Project design document form for CDM project activities

(Version 06.0)

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	**Bii Nee Stipa**
Version number of the PDD	7
Completion date of the PDD	13/10/2015
Project participant(s)	Gamesa Energía S.A.
Host Party	Mexico
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	**Sectoral scope**: 01- Energy industries (renewable / non-renewable sources) **Methodology**: ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Version- 2
Estimated amount of annual average GHG emission reductions	205,756 tCO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of this project activity is to generate renewable energy coming from wind resources, in order to sell it to Mexican partners willing to consume this sort of energy. With this aim, the project activity will reduce greenhouse gas (GHG) emission by avoiding electricity generation otherwise produced at fossil-fuel fired power plants, and thus CO_2 emissions associated to it. Total power to be installed will be 170.35 MW in different phases:

Starting operations calendar:

Name	**Power Plant Operating**
Bii Nee Stipa I	26.35 MW on 1st April 2010
Bii Nee Stipa II	74 MW on 1st January 2012
Bii Nee Stipa III	70 MW on 1st January 2013
Cumulative power installed	**170.35 MW**

Table 1. Commissioning calendar

The wind resources available at the location of the project activity are optimal for the implementation of this kind of renewable project, due to the excellent wind resources existing (both speed and quality) in this area, as well as the possibilities of energy evacuation through existing High Voltage lines. Wind data is available at *Instituto de Investigaciones Eléctricas* (IIEE), CFE and yet confirmed by two 40m high measurement towers installed in December 2001 at the future Wind Farm location. A third 65m tower was installed in order to evaluate with more accuracy the wind resources in the whole area.

Wind power plants are one of the solutions to reduce GHG emissions in the energy sector. The energy sector is considered one of the main responsible of GHG emissions. It is also one of the key sectors in the economic and social development of countries like Mexico. Low cost-pollutant plants are the basis for the forecast of energy demand for countries with high growth rate, so wind energy appears to be an optimal solution to this problem. Installing the first wind farm in Mexico will contribute to the growth in the development of renewable energy technologies, as well as to establish a clear and favourable framework for its expansion. It is very important to develop the renewable energy sector in Mexico to serve as an example to other countries in Latin America, which is crucial for stabilizing worldwide emissions.

The contribution to the environment of this kind of technology has been already proven in other countries, with a very positive result. It is remarkable to mention that Mexico has one of the best wind resource areas in Latin America, appropriate for wind energy development.

The Bii Nee Stipa project environmental impact evaluation (MIA) received the approval by the Mexican environmental institution SEMARNAT for the Phase I (26.35 MW) in July 2008. Then the second MIA was obtained for the Phase II (74 MW) in February 2011. Finally the third MIA for Phase III (70 MW) was issued in January 2012.

Resolution of the self-supply permit from the Comisión Reguladora de Electricidad (CRE) was obtained the 28 January 2010. This way of generation is included in the Public Electric Service Act and the Public Electric Service Ruling as a possibility of generation in Mexico. The Application Form to get this permit is published in the “Diario Oficial de la Federación” on July 29, 1993 and is available in the office of the “Comisión Reguladora de Energía” (CRE).

The Interconnection Agreement with CFE (Electricity Federal Commission or *Comisión Federal de Electricidad*) to get access to the grid was signed the 25 March 2010 according to the Resolution RES/140/2001, is in the web of CRE.

Environmental and social benefits other than GHG emission reductions

In addition to the reduction in GHG emissions that the project activity would carry, other environmental and social benefits have been detected:

- Use of autochthonous energy resources (wind energy) which will improve local grid performance, this is, decreasing the occurrences of voltage drops and local blackouts.
- Job creation, especially during the construction period of the wind farm, but also for the maintenance and operation works throughout the life time of the wind farm.
- Additional income to landowners derived from land leasing without impacting in the incomes they perceive because of their regular activities.
- Foreign capital attraction, which would yield in higher incomes related to taxes.
- Decrease of fossil-fuel sources dependence.
- Local environmental studies performed.

Boundaries

For the baseline determination, it will be only taken into account CO_2 emissions from electricity generation in fossil fuel fired power plants displaced by the project activity.

The spatial extent of the boundary includes the site where the power plant is being erected and all power plants physically connected to the Mexican National Grid, where the project activity is also connected. Only power plants with no energy transportation constraints related to transmission lines are considered. Electricity imports and exports from the Mexican National grid have also been taken into account.

This CDM project activity is not a CPA that has been excluded from a registered CDM PoA as a result of erroneous inclusion of CPAs.

A.2. Location of project activity

A.2.1. Host Party

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Mexico

A.2.2. Region/State/Province etc.

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Oaxaca. Pacífico coast, Tehuantepec Istmo

A.2.3. City/Town/Community etc.

>>
Juchitán de Zaragoza council, area La Ventosa

A.2.4. Physical/Geographical location

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The Project is located in La Ventosa windy region in the Isthmus of Tehuantepec, state of Oaxaca, Mexico. The site is near the municipality of Juchitán de Zaragoza. The Project is being built on land leased from private landowners extending for at least thirty (30) years.

The coordinates for the centre of the project will be, Longitude(º) -94.9815 and Latitude(º) 16.5408. Also the perimeter of the wind farm based on its vertex will be:

WTG	Longitude(º)	Latitude(º)
V1	-94.9593	16.5652
V2	-94.9764	16.5612
V3	-95.0040	16.5499
V4	-95.0092	16.5467
V5	-95.0141	16.5376
V6	-95.0124	16.5360
V7	-95.0073	16.5323
V8	-94.9746	16.5170
V9	-94.9689	16.5172
V10	-94.9604	16.5305
V11	-94.9600	16.5430

Table 2. Perimeter of the Project Activity

The wind turbines will be located in the following geographical coordinates:

WTG	Longitude(º)	Latitude(º)
D1	-94.9736	16.5610
D2	-94.9723	16.5613
D3	-94.9711	16.5615
D4	-94.9699	16.5618
D5	-94.9687	16.5620
D6	-94.9677	16.5622
D7	-94.9662	16.5625
D8	-94.9649	16.5625
D9	-94.9638	16.5628
D10	-94.9626	16.5630
D11	-94.9695	16.5567
D12	-94.9683	16.5570
D13	-94.9671	16.5572
D14	-94.9659	16.5575
D15	-94.9647	16.5577
D16	-94.9635	16.5579
D17	-94.9687	16.5522
D18	-94.9675	16.5525
D19	-94.9664	16.5526
D20	-94.9651	16.5533
D21	-94.9639	16.5536
D22	-94.9627	16.5537
D23	-94.9692	16.5465
D24	-94.9680	16.5468
D25	-94.9668	16.5471
D26	-94.9656	16.5474
D27	-94.9645	16.5475
D28	-94.9674	16.5422
D29	-94.9661	16.5422
D30	-94.9649	16.5424
D31	-94.9638	16.5426

Table 3. Turbines coordinates of Bii Nee Stipa phase I.

WTG	Longitude(º)	Latitude(º)
A1	-95.0096	16.5438
A2	-95.0079	16.5441
A3	-95.0063	16.5444
A4	-95.0053	16.5469
A5	-95.0036	16.5472
A6	-95.0002	16.5470
A7	-94.9985	16.5471
A8	-94.9969	16.5471
A9	-94.9952	16.5472
A10	-94.9936	16.5473
A11	-94.9919	16.5474
A12	-94.9903	16.5476
A13	-94.9886	16.5479
A14	-94.9870	16.5483
A15	-94.9780	16.5500
A16	-94.9763	16.5504
A17	-95.0125	16.5373
A18	-95.0109	16.5376
A19	-95.0093	16.5380
A20	-95.0077	16.5383
A21	-95.0061	16.5386
A22	-95.0045	16.5389
A23	-95.0028	16.5392
A24	-95.0010	16.5396

WTG	Longitude(º)	Latitude(º)
A25	-94.9994	16.5399
A26	-94.9978	16.5402
A27	-94.9962	16.5405
A28	-94.9946	16.5409
A29	-94.9929	16.5412
A30	-94.9878	16.5422
A31	-94.9862	16.5425
A32	-94.9838	16.5466
A33	-94.9822	16.5469
A34	-94.9805	16.5468
A35	-94.9789	16.5472
A36	-94.9754	16.5447
A37	-94.9738	16.5450

Table 4. Turbines coordinates of Bii Nee Stipa phase II.

