo Potencia	CC	2147926	23.587%	GAS	0.370	794318.15

Table 18 New power plants installed. Source: SENER. "*Electricity Sector Outlook 2010-2025 Cuadro 17 p 103* "*Electricity Sector Outlook 2009-2025 Cuadro 18 p 97* ; "*Electricity Sector Outlook 2008-2017 Cuadro 19 p 101*; "*Electricity Sector Outlook 2009-2024 Cuadro 19 p.77; Electricity Sector Outlook 2006-2015 Cuadro 13 p.57; Electricity Sector Outlook 2005-2014 Cuadro 14 p.51; Electricity Sector Outlook 2004-2013 Cuadro 9 p.44* and *Electricity Sector Outlook 2003-2012 Cuadro 8 p.39"*. Abbreviations: Hydro: hydropower plant; Geo: geothermal plant, CC: combined cycle plant, fuelled with natural gas, GT/GAS: Gas turbine, fuelled with natural gas, IC: Internal combustion, COM: Fuel Oil, DI: Diesel, GAS: Natural gas. Generation by power plant for 2007. Source: SENER. "Electricity Sector Outlook 2008-2017 Table 5 p.205"

BM factor: **0.379** tCO_2/MWh

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

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

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

Since Mexico has more than 10 registered CDM projects, the option a) has been chosen in order to calculate the combine margin.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(6)}$$

Where:

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

For wind and solar projects, the default weights are as follows: w_{OM} = 0.75 and w_{BM} = 0.25 (due to their intermittent and non-dispatchable nature).

For the calculation of these two terms (BM and OM), the information used can be found in the *Prospectiva del sector eléctrico 2010-2025; 2009-2024; 2008-2017*, prepared by the *Secretaría de energía*. These documents can be accessed at http://www.energia.gob.mx/portal/Default.aspx?id=1433

Emission factor ex-ante = 0.75*OM+ 0.25*BM = 0.592 tCO_2/MWh.

Appendix 5. Further background information on monitoring plan

A. Measuring and calculation procedure.

1. Measuring.

The Operation Department will obtain the readings from the meters installed in CFE substation "La Venta II" monthly, and it will report them in the spreadsheet designed for measurement control and will store the data discharged from the meters electronically.

Personnel of the Operation Department will be trained continuously. If new personnel are hired, they will follow a training program in order to acquire the specific skills required to carry out the Monitoring Plan.

2. Cross-check of net electricity generation:

The net electricity supplied to the grid measured at the substation will be cross-checked with receipts of sales. If the two do not match, the person(s) responsible will solve it, explaining the discrepancy detected, the origin of deviations and the corrective actions taken and file the evidence.

The data validated will be registered in this form:

Ventika Wind Farm Generation	
Year:	
Month	**Monthly Generation (GWh)**
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
Total	

Calculation of emission reductions.

Emission reductions will be calculated with cross-checked net electricity supplied to the grid as per the formula:

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

Ventika Wind Farm emission reductions		
Year:		
A	**B**	**C**
Annual validated generation (MWh)	**Emission factor *ex-ante* (tCO_2/MWh)**	**Emission reductions (tCO_2)**
A	B	A*B
A	**0.592**	A* 0.592

B. Quality control (QC) procedures and quality assurance procedures (QA).

1. *Monitoring equipment*

   1.1. Monitoring equipment shall be set up under the Mexican Law (Federal Law about Metrology and Standardization “Ley Federal sobre Metrología y Normalización”).
   1.2. Monitoring equipment shall be authorized through a certificated formal process.
   1.3. After set up monitoring equipment shall be calibrated annually and checked periodically by CFE for accuracy.

2. *Monitoring of amount of electricity.*

   2.1. The amount of net electricity transmitted to the grid shall be measured automatically by the established equipment. The measured variables are simultaneously transferred to the Ventika wind farm central control system.
   2.2. The measured amount of net electricity shall be collected monthly and shall be archived in electronic way.
   2.3. The net electricity shall be checked with the energy bill.

