Project design document form
(Version 11.0)

BASIC INFORMATION	
Title of the project activity	La Venta II
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	12
Completion date of the PDD	30/08/2019
Project participants	Comisión Federal de Electricidad; International Bank for Reconstruction and Development (IBRD) as the Trustee of the Spanish Carbon Fund (SCF); Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness; AZULIBER 1, S.L.; Comercial De Materiales De Construccion, S.L. (COMAC); Compania Espanola De Petroleos, S.A. (CEPSA); Endesa Generacion, S.A.; E.ON Generacion S.L; Gas Natural SDG, S.A.; Hidroelectrica Del Cantabrico, S.A.; IBERDROLA Generacion S.A.U; Repsol YPF S.A.; Zeroemissions Carbon Trust, S.A.; Cementos Portland Valderrivas S.A.; International Bank for Reconstruction and Development (IBRD) as Trustee of the Spanish Carbon Fund (SCF).
Host Party	Mexico
Applied methodologies and standardized baselines	ACM0002 Version 14.0.0 – "Grid-connected electricity generation from renewable sources"
Sectoral scopes	1: Energy industries (renewable - / non- renewable sources)
Estimated amount of annual average GHG emission reductions	164,634 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project is a wind power plant located in Mexico, in the southern state of Oaxaca. The project's purpose is renewable electricity generation to be supplied to the Interconnected Mexican National Grid ("IMNG"). The project's installed capacity and estimated yearly average generation is 83.3 MW ("megawatts") and 307,728 MWh[1] ("megawatts hours"), respectively. The project is expected to displace 164,634 tons of carbon dioxide equivalent ("tCO_2e") per year, which will account to 1,152,437 tCO_2e for the second crediting period (7 years), generating the equivalent amount of greenhouse gasses emissions reductions ("ERs"). The annual amount of carbon dioxide equivalent avoided per year has decreased from 192,545 tCO_2e in the first crediting period to 164,634 tCO_2e in the second crediting period, mainly due the introduction in the Mexican energy grid of less pollutant technologies (the CM for the second crediting period is 0.535 tCO_2e/MWh, compared to 0.6257 tCO_2e/MWh for the first crediting period). The project's greenhouse gasses ("GHG") emissions will be negligible, thus there will be no need to monitor leakage and it will not be taken into account when calculating ERs.

La Venta II wind power plant (La Venta II) consists of 98 wind turbine-generator engines (WTGs) each of 0.85 MW capacity, adding up to a total installed capacity of 83.3 MW. The WTGs are distributed in 4 rows approximately 600 meters away from each other. The WTGs are approximately 130 meters away from each other; the height of the WTGs is 44 meters.

The spatial extent of the project boundary is the IMNG. The project is connected to the IMNG through La Venta II substation of the IMNG, which belongs to the *Comisión Federal de Electricidad* ("*CFE*"). The generated electricity is dispatched to the grid and commercialized by CFE, which is the developer operator and owner of the project. The project will have an expected minimum plant operating life of 21 years. The project has obtained all applicable permissions/authorizations required for its construction and operation, and complies with all environmental requirements mandated by *SEMARNAT (*Mexican Environmental authority and Designated National Authority)[2].

The project contributes to sustainable development by:

a) Assisting the *IMNG* to keep thermal plants shut down and use them only as stand-by power generation, when displacing expensive heavy fuel, diesel, coal and gas-fired generation thus reducing CO_2 emissions to the atmosphere by generating energy without GHG emissions[3].
b) Employing local labor in construction and plant management.
c) Contributing to Mexico's fiscal accounts through the payment of taxes[4].
d) Helping the country improves the hydrocarbons trade balance through reduction of oil imports to be used for electricity generation.
e) Spurring Oaxaca State's economy since it consumes materials of Oaxaca such as cement, metals, wood, and construction equipments, among others.
f) Serving as a demonstration project for clean renewable electricity generation in the country, being the first large scale wind power plant in the country to be built and that will supply electricity to the grid.

[1] Source: The sponsor (calculation supported in the project feasibility study).