WTG	Longitude(º)	Latitude(º)
A38	-95.0048	16.5327
A39	-95.0032	16.5333
A40	-95.0016	16.5336
A41	-95.0000	16.5339
A42	-94.9983	16.5342
A43	-94.9967	16.5345
A44	-94.9952	16.5348
A45	-94.9935	16.5352
A46	-94.9919	16.5355
A47	-94.9903	16.5358
A48	-94.9887	16.5362
A49	-94.9871	16.5364
A50	-94.9855	16.5368
A51	-94.9876	16.5304
A52	-94.9860	16.5308
A53	-94.9844	16.5311
A54	-94.9828	16.5314
A55	-94.9812	16.5317
A56	-94.9785	16.5323
A57	-94.9764	16.5326
A58	-94.9747	16.5330
A59	-94.9731	16.5333
A60	-94.9839	16.5253
A61	-94.9823	16.5256
A62	-94.9807	16.5259
A63	-94.9765	16.5267
A64	-94.9749	16.5270
A65	-94.9733	16.5274
A66	-94.9717	16.5277
A67	-94.9683	16.5284
A68	-94.9658	16.5302
A69	-94.9734	16.5210
A70	-94.9716	16.5214
A71	-94.9698	16.5217
A72	-94.9686	16.5231

Table 5. Turbines coordinates of Bii Nee Stipa phase III.

A.3. Technologies and/or measures

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The Project is a 170.35 MW wind power project, expected to produce 640.680 GWh per year, with a capacity factor of 42.9%. The minimum expected operational lifetime is 20 years.

Total Power	170.35 MW
Turbine	Phase 1: 31 turbines G52 (850 kW) Phase 2: 37 turbines G80 (2 MW) Phase 3: 20 turbines G87 (2 MW) and 15 turbines G80 (2 MW)
Rated Power per turbine	850 kW - 2000 kW
Rated output Voltage	690V
No. of turbines	31 turbines of 850 kW and 72 turbines of 2 MW
Equivalent annual operating hours	3,761 h
Annual Production	640.680 GWh
Capacity factor	42.9%
Transmission line length and voltage	Phase I: - Length = 4.8 km - Voltage = 115 kV Phase II: - Length = 11.8 km - Voltage = 115 kV Phase III: - Length = 11.8 km - Voltage = 115 kV
Wind Farm output transformer	Phase I: 34.5/115 kV of 25/30 MVA Phase II: 34.5/115 kV of 60/80 MVA Phase III: 34.5/115 kV of 60/80 MVA

Table 6. Power plant characteristics

After wind measurements and analysis, the optimal wind turbines (maximum energy output assuring its reliability throughout the lifecycle of the wind farm) that have been selected for the project are G52, G80 and G87.

The wind turbine size is 850 kW for the G52 turbine and 2 MW for G80 and G87 turbines. All of them are three-bladed rotor machines, with a rated voltage of generator of 690 V, assuring optimal performance, maximum output from existing wind resource, robustness and reliability.

The transmission lines to connect the three phases to the grid will have the following characteristics:

Phase I:
- Length = 4.8 km
- Voltage = 115 kV
- Output transformer: 34.5/115 kV of 25/30 MVA

Phase II:
- Length = 11.8 km
- Voltage = 115 kV
- Output transformer: 34.5/115 kV of 60/80 MVA

Phase III:
- Length = 11.8 km
- Voltage = 115 kV
- Output transformer: 34.5/115 kV of 60/80 MVA

The net equivalent hours are estimated to be 3,761 hours per year, which implies a capacity factor of 42.9%.

The impact of the wind farm to the national grid has been studied by CFE with no objections to connect the wind farm to the National Grid.

The Project will reduce anthropogenic GHG emissions by supplying zero GHG emission power, which will displace fossil-fuel-fired electricity generation. The Project is expected to be responsible for reducing 2,057,557 tCO_2 during the crediting period, as described further in the document. By not finalising the wind farm construction, the energy yield to the grid injected by the wind farm to the national grid would have to be supplied from another power generator. From the energy mix installed in Mexico and the forecast of new capacity additions (data available at CFE), this energy would come mainly from fossil-fuel sources.

The forecast of power installation in México at the time when PDD was written comes as follows:

Power (MW)	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**% as of 2013**
Hydro	9,608	10,232	10,544	10,544	11,293	11,293	11,293	11,293	12,193	12,793	12,793	19.6%
CC	10,603	11,257	12,378	14,654	15,700	16,618	17,955	20,063	21,360	21,910	23,360	35.7%
Diesel	2,890	3,328	3,328	3,300	3,276	3,276	3,212	3,467	3,467	3,722	3,722	5.7%
Internal	140	189	189	189	218	218	210	210	213	213	213	0.3%
Wind	3	3	3	104	104	104	104	205	307	307	408	0.6%
Free								38	1,819	3,546	6,446	9.9%
Fuel-oil	14,283	14,283	14,243	13,930	13,710	13,312	12,712	12,370	11,830	11,346	10,464	16.0%
Geo.	960	960	960	960	960	960	960	960	960	960	960	1.4%
Coal	2,600	2,600	2,600	2,600	2,600	2,600	3,300	3,300	3,300	3,300	3,550	5.4%
Dual	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	3.2%
Nuclear	1,365	1,365	1,365	1,365	1,365	1,365	1,365	1,365	1,365	1,365	1,365	2.1%
Total	**44,552**	**46,317**	**47,710**	**49,746**	**51,326**	**51,846**	**53,211**	**55,371**	**58,914**	**61,562**	**65,381**	

Table 7. Source: Sener. "*Prospectiva del sector eléctrico* 2004-2013"

Future planning for wind power installation is expected to be 0.6% of total power installed within the Mexican energy system in 2013 (apart from power installed from this project activity). This means that the power to be installed from this project activity will not impact in the baseline calculations. The energy system will mainly be based in Combined Cycle and Thermal power plants, being the percentage of hydro power less than 20% in 2013.

This forecast is based on future energy demand expected, as well as planned infrastructure investment. New power plants generation with zero-emission will therefore displace any non-zero emission generation within the project boundaries. In the absence of the project, the energy would be produced by non-zero emission power plants.

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 (host)	Gamesa Energía S.A.	No
Spain	Gamesa Energía S.A.	No

A.5. Public funding of project activity

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N/A

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

B.1. Reference of methodology and standardized baseline

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

B.2. Applicability of methodology and standardized baseline

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The proposed methodology is appropriate for this project since renewable projects like this fits into the spec of sources for electricity capacity additions (wind sources).

The methodology is designed to be applicable to grid-connected wind power projects, provided that does not involve switching from fossil fuels to renewable energy at the site of the project activity.

Also the geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available at *Prospectiva del sector eléctrico*, prepared by *Secretaría de energía.* These boundaries include all the geographic area and infrastructures within the whole territory of Mexico, as well as the energy exports and imports outside the Mexican energy system. The characteristics of the Mexican energy system as well as the energy exports and imports are public and can be found at CFE web page: http://www.cfe.gob.mx/.

The project is in an electric sector that is not dominated by generating sources with zero- or low-operating costs such as hydro, geothermal, wind, solar, nuclear, and low-cost biomass, and this fuel mix is expected to persist for the duration of the crediting period. For the chosen methodology (low-cost/must run resources: hydro, geothermal, wind, low-cost biomass, nuclear and solar generation) the percentages of production are shown for year 2003 and the forecast for 2013.

	2003	**2013**
Fuel-oil	36.6%	18.1%
Combined cycle	27.0%	45.1%
Renewable (incl. Hydro)	12.8%	10.9%
Coal	8.2%	5.6%
Dual (coal+oil)	6.8%	6.0%
Nuclear	5.2%	2.9%
Diesel	3.4%	0.6%
Free	-	10.8%
Total	203,555 GWh	346,387 GWh

Total % under methodology	
2003	2013
18%	13.8%

Table 8. Source: Sener,"*Prospectiva del sector eléctrico* 2004-2013. Gráfica 21"

At the time of the PDD being carried out, the forecast of power installed in México in 2010 (year when the first stage will start operations) is 55,373 MW, so the impact of 170.35 MW would not reach the 0.31% of the generation mix of the electric system.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	The project activity is aimed at displacing the grid power, and thus reducing CO2 emissions resulting from the power generation.
		CH_4	No	No CH4 generation is expected
		N_2O	No	No N2O generation is expected
Project scenario	Project Activity	CO_2	No	Not applicable for wind projects
		CH_4	No	Not applicable for wind projects
		N_2O	No	Not applicable for wind projects

The project boundary related to the baseline methodology was limited to where other power plants could be located. This boundary is defined by:

- System boundary: the electric Mexican system, where power plants can be connected except for areas with transmission constraints because of weak grid.
- Geographic boundary: power plants can be installed almost anywhere in the country, provided that the connection line to the grid does not make the project unfeasible because of its costs.
- Time boundary: the crediting period.