C. Monitoring the sustainable development.

Ventika Wind Farm		
Year:		
Dimension	**Criteria**	**Indicators**
Environmental	1. CO_2 emissions reduction by using renewable energy sources. 2. Natural resources conservation	1. GHG Emission reductions (ton CO_2) 2. The environmental indicators will be provided in accordance to the SEMARNAT Environmental Program (Plan de Vigilancia Ambiental). The data gathered to accomplish the Environmental Program by SEMARNAT mandatory will be incorporated within the Monitoring Plan. The visits and audits, and reports received from SEMARNAT will be also incorporated to the monitoring plan as attachments

According to SEMARNAT, the Environmental Program should contain a description specifying the environmental impacts, the activities and procedures developed for each preventive, control, mitigation and offset measures. Besides, additional information about the activities developed as response to the environmental impacts that were not included in the environmental impact assessment as well as additional information that could emerge during the building stage in

order to define if additional measures are necessary for those environmental impacts that had been underestimated previously.

As part of the Environmental Program, the project proponent should perform a bird monitoring study, which should include the following aspects:

A study of the bird population in the zone, the resident and migratory species: This study should be developed annually including bird diversity, specie distribution and abundance, flight behavior, collisions risk estimation.

Noise level assessment: The project proponent should analyze if the noise levels brings adverse effects to the bird species.

Appendix 6. Summary of post registration changes

The PDD has been updated to reflect a technology change in the turbines to be used in this project activity, and the minor changes that occur as a consequence of this technology change. An updated financial analysis has been included, demonstrating that the Project activity remains additional.

Additionally, due to the project construction delay the starting date of the crediting period has change to be in July 14 of 2016.

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

1. General instructions

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

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

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

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

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

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

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

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

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

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

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

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

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

2. Specific instructions

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

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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

A.2. Location of project activity

A.2.1. Host Party

A.2.2. Region/State/Province etc.

A.2.3. City/Town/Community etc.

A.2.4. Physical/Geographical location

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

A.3. Technologies and measures

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

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

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

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

A.5. Public funding of project activity

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

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

B.1. Reference of methodology and standardized baseline

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

B.2. Applicability of methodology and standardized baseline

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

B.3. Project boundary

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

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

Source		Gas	Included	Justification/Explanation
	…	CO_2		
		CH_4		
		N_2O		
		…		

B.4. Establishment and description of baseline scenario

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

B.5. Demonstration of additionality

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

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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

(a) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) include different scenarios or cases, indicate and justify which scenario or case applies to the project activity (e.g. which scenario in ACM0006 is applicable); (b) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) provide different options to choose from (e.g. which methodological approach is used to calculate the "operating margin" in ACM0002), indicate and justify which option is chosen for the project activity; (c) Where the selected methodology(ies) and, where applicable, the selected standardized baseline(s) allow different default values, indicate and justify which of the default values have been chosen for the project activity.

B.6.2. Data and parameters fixed ex ante

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

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

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

B.6.3. Ex ante calculations of emission reductions

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

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

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

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

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

B.7. Monitoring plan

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

B.7.1. Data and parameters to be monitored

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

(e) "Purpose of data": Choose one of the following: (i) Calculation of baseline emissions; (ii) Calculation of project emissions; (iii) Calculation of leakage. 3. Provide any relevant further background documentation in Appendix 5. below.

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

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

B.7.2. Sampling plan

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

B.7.3. Other elements of monitoring plan

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

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

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

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

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

C.1.2. Expected operational lifetime of project activity

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

C.2. Crediting period of project activity

C.2.1. Type of crediting period

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

C.2.2. Start date of crediting period

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

C.2.3. Length of crediting period

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

SECTION D. Environmental impacts

D.1. Analysis of the environmental impacts

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

D.2. Environmental impact assessment

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

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

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

E.2. Summary of comments received

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

E.3. Report on consideration of comments received

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

SECTION F. Approval and authorization

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

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

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

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

Appendix 2. Affirmation regarding public funding

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

Appendix 3. Applicability of methodology and standardized baseline

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

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

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

Appendix 5. Further background information on monitoring plan

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

Appendix 6. Summary of post registration changes

1. Provide a summary of the post registration changes.

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Document information

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

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