[2] Environmental requirements for the project's construction and operation mandated by SEMARNAT in order to keep the project's EIA approval, is monitored according to the "Programa de Vigilancia Ambiental", complying with country regulations.

[3] The project's technology is considered load base in the IMNG, thus the project has priority in dispatch and so dispatches all the energy that it produces.

[4] Although the sponsor is a public entity, it pays income taxes.

A.2. Location of project activity

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- **Host Party:** México.
- **Region/State/Province:** Oaxaca State/ Juchitán de Zaragoza Municipality.
- **City/Town/Community:** Mexican Native Community (“Ejido”) La Venta.
- **Physical/Geographical location:** The project will be located in the Southern State of Oaxaca, in the Municipality of Juchitán de Zaragoza, in the Ejido La Venta. The project site is 500 meters North from La Venta locality and 30 km Northeast from Juchitán de Zaragoza City (capital of the Municipality of Juchitán de Zaragoza). Project GPS coordinates are:
    - Latitude: 16.59
    - Longitude: -94.819722

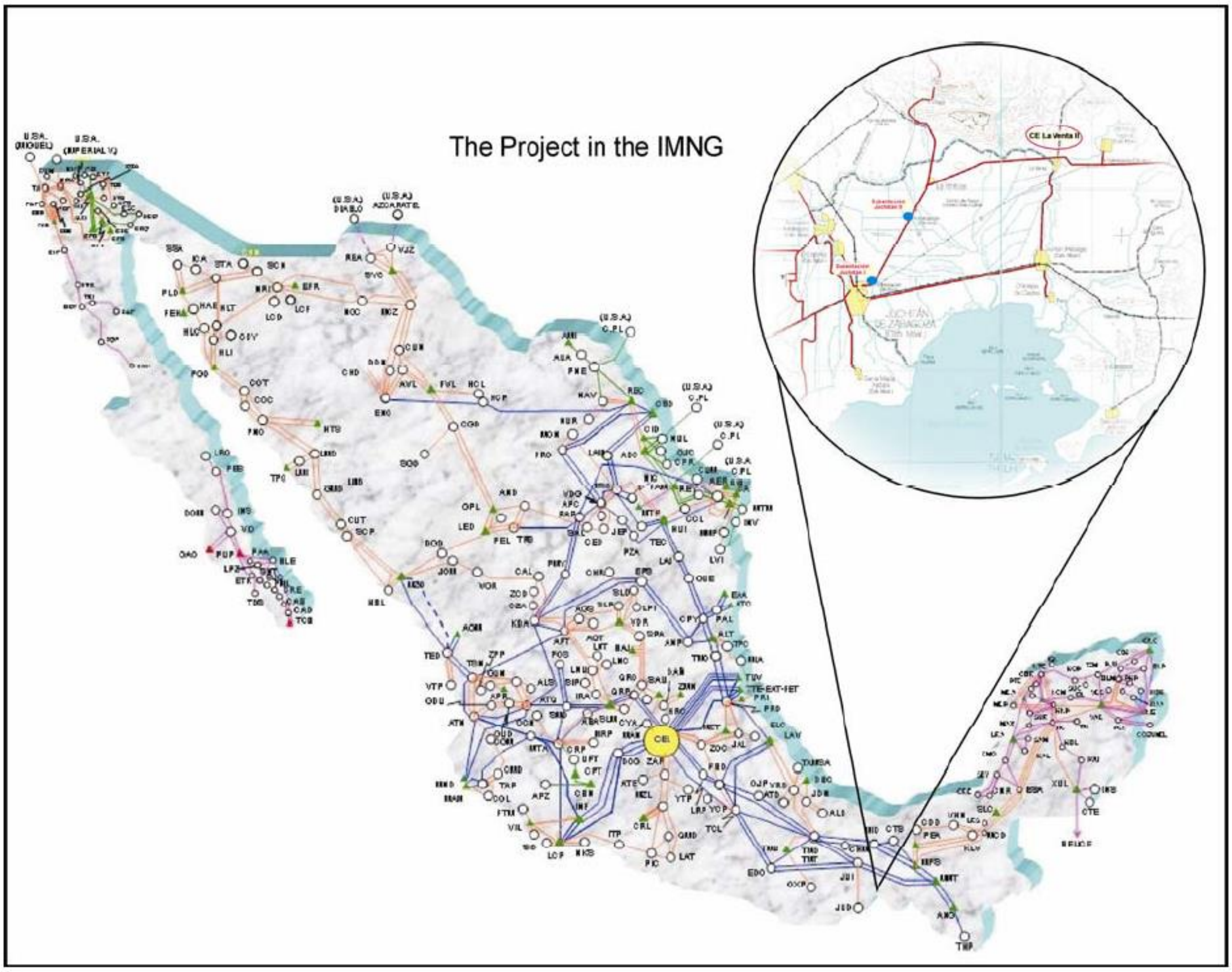

Figure 1 Project Location

A.3. Technologies/measures

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The technology of the project is horizontal axis wind turbines[5]. The project is composed by 98 WTG of 3 blades each (with power control) and an active system for rotor[6] orientation. Under wind high speed, a control system will keep the power at the plant's nominal value. Under wind slow speed, a control system will optimize the energy production, selecting an optimal combination of revolutions and angle of attack[7].

The 98 WTG are each of 0.85 MW capacity, which adds to a total capacity of 83.3 MW. The WTG are distributed in 4 rows approximately 600 meters away from each other. The WTG are approximately 130 meters away from each other; the hub height of the WTG is 44 meters. The WTG are clustered in 5 independent circuits from which the energy is collected. Each WTG counts with an individual transformer to raise the voltage of the energy from 0.6 kV up to 34.5 kV which is the voltage required for its transmission to "La Venta II Substation, in which the main transformer is placed. This main transformer raises the voltage again from 34.5 kV to 230 kV, for its interconnection with the IMNG. The