For the baseline methodology applied to the project activity, it was only considered emission reductions of on-site emissions of all the power plants connected to the National Grid and the forecast of power plants to be connected, this is, the emissions associated to electricity generation. The emissions generated during the building process of future power plants, the emissions generated related to electricity transmission and distribution losses, the emissions related to fossil-fuel transportation, mining, water dumping, etc., were not considered for the baseline.

B.4. Establishment and description of baseline scenario

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The determination of the baseline scenario is explained in the steps above through the application of the baseline method. The project reduces emissions related to the projected emission level in the baseline scenario.

For demonstrating the displacement of emissions otherwise generated by other power plants, it should be mentioned that the project is not part of the baseline, since lower cost alternatives are available in the country. Also, the generation coming from wind sources cannot be the basis for any electric system because it needs to have a back-up power capacity for when there is no wind. All these reasons make wind energy to be very adequate for displacing base energy from any electric grid when wind conditions are suitable. Wind energy is a zero-emission renewable energy.

Moreover, wind energy over-capacity can damage the stability of the grid, and thus provoke blackouts. An example of this situation is the Spanish Electric System, where there were over 6,000 MW of wind power installed, at the time when the PDD was elaborated. In the Spanish Electric System, a production prediction tool and a very strong grid is needed to assure the system stability because of specific technical characteristics of wind turbines.

Due to the size of the power plant and its characteristic as non-system basis energy, the Project does not delay the addition of new capacity to the electric system nor displace old plants from generating. This is the reason why its impact on emissions results exclusively from adjustments in the operation of existing plants.

B.5. Demonstration of additionality

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Wind energy in Mexico is the perfect complement for CDM projects due to its additionality. The most relevant fact that demonstrates this situation is that, at the time of witting the PDD, there were no wind farms in México. By finalising the project activity, Bii Nee Stipa wind farm would be the first wind farm in México.

For demonstrating its additionality, the *Tool for demonstration and assessment of additionallity* approved has been used, following all steps defined. These steps will demonstrate that the project activity is not the baseline scenario.

Step 0. Preliminary screening based on the starting date of the project activity

The crediting period of the project activity will start after the registration of the project activity, so step 0 does not apply to the project activity.

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

Definition of alternative scenarios to the project activity that otherwise could be implemented in case that the project activity does not reach its operative status.

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

The output of the project activity is zero-emission electricity generation for exporting to the Mexican electrical grid. The alternatives to be considered will be power generation plants with zero or low emission capacity. The alternative scenarios include:

1. The proposed project activity not undertaken as a CDM project activity, this is a 200 MW wind power plant with 3,650 net equivalent production hours that does not obtain CERs from CDM registration.
2. Power generation plants from renewable sources with equivalent electricity output within the Mexican electrical system, like biomass or minihydro power plants. Due to the size of the project activity, minihydro power plants would not generate the same amount of electricity than the project activity; they would be considered as conventional hydro and would have a large impact on the baseline scenario.
3. Continuation of current situation in Mexico, as if no wind energy power plant was installed. Based on official statistics provided by Sener, continuation of current situation would be CCGT construction.

Project	Technology	Status	Capacity (MW)	
			2006	2007
Altamira V	Combined Cycle	Approved	1155	
Tuxpan V	Combined Cycle	Approved	512	
Valladolid III	Combined Cycle	Approved	540	
El Encino	Combined Cycle	Approved	67	
Tamazunchale	Combined Cycle	Tender		1046
Baja California SurII	Internal Combustion	Tender		39

Table 9. Planned new power installed. Source: Sener,"*Prospectiva del sector eléctrico* 2004-2013. *Cuadro 19*"

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

For building a power plant, the developer has to participate in public tenders called by CFE (*Comisión Federal de la Energía*). Thus, any kind of project from renewable sources would have to compete against conventional energies in price, which would always be unfeasible. In order to promote the private investor to develop power plants from renewable sources, CRE (*Comisión Reguladora de Energía*) has created different formulas instead of participating in public tenders.

These formulas are described in article 36 from "*Ley del Servicio Público de Energía Eléctrica"* and it can be found at: *http://www.energia.gob.mx/work/resources/LocalContent/2929/1/LeyEnerElec%208junio2004.pdf*

- Self-consumption (*autoabastecimiento*): For self-consumption 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 exactly match with real-time consumption. Total energy generated not used by the consumer has to be sold to CFE at a fixed price.
- Cogeneration (*cogeneración*): For power generation combined with steam or other thermal energy production or both. It is obligatory that the efficiency of the total of generation and electricity and heat consumption is higher that each part independently.
- Independent production (*producción independiente*): It is needed to mandatory sell the energy to CFE at a fixed price, and to be included in CFE expansion plans.
- Small energy producers (*pequeña producción*): for power plants smaller than 30MW of installed power.

The only possibility to make the Project activity or other renewable alternatives feasible is to create a Self-consumption company, so the consumer participates in the Project by purchasing at least one share of the project's company. Both alternatives 1 and 2 would have to use this formula.

These formulas were created with the objective of promoting small independent entities investing in renewables.

The other alternatives would also fulfil with the regulation in place, following "*Ley del Sector Público de Energía Eléctrica*":

- Power generation plants from renewable sources with equivalent electricity output within the Mexican electrical system, like biomass or minihydro power plants, would be able to be included in the same formula than wind energy (*Autoabastecimiento*).
- Continuation of current situation in Mexico (CCGT construction). This alternative would go under Independent Production (*Producción Independiente*), which is the most common procedure for new power installation I Mexico. The main barrier for using this formula is that new power installation must be included in CFE expansion plans

Step 2. Investment analysis

This step will demonstrate that the proposed project activity is economically or financially less attractive than the other alternatives in case that the project activity does not get the revenue from the sales of certified emission reductions.

Sub-step 2a. Determine appropriate analysis method

The project activity generates incomes other than CDM related income, so simple analysis cost cannot be applied. Instead, the investment comparison analysis will be used.

Sub-step 2b. Option II Application of the investment comparison analysis

For the investment comparison analysis, the IRR is the main indicator for comparing all the scenarios under this analysis. The equity IRR will be used, since it reflects the return on equity investors and includes all amounts and costs of debt financing, which is a key issue for this project activity. We consider the equity IRR more suitable for the analysis

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

For any client to participate in the self-consumption company instead of buying the energy directly to CFE (also alternative 3), the price of energy will be indexed to the general tariff fixed by CFE minus some defined discount:

	Tariff ($Mex/MWh)
Year 1 to year 5	CFE tariff – 5%
Year 6 to year 10	CFE Tariff – 10%
Year 11 to year 15	CFE Tariff – 15%
Yer 16 to year 20	CFE Tariff – 20%

Table 10. Energy price in PPA

For calculating the CFE Tariff, the "*Tarifa HM Noreste de CFE"* is used (the tariff that would correspond to some potential clients). The weighted average price (following consumer's load curve) for such a consumer would be 6.63 cUS$/kWh. It is expected the electrical tariff to keep growing in the future. In the last 5 years this tariff has grown more than 10%, except year 2001, on average above inflation (CPI) growth:

	Weighted average (cUS$/kWh)	Annual increment	CPI
2004	6.63	22%	9%
2003	5.41	11%	7%
2002	4.88	23%	9%
2001	3.97	-5%	1%
2000	4.20	11%	6%
1999	3.79	12%	12%

Table 11. Increase on tariff. Source: CFE annual tariff

The equivalent baseload price for 2005 that clients are expecting is around 63 US$/MWh (a 5% discount on CFE tariff). On a 20-year project basis, this price would yield:

Annual Production (MWh/year)	730,000
Average price (US$/MWh)	63
Annual income (US$)	45,990,000
Total Investment (US$)	270,000,000
Project duration (years)	20
Income tax	34%
IRR (%) without CERs sales	11.67%
IRR (%) with CERs sales (@18$/t$CO_2$)	13.22%

Table 12. Financial characteristics

The IRR of the project would make it unfeasible. An extra income from CERs sales of between 5 to 20 US$/t$CO_2$ will bring the project's IRR to the correct level, and would make the project to become feasible. At the current level of price of each tCO_2, the increase on the equity IRR of the project is 1.6%, enough for reaching the Required Rate of Return (RRR) for financing the project.

The level of investment for wind energy projects (1.35 million $/MW installed aprox.) is higher than the level of investment of other kind of renewable power generation plants like biomass. Thus, the project activity is financially less attractive than other renewable energy power plant project of similar characteristics that could be implemented otherwise.

Other alternatives are financially more attractive. Continuation of current situation in Mexico (CCGT construction) has lower investment requirements for higher energy production

Project	Power Installed (MW)	Annual Production (GWh)	Investment (Mil. US$)
Hermosillo	250	1,555	178.6
Tuxpan	1,000	4,064	598.3

Naco Nogales	300	423	225.5

Table 13. Unión Fenosa combined cycle power plants . Source: Unio Fenosa. www.unionfenosa.es
http://www.unionfenosa.es/ShowContent.do?contenido=CON_14_04_01&audiencia=1

Energy sales prices are confidential, but the investment per MW installed is much smaller than wind energy (0.7 million $/MW aprox for CCGT versus 1.2 million $/MW for wind) and production factors are higher.

The next table shows the project financial characteristics taking into account the key parameters that have changed as a consequence of the modifications of the project activity. These updated parameters are CAPEX, Installed Capacity, Plant Load Factor and Revenues from electricity sales.

Annual Production (MWh/year)	640,680
Plant Load Factor (%)	42.9%
Average price (US$/MWh)	63
Annual income (US$)	40,362,840
Total Investment (US$)	330,421,579
Project duration (years)	20
Income tax	34%
IRR (%) without CERs sales	6.99%
IRR (%) with CERs sales (@18$/t$CO_2$)	7.94%

Table 14. Financial characteristics

As per this table it is demonstrated that the project activity is still additional for the current design because the IRR of the project makes it unfeasible without the extra revenues from CERs sales.

Sub-step 2d. Sensitivity analysis

The main driver for performing a sensitivity analysis would be the price of the tCO_2 in organized markets.

The increment of the IRR for different price of tCO_2 scenarios:

	Price of tCO_2 (US$/t$CO_2$)				
	5	7	10	15	20
Project's IRR increment	+0.6%	+0.8%	+1,2%	+1,7%	+2,3%

Table 15: Increase on IRR with different scenarios

Other drivers that could have impact on the project activity:

- Changes in long-term energy mix strategy
- Changes in financial situation in Mexico

These situations are very unlikely to occur, and the impact on the assumptions from this project activity would not be important.

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

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

<u>Financial barriers</u>
The project is on the final stage of development. Since there is no premium for energy from renewable sources of any kind (like in other countries: Germany, Spain, Italy,) it is very difficult to negotiate a sales price to assure the correct IRR of the project and obtaining financing for the project.

Moreover, following Gamesa experience in project development, the registration of the project and its additional income from CERs sales will help to obtain financing from investment banks.

The only way to make this project feasible is by means of these emission rights, which would yield an extra income for each MWh produced, and which give a more solid position with financing institutions

Common Practice barriers

New power installation is planned by CFE to be mainly from Combined Cycle power plants. The plans for renewables are limited, so wind energy would go against common practices in Mexico. By registering the project as a CDM activity, the support of United Nations to emission reduction would help to overcome this barrier.

From "*Programa de obras e inversions del Sector Eléctrico 2004-2013*", published by CFE, there is only two facilities generating from wind: a 7-turbine 1.58 MW la Venta and a single-turbine 0,6 MW Guerrero Negro. The project activity s not comparable to these generators.

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

For other kind of renewable energy power generation projects, since the investment cost is much lower (like for biomass), both the sales of energy and the financing of the project are easier to obtain because of higher IRRs.

Step 4. Common practice analysis

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

There are no other activities similar to the project activity in Mexico. As said before, Bii Nee Stipa would be the first wind farm in Mexico. This kind of renewable energy source is not similar to any other technology due to its technical characteristics. Although this technology is widely used and proven, its high investment costs impeded its development in Mexico.

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

No other activities are widely observed

Step 5. Impact of CDM registration

As explained in steps 2 and 3, the approval and registration of the project activity as a CDM activity will alleviate both economic and financial hurdles related to the project activity. The benefits associated to the registration:

- Anthropogenic greenhouse gas emission reductions
- Financial benefit of the revenue of sales of CERs
- More robust positioning for project financing

The only risk associated to the baseline would be significant changes in prices of natural gas (due to Mexico's high dependence on Natural Gas) in the long term. And still the impact on the baseline would not be important

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The baseline scenario consists on 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.

For the calculation of the emission factor, which will yield the total equivalent CO_2 emission reduction for the whole crediting period, it is used a Combinated Margin (CM), following the approved methodology ACM0002. This Combinated Margin is divided in two parts, the Operating Margin (OM) and the Build Margin (BM). The weight of each term by default is 50% each. This weight was considered to be appropriate, following the trend and forecast of future combined cycle installation in Mexico as explained in step 3.

For the calculation of these two terms (CM and OM), the information used can be found at *Prospectiva del sector eléctrico*, prepared by *Secretaría de energia.* The latest data available at the time when PDD was published for Global Stakeholder Consultation was the document presented with data from 2003 and the forecast 2004-2013. This document can be found at http://www.energia.gob.mx/.

Step1. Calculate the Operating Margin emission factor (EFOM)

The Operating Margin refers to actual generation mix by sources installed in México. The total fuel consumption for generation is divided into the different types of power plants, in order to determine what is the weighted average of actual CO_2 emissions in México.
For its calculation, the simple OM method was selected from the four options proposed in the approved methodology ACM0002. Dispatch data analysis method was the first choice considered, but this method will not be used for this project activity because of the lack of available public data for its calculation. For using Dispatch data analysis method, the hourly generation-weighted average emissions per electricity unit (tCO_2/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 were not publicly available, so this method could not be used for calculating the Operating Margin emission factor.

The reason for selecting the simple OM method among the other two methods (simple adjusted OM or Average OM) was that the low-cost/must run resources in México were and still are well below 50% of total grid generation in both the average of the five most recent years and in the long-term normals for hydroelectricity production:

	1998	1999	2000	2001	2002	2003
Hydro	27,51%	26,97%	26,21%	24,97%	23,33%	21,56%
Geo+wind	2,13%	2,10%	2,33%	2,18%	2,05%	2,15%
Nuclear	3,71%	3,84%	3,72%	3,54%	3,31%	3,06%
Coal	7,37%	7,29%	7,09%	6,75%	6,31%	5,84%
Steam	40,51%	40,05%	38,92%	37,08%	34,69%	32,06%
Combined Cycle	6,99%	6,91%	9,26%	13,47%	17,83%	23,80%
Diesel	5,47%	6,63%	6,43%	6,18%	7,02%	6,49%
Internal	0,34%	0,33%	0,32%	0,37%	0,35%	0,32%
Dual (coal+fuel oil)	5,96%	5,89%	5,72%	5,45%	5,10%	4,71%
Low-cost/must run %	33,36%	32,91%	32,27%	30,70%	28,70%	26,79%

Table 16. Source: Sener."*Prospectiva del sector eléctrico* 2004-2013. Data from *Cuadro 10*"

Since data for calculating the emission factor using the simple OM method were very robust and reliable and following the definitions from the approved methodology this method could be applied to this project activity, the simple OM method was finally chosen.

The average low-cost/must run generation resources in the last six years, from the date when PDD was elaborated), was 30.79%, below 50%. Coal is not included under the low-cost/must run category, but even adding coal generation to it, it would be always lower than 50%.

Long term for hydroelectricity production was forecasted to be 7.2% of total generation in 2013.

For the purpose of determining the Build Margin (BM) emission factor, the spatial extent was limited to the project electricity system.
For determining the Operating Margin (OM) emission factor, it was necessary to determine the net electricity imports. There were 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) were:

	2002	2003	% of total generation
Imports (GWh)	531	71	0.05%
Exports (GWh)	344	953	0.8%
Net Exchange (GWh)	-187	882	

Table 17. Electricity imports and exports. Source: Sener. "*Prospectiva del sector eléctrico* 2004-2013"

For imports from connected electricity system located in another country, the emission factor is 0 tCO_2/MWh. Electricity exports will not be subtracted from electricity generation data used for calculating and monitoring the baseline emission rate.
The plans of transmission line construction for next years to increase the electricity export capacity were very low; there were no plans to build any transmission line to Belize. The interconnection with the US represents net imports calculated at 0 tCO_2/MWh. Future modifications of import and export capacity of electricity outside the Mexican electric system will not have any impact on the scenario for the project activity.

For calculating the Simple OM, an average emission per unit of electricity generated of all the generation types, not taking into consideration the low-cost/must-run were used.

This option is supported on all the electricity generation of the plants in the country and the fuel consumption that these plants need. However, there is no available public data of fuel consumption and electricity generation for all generating sources serving the system. For that reason, a different approach based on total power generation of the plants in the system and their fuel consumption was chosen.

$$EF_{OM,y} = \frac{\sum_i FC_{i,y} \times COEF_{i,y}}{EG_y}$$

Where:

EF_{OM} is the Operating Margin Emission Factor for Mexican grid in year y
$FC_{i,y}$ Quantity of fossil fuel type *i* which was used in the projects electricity system in year *y* (mass or volume unit).
$COEF_{i,y}$ is the emission coefficient of fuel i in tCO_2/TJ
EG_y *n*et 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).

This $COEF_{i,y}$ could be found in the IPCC Inventory Workbook, 1996. Data for $FC_{i,y}$ could be found in TJ/day in the available "*Prospectiva*" document at this time, so total annual consumption per fuel source can be calculated multiplying times 365.

Using the approved methodology AMC0002, data of specific energy consumption by fuel type was directly calculated by CFE at *Prospectiva del sector eléctrico 2004-2013*. The emission coefficient factor by fuel type was determined in tCO_2/TJ instead of tCO_2/mass or volume.

The Operating Margin emission factor calculation for 2003 was 700.7 tCO_2/GWh (see details is Appendix 4).

Step 2. Calculate the Build Margin emission factor ($EF_{BM,}$)

The building Margin emission factor was calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants, calculated in the same way as the Operating Margin. This sample of power plants could be chosen from two options proposed by the methodology. The option chosen was based on the most recent information available on plants already built at the time of submitting this PDD. For this option, the sample had to be either:

- The five power plants that have been built most recently.
- The power plants capacity additions in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently.

Most recent data available at the time when PDD was published for Global Stakeholder Consultation showed that in 2003, 85% of new power installed was combined cycle (natural gas) and 8% were Natural Gas turbines, which made 93% of natural gas-fired power plants. For being conservative, it was considered that the five last power plants installed in Mexico were Natural Gas Combined Cycle plants. Moreover, in *Prospectiva del sector eléctrico*, prepared by Sener the forecast of new power installed was based in Combined Cycle plants with a production of 45.1 % of total generation in 2013.

Power Plant	Power installed (MW)	Technology	Location
Altamira III y IV (PIE)	1,036	Combined Cycle	Tamaulipas
Tuxpan III y IV (PIE)	983	Combined Cycle	Veracruz
Mexicali (PIE)	489	Combined Cycle	Baja California
Transalta Chihuahua III (PIE)	259	Combined Cycle	Chihuahua
Naco Nogales (PIE)	258	Combined Cycle	Sonora
Transalta Campeche (PIE)	252	Combined Cycle	Campeche
Calera (bloque) (Arrendamiento)	170	Internal combustion	Zacatecas
El Verde (Arrendamiento)	103	Gas Turbine	Jalisco
Las Cruces (Arrendamiento)	100	Gas Turbine	Guerrero
Dos Bocas (bloque) (Arrendamiento)	100	Gas Turbine	Veracruz
Los Azufres	79.8	Geothermal	Michoacán
Los Azufres	26.8	Geothermal	Michoacán
Total	3,856.6		

Table 18. New power plants installed. Source: Sener. *"Prospectiva del sector eléctrico 2004-2013"*

The technical characteristics of combined cycle power plants:

	Power	Efficiency	Life cycle
Combined Cycle	1 × 283	51.01	30 years
	1 × 568	51.23	30 years
	1 × 374	51.79	30 years
	1 × 750	51.82	30 years

Table 19. Technical data and characteristics of typical projects. Source: Sener. *"Prospectiva del sector eléctrico 2004-2013"*

For being conservative, the most efficient factor for all new combined cycle power plants installed was taken, being 51.82% (lowest emission factor). This yield in an emission factor of 390 tCO_2/GW. (See details in Appendix 4).

Step 3. Calculate the baseline emission factor EF

The baseline emission factor was calculated as the weighted average of the Operating Margin emission factor and the Building Margin emission factor. For weighting these two factors, default value of 50% each were considered appropriate for describing the real situation in Mexico. New wind farms will delay the installation of new Combined Cycle while substituting both the existing mix of energies and the new Combined Cycle power plants. From the Sener forecast of energy consumption, it is remarkable to mention that 45.1% of generation in 2013 will come from Combined Cycle plants.

Thus, the baseline emission factor in the year 2003 was (700.7 + 390)/2 = 545.3 tCO_2/GWh.

This baseline emission factor is the basis for calculating the emission factors for all the years in the crediting period (See Appendix 4).

Emission Reductions

The emission reductions by the project activity are calculated as the difference between the baseline emissions, project emissions and emissions due to leakage. Since there are no project emission and no emission due to leakage, the emission reductions were the baseline emission. This baseline emission was the baseline emission factor multiplied by the energy generation.
Baseline emission factor (as of 2003): 545.3 tCO_2/GWh

Annual generation (once the 170.35 MW will be operating): 640,680 MWh

Annual baseline emission (as of 2003 baseline emission factor for 170.35MW in operation): 349,363 tCO_2.

Total emission reduction during the crediting period: 2,057,557 tCO_2 (See Appendix 4).

Estimation of emissions reductions prior to validation

For the proposed crediting period, it is necessary to present an estimation of likely project emission reduction. For this purpose, the same methodology (simple Operating Margin calculation) was used, with the difference of the Emission Factor (EF_y, being *y* each year of the crediting period) will be determined ex-post during monitoring.

For an estimation of emission reductions during the crediting period, the actual data available (2003) and forecast data from 2013 available were used. The baseline emission factor was calculated in the same way in these two situations. From the result of this calculation, the trend of the emission factor was obtained and thus, the emission reductions of each of the years from the crediting period. This trend was assumed to be linear. For details of the calculation see Appendix 4. The results are show in the next table:

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Emission rate (tCO_2/GWh)	505.7	499.1	492.5	485.9	479.2	472.6	466.0	459.4	452.8	446.2
Emission Reductions (tCO_2)	0	39,059	51,390	188,451	307,014	302,785	298,557	294,328	290,100	285,871
Total Emission Reductions (tCO_2)	**2,057,557**									

Table 20. Emission reductions

The registration of the project took place before its commissioning, so there were no emission reductions prior to its registration.

The approved monitoring methodology to be applied to the project activity was ACM0002 *“Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”.*

B.6.2. Data and parameters fixed ex ante

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N/A

B.6.3. Ex ante calculation of emission reductions

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The chosen crediting period will be the fixed crediting period formula, starting the 31st December 2008. The wind power plant will generate a total reduction of 2,057,557 tCO_2.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Emission rate (tCO_2/GWh)	505.7	499.1	492.5	485.9	479.2	472.6	466.0	459.4	452.8	446.2
Emission Reductions (tCO_2)	0	39,059	51,390	188,451	307,014	302,785	298,557	294,328	290,100	285,871
Total Emission Reductions (tCO_2)	**2,057,557**									

Table 21. Emission reductions

In each crediting year, the amount of emission reductions generated by the project will vary in relation to the product of total generation measured and the emission rate. Due to the importance of estimation of energy production in order to determine the cash flows generated by the wind farm and thus, the financing possibilities, a long-term forecast of net equivalent production hours is estimated by our technical office (net hours at full power operation). These estimations are conservative, and use historical data series from meteorological measurements and data from wind measurement masts.

The baseline emission rate is calculated annually (slightly decreasing due to the forecast of installation of power capacity from combined cycle plants, whose emissions of 390 tCO_2/GWh are below the emission rate calculated with latest data available) over the whole crediting period.

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)
2009	0	0	0	0
2010	39,059	0	0	39,059
2011	51,390	0	0	51,390
2012	188,451	0	0	188,451
2013	307,014	0	0	307,014
2014	302,785	0	0	302,785
2015	298,557	0	0	298,557
2016	294,328	0	0	294,328
2017	290,100	0	0	290,100
2018	285,871	0	0	285,871
Total	2,057,557	0	0	2,057,557
Total number of crediting years	10			
Annual average over the crediting period	205,756	0	0	205,756

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

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Data / Parameter: 1	**$EG_{facility,y}$**
Unit	MWh
Description	Electricity supplied by the project activity to the grid in year y.
Source of data	Wind farm and electricity bill
Value(s) applied	-
Measurement methods and procedures	Directly measured
Monitoring frequency	Hourly measurement and monthly recording
QA/QC procedures	Double check by receipt of sales (taking into account the transportations electric losses). Calibrated metering by CFE.
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	**EF_y**
Unit	tCO_2/MWh
Description	Baseline emission factor calculated as the weighted average of the Operating Margin and the Building Margin emission factors in year y
Source of data	-
Value(s) applied	-
Measurement methods and procedures	Calculated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	**$EF_{OM,y}$**
Unit	tCO_2/MWh
Description	Operating Margin Emission Factor for Mexican grid in year y
Source of data	-
Value(s) applied	-
Measurement methods and procedures	Calculated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	$EF_{BM,y}$
Unit	tCO_2/MWh
Description	Build Margin Emission Factor for Mexican grid in year y
Source of data	-
Value(s) applied	-
Measurement methods and procedures	Calculated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	$FC_{i,y}$
Unit	TJ
Description	Quantity of fossil fuel type *i* which was used in the projects electricity system in year *y* (mass or volume unit).
Source of data	CFE
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	$COEF_{i,y}$
Unit	tCO_2/TJ
Description	Emission coefficient of fuel i in tCO_2/TJ
Source of data	IPCC Workbook
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	EG_y
Unit	MWh/year

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* (MWh).
Source of data	CFE
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data are kept archived during the crediting period and until two years later.

Data / Parameter	**Plant Name**
Unit	Text
Description	Identification of power source for the BM
Source of data	CFE
Value(s) applied	-
Measurement methods and procedures	Estimated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Electronic archived data kept during the crediting period and two years later

Data / Parameter	$F_{j,y}$
Unit	TJ
Description	Amount of fuel consumption for the new installed plants in year y
Source of data	CFE
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Electronic archived data kept during the crediting period and two years later

Data / Parameter	**New capacity additions**
Unit	Text
Description	New capacity additions in the electric sector
Source of data	CFE

Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Electronic archived data kept during the crediting period and two years later

Data / Parameter	**GEN_{imp}**
Unit	MWh
Description	Electricity imports to the project electricity system
Source of data	CFE
Value(s) applied	-
Measurement methods and procedures	Calculated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Electronic archived data kept during the crediting period and two years later

Data / Parameter	**$COEF_{imp}$**
Unit	tCO_2/MWh
Description	CO_2 emission coefficient of fuels used in connected electricity systems.
Source of data	IPCC Workbook
Value(s) applied	-
Measurement methods and procedures	Calculated
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Electronic archived data kept during the crediting period and two years later

This methodology was chosen because of it to be used with the approved baseline methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. This methodology is designed for Power plants using wind resources among others.

The methodology is applicable to the project activity because:

- It is applicable to electricity capacity addition from wind resources
- The project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity

- There is enough and clear information to identify the geographic and system boundaries for the relevant electricity grid in which the project activity will be developed. Public information on characteristics of the grid is available at *Comisión Federal de Energía (CFE)*.

For this purpose and following the monitoring methodology, the requirements of information to be monitored include:

- Electricity generation from the proposed project activity, measured from the control house in site. Electricity losses related to transportation will not be considered since they would be common to any power plant in operation within the project boundary
- Data needed to recalculate the Operating Margin emission factor, based on the Simple operating margin method chosen consistent with ACM0002 baseline methodology. This option has been chosen since the data of fuel consumption by each power plant of the power system is not released by the relevant authority. Only aggregated fuel consumption data is yearly published.

B.7.2. Data needed to recalculate the Build Margin emission factor consistent with ACM0002 baseline methodology. In this case, the specific data: Plant name and fuel consumption of each power plant is annually released by the national public utility. Sampling plan

>>
N/A

B.7.3. Other elements of monitoring plan

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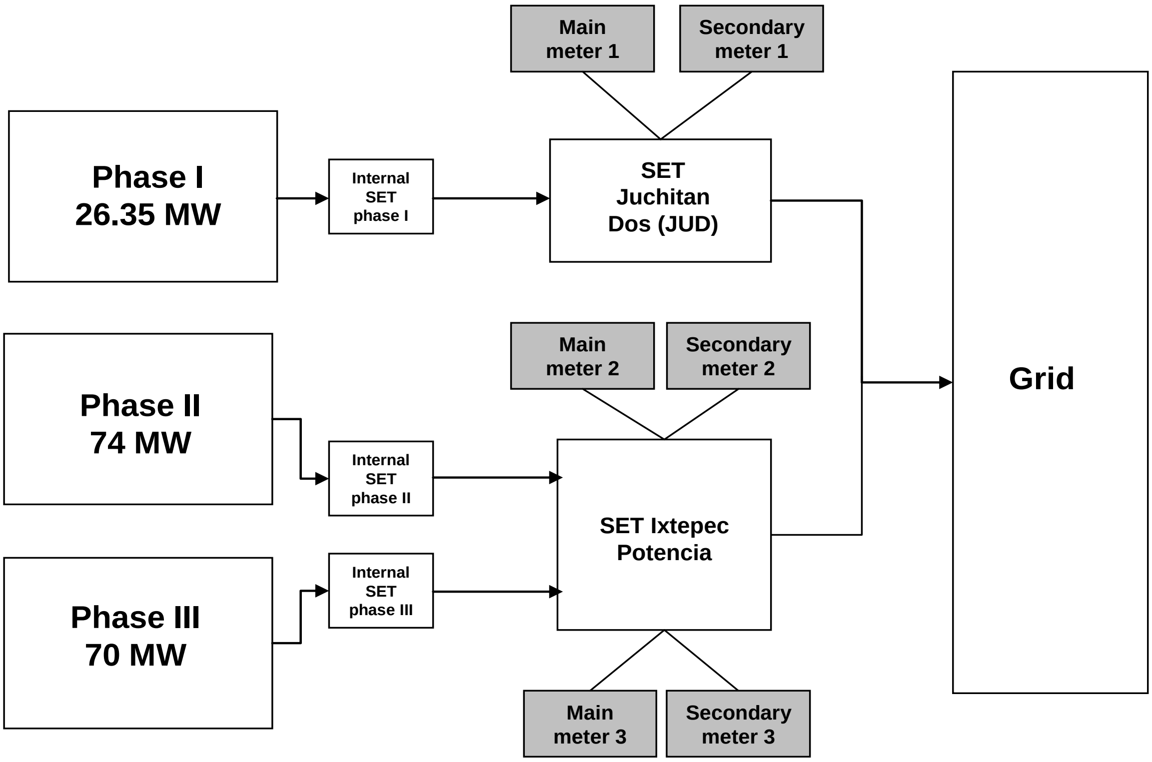
As the Mexican power grid relies on a regulated metering setup established by the Federal Electricity Commission (CFE), which is required for the invoicing of power generation, monitoring will be carried out by CFE and project participant will keep copies of the bills provided by CFE. In those bills, CFE provides the project participant with generation data measured by the main meter located at the sub-station.

Since no leakage is expected from the project activity, the emission reductions will be equivalent to the recorded value monitored by CFE periodically checked meters, according to Mexican standards.

<u>The quality of the net generation (Quality Control and Quality Assurance):</u>
The quality of the net generation is assured by carrying out double measurement by means of a main meter and secondary meter. These meters will be located at the entrance of substations “Juchitan Dos”, for phase I, and “Ixtepec Potencia”, for phases II and III. In substation “Ixtepec Potencia” meters will measure separately energy delivered by phase II and by phase III. The location of meters is shown in the next figure:



<u>Calibration:</u>
The meters will be ION 8600 with an accuracy of ±2%. They will collect data continuously and will meet all the CFE requirements.

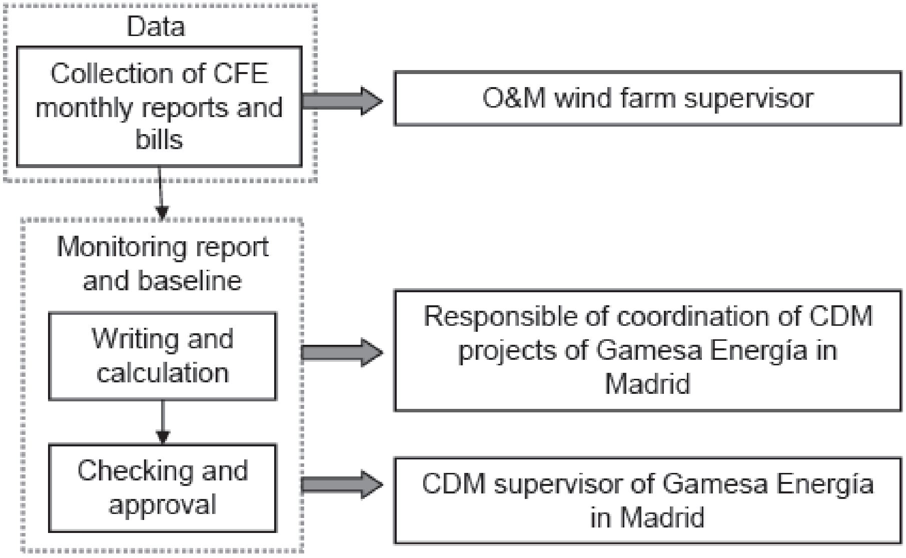
Meters are initially calibrated by CFE when they are installed. An annual calibration will be carried out in both main and secondary meters by CFE, according to what was stipulated in the "interconnexion agreement". CFE is the only responsible and authorised entity to have access to the meters.

<u>Training:</u>
Wind farm staff is trained for operation and maintenance works, as well as monitoring procedures in order to be able to read CFE reports and register electronically the provided data.

<u>Data Reporting & Storage:</u>
CFE will send generation monthly report providing the net amount of energy supplied to the grid. Those data provided by CFE from meter readings will be used in the calculations of the emissions reductions, and they will be checked as well by the CFE monthly on a remote basis. CFE bills will be used for cross checking.

The supervisor of Operation and Maintenance of the wind farm is in charge of receiving, analysing and compiling all CFE monthly reports and bills. This person is also in charge of doing monthly/annual reports regarding the electricity generated by the project. Hourly data provided by CFE are kept archived during the crediting period and for two years after the end of the last crediting period.

All these reports (internal and external) shall be sent to the responsible of coordination of CDM projects of Gamesa Energía in Madrid who is in charge of writing the MR as well as baseline calculation. Responsible of coordination of CDM projects of Gamesa Energía in Madrid will carry out an annual internal audit consisting in checking both documents with final data provided for baseline calculations. The CDM supervisor will check and approve monitoring report. Data reporting & storage structure is shown in the table below:



Failure procedure:
In the cases of failure of the main meter, back up meter would be used for power generation measurements while the grid officials would immediately replace the main meter with a new calibrated meter. If both main and back up meters would fail, CFE is expected to carry out a conservative and reliable estimation.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>The original PDD was done by Gamesa Energía on 01/07/2005
The new changes have been done by Oswaldo Alvarez on 01/11/2005.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
13/02/2008, date when the contract for supply of first phase turbines was signed.

C.1.2. Expected operational lifetime of project activity

>>
The project activity is expected to have a minimum lifetime of 20 years from the operation start of each phase.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Fixed period

C.2.2. Start date of crediting period

>>
31/12/2008

C.2.3. Length of crediting period
10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts
>>
As part of the intensive documentation on the analysis of the environmental impacts, an abstract of the executive summary of this study is presented:

Title: "*Manifestación del impacto ambiental. Modalidad particular: Sector Eléctrico*"

Abstract

Identification and evaluation of environmental impacts. Quantitative evaluation, showing total negative impacts and benefits, as well as inevitable, irreversible and cumulative impacts of the Project. The environmental impacts that the project will generate during the different project phases will be listed to the detail of all kind of activities and environmental factors to which they will cause major effects.

The study will also propose some measures to mitigate and compensate the identified negative effects.

The construction and operation of Bii Nee Stipa Wind Farm is focused on strengthening the National Electric System, which is considered to be a key project for the social and financial development of the region. The region in which the project is located is considered one of the poorest regions in the country.

The development of the building Works and future installations will not have important effects in the environment, since most of the effects have small impact and will affect for a short period of time. These effects are basically related to the wind turbine installation.

The vegetation in the area was substituted by grassland for livestock use and land for cultivation. This is the reason why most part of the fauna emigrated. From the study performed, the activities to be carried out will not generate any negative impact on these elements.

For the operating phase, there are no emissions to the atmosphere and there is no residual water dumping. Energy produced from wind resources is considered one of the cleanest energies. Also the project accomplishes with public policies defined in *Planes Federal y Estatal de desarrollo*. The project does not interfere in urban development and does not affect to the natural protected area of *Parque Ecológico Regional del Istmo*, which is located eight kilometers away from the site of the wind farm.

D.2. Environmental impact assessment
>>
From all these reasons, it is considered that Bii Nee Stipa wind farm Project is beneficial for the region from a social and financial point of view and that it is feasible from an environmental point of view.

The Bii Nee Stipa project environmental impact evaluation (MIA) received the approval by the Mexican environmental institution SEMARNAT for the Phase I (26.35 MW) in July 2008. Then the second MIA was obtained for the Phase II (74 MW) in February 2011. Finally the third MIA for Phase III (70 MW) was issued in January 2012.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The process followed for obtaining local stakeholders comments consisted on contacting the main agents related with the project activity, including the Climate Change Office in Mexico (*Oficina de Cambio Climático Mexicana*).

The first agent to be consulted was the *Presidencia Municipal de El Espinal*, municipal authority were the wind farm would be placed. The municipality expressed its deep interest in wind farm development and issued a No Objection Letter.

The Landowners of the terrains where the wind farm will be placed gave their support to the Project. They signed all the land lease agreements for installing the wind turbines.

The *Secretaría de Medio Ambiente Mexicana (SEMARNAT)*, this is, the environmental authority, authorized the execution of the project activity after preparing a report where the environmental impact was analyzed. Thus, an official Environmental License was obtained for the whole 170.35 MW.

The project developers joined the *Asociación Mexicana de Energía Eólica (Mexican wind energy association)*, to which inauguration the *Secretario de Energía* assisted, giving his support to wind energy development in Mexico.

Moreover, the project developers participated in several conferences and round tables in Oaxaca and in Mexico D.F. *(Coloquio Internacional Corredor del Istmo)*, presenting their project and obtaining the support of all agents attending to these conferences.

The *Comisión Nacional para el Ahorro de la Energía (National Energy Saving Comission)* was promoting the wind energy development in Mexico. An example of this initiative was the Mexico-UE Seminar for the development of energy efficiency and renewable energies that took place in February 2005, where the project developers participated actively.

The *Comisión Federal de Electricidad (CFE)* prepared an interconnection feasibility study, informing the required infrastructure for this end.

The *Comité Mexicano para Proyectos de Reducción de Emisiones y de Captura de Gases de Efecto Invernadero (Mexican Commission for Emission Reduction Projects and Greenhouse Gas capture)* issued the No Objection Letter as the initial procedure prior to the Acceptance Letter.

As a summary, it can be concluded that the main agents in the energy and environmental sectors in Mexico, as well as all local parties involved after public consulting accomplished, gave their support to the project activity.

E.2. Summary of comments received

>>

All the comments received have been very positive and the general opinion was very favourable for the wind development in the area. Letters of No Objection were received as mentioned above. The developer was invited to several seminars to present the project due to the interest of the sector in this project.

Some of the comments received included the concerns from local farmers regarding the use of land: in the past, high wind speeds in the area has spoiled agriculture development. This high speed wind is also making difficult reforestation activities. The implementation of the project activity would help farmers to overcome these difficulties and thus diversify their activities apart from extensive cattle, which is the only activity they can nowadays develop in the area.

E.3. Report on consideration of comments received

>>
No opinions against the project activity were received.

SECTION F. Approval and authorization

>>
The letter of approval from parties for the project activity is available at the time of submitting the PDD to the validation 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	Gamesa Energía S.A.
Street/P.O. Box	Plaza Pablo Ruiz Picasso
Building	Torre Picasso, pt. 24
City	Madrid
State/Region	
Postcode	28020
Country	Spain
Telephone	(+34) 91 5667400
Fax	(+34) 91 5158886
E-mail	
Website	
Contact person	Eduardo García / Javier López-Huerta Martín
Title	Project Manager Mexico / Energy Management
Salutation	Mr
Last name	García / López-Huerta
Middle name	
First name	Eduardo / Javier
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2. Affirmation regarding public funding

N/A

Appendix 3. Applicability of methodology and standardized baseline

Please, see section B.2.

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

Total Fuel consumption:

2003: 1,608,190 TJ
2013: 2,538,575 TJ

	(1)	(2)	(3)	(2)*(3)*(44/12)	(5)	(6)	(7)	(6)*(7)*(44/12)
	2003				2013			
	Fuel share	Fuel consumption TJ	Carbon content (tC/TJ)	Emission CO_2 tCO_2	Fuel share	Fuel consumption TJ	Carbon content (tC/TJ)	Emission CO_2 tCO_2
Fuel Oil	42,2%	678,656	21.1	52,505,366	25,1%	637,182	21.1	49,296,673
Natural Gas	37,0%	595,030	15.3	33,381,200	60,6%	1,538,376	15.3	86,302,919
Diesel	1,6%	25,731	20.2	1,905,812	0,3%	7,616	20.2	564,071
Coal	19,2%	308,772	25.8	29,209,877	14,0%	355,401	25.8	33,620,887
Total		1.608.190		**117,002,255**		2,538,575		**169,784,550**

Table 22. Fuel consumption per fuel type. Source: *Prospective del sector eléctrico 2004-2013*

Generation by sources:

	2003	**2013**
Fuel-oil	36.6%	18.1%
Combined cycle	27.0%	45.1%
Renewable (including hydro)	12.8%	10.9%
Coal	8.2%	5.6%
Dual (coal+fuel-oil)	6.8%	6.0%
Nuclear	5.2%	2.9%
Diesel	3.4%	0.6%
Free	-	10.8%
Total	203,555 GWh	346,387 GWh

Total % under methodology	
2003	2013
18%	13.8%

Total low/cost-must run+imports (GWh)	
2003	2013
166,986	298,657

Table 23. Generation by sources. Source: Prospectiva del sector eléctrico 2004-2013

Baseline calculations:

- Operating Margin:

Operating Margin = total CO2 emission / total generation under baseline
Operating margin 2003 = 117,002,255 / 166,986 = 700.7 tCO_2/GWh
Operating Margin 2013 = 169,784,550 / 298,657 = 568.5 tCO_2/GWh

- Building margin:

The efficiency of the most efficient new Combined Cycle plant installed is 51.82%. The carbon content in Natural Gas is 15.3 x (44/12) =56.1 tCO_2/TJ.
The emission factor is:
$(56.1\ tCO_2/TJ \times 3.6\ TJ/GWh_{therm}) / 0.5182 GWh_{elec}/GWh_{therm} = 390\ tCO_2/GWh$

Thus:

	2003	**2013**
Total Generation in baseline (GWh)	166,986	298,657
Operating margin (tCO_2/GWh)	700.7	568.5
Build margin (tCO_2/GWh)	390	390
Emission factor (tCO_2/GWh)	545.3	479.2
Annual increment (tCO_2/GWh)	-6.6	

Table 24. Evolution of the emission factor from 2003 to 2013

The Building Margin was considered to remain constant during the crediting period, due to Combined Cycle forecast installation. This assumption was conservative. The emission factor was 545.3 tCO_2/GWh in 2003 and was estimated to be 446.2 tCO_2/GWh in 2018 (545.3 – 6.6×15). A linear reduction of -6.6 tCO_2/GWh per year was considered for ex-ante calculations, which was realistic following the Combined Cycle power plant installation forecast from CFE.

This means that for 2009 (first year of the crediting period) the Emission factor was expected to be: Emission factor (2009) = 545.3 – 6.6*6 = 505.7 tCO_2/GWh.

The same formula was used to estimate the emission factor for the rest of the years. The results:

YEAR	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Emission factor (tCO_2/GWh)	505.7	499.1	492.5	485.9	479.3	472.6	466.0	459.4	452.8	446.2
Power generation (GWh)	0.00	78.26	104.35	387.84	640.68	640.68	640.68	640.68	640.68	640.68
Emission reductions (tCO_2)	0	39,059	51,390	188,451	307,014	302,785	298,557	294,328	290,100	285,871
Total emission reductions (tCO_2)	**2,057,557**									

Table 25. Emission reductions during the crediting period

So the total emission reductions for the crediting period will be 2,057,557 tCO_2.

Please note that these calculations are only valid for ex-ante estimations of the emission reductions. For calculating the emission reductions once the project is commissioned a yearly ex-post calculation will be done.

Appendix 5. Further background information on monitoring plan

For the baseline emissions estimation, it will be used the following formula:

Annual emission reduction = (project activity's annual electricity dispatched to the grid) * (CO_2 emission rate of the estimated baseline)

<u>Step 1</u>

- Determination of the Operating Margin emission factor (tCO_2/MWh)

Operating Margin emission factor for year y (tCO_2/MWh) = (Quantity of fossil fuel type *i* used in the projects electricity system in year y (TJ) * carbon content for each source (tCO_2/TJ)) / *n*et 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).

- Determination of the Building Margin emission factor (tCO_2/MWh)

Average emission factor of the five last new power plants built during year y, from the most efficient plant (Combined Cycle).

Building Margin emission factor for year y (tCO_2/MWh) = [Carbon content of fuel type *44/12 (tCO_2/TJ) × 3.6 TJ/GWh_{therm}] / Efficiency (GWh_{elec} / GWH_{therm})

- Determination of the baseline emission rate (tCO_2/MWh)

Weighted average (0.5 each) of the Operating Margin emission factor and Building Margin emission factor

Step 2

- 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.

Appendix 6. Summary of post registration changes

Changes to start date of crediting period were requested and approved.
The starting date of the initial crediting period was January 1st 2007 (01/01/2007). Due to a delay in the construction of a transmission line and electrical substation by the CFE, the start of operation of the project was inevitably postponed. Therefore, a delay on the start of the crediting period was requested, in a way that this date was moved from January 1st 2007 to December 31st 2008 (31/12/2008). The delay on the start of the crediting period was approved on January 30th 2011.

Changes to project design of registered project activity and to the monitoring plan were requested and approved.
Changes regarded mainly the total power installed, which went down from 200 MW to 170.35 MW, with a smaller number of WTG of higher individual nominal capacity. Wind turbines installed are state-of-the-art technology assuring optimal technical and environmental performance.
Also the monitoring plan was updated and improved to give more clarity: three monitoring parameters were removed since they are redundant (not included as monitoring parameters in the methodology and not used for the ER calculation). Other improvements include double measurement of the net generation by means of a main and secondary meters; annual calibration of the meters; annual internal audits carried out by the responsible of coordination to make sure that information flows timely.

A permanent change from monitoring methodology was requested.
The Project Participant proposes a change in the calculation of the OM. A simple average calculation of the OM has been applied instead of weighted average.
The reason of this change is because there is no available public data of fuel consumption and electricity generation for all generating sources serving the system. Thus, it has been used for calculations:

- Total volume of each fossil fuel type consumed in the electricity system and
- Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plan

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Document information

Version	*Date*	*Description*
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Editorial improvement.
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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