SCADA Control System has been placed in La Venta II Substation and can be accessed remotely from Juchitán's supervisor computer. There are 7 electricity meters located in La Venta II Substation: One for each independent circuit (a total of 5 meters – recording at 34.5 kV) and two for the project's total energy generated (recording at 34.5 kV and at 230 kV). The meters located in La Venta II Substation are of 0.2% precision level and will comply with country regulations.

The project transferred environmentally safe and sound technology and know-how to Mexico by:

- Hiring local labor in all of its implementation phases, including operation.
- Being the first large scale wind power plant in the country to be built and that supplies electricity to the IMNG, this way serving as a technological example for implementing this type of technology in Mexico.
- Diminishing the financial risk for future similar projects.
- Gamesa Eolica e Iberinco ("the contractor") provided training for project personnel. After this training, the sponsor has total responsibility for operation and maintenance of the power plant.

[5] Horizontal axis wind turbines meaning: A "normal" wind turbine design, in which the shaft is parallel to the ground, and the blades are perpendicular to the ground.

[6] Rotor meaning: The blade and hub assembly of a wind generator.

[7] Angle of attack meaning: The angle of relative air flow to the blade chord.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Mexico (host)	Comisión Federal de Electricidad; International Bank for Reconstruction and Development (IBRD) as the Trustee of the Spanish Carbon Fund (SCF)	No
Spain	Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness; AZULIBER 1, S.L.; Comercial De Materiales De Construccion, S.L. (COMAC); Compania Espanola De Petroleos, S.A. (CEPSA); Endesa Generacion, S.A.; E.ON Generacion S.L; Gas Natural SDG, S.A.; Hidroelectrica Del Cantabrico, S.A.; IBERDROLA Generacion S.A.U; Repsol YPF S.A.; Zeroemissions Carbon Trust, S.A.; Cementos Portland Valderrivas S.A.; International Bank for Reconstruction and Development (IBRD) as Trustee of the Spanish Carbon Fund (SCF)	Yes

A.5. Public funding of project activity

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No public funding from an Annex 1 country is involved in this project.

A.6. History of project activity

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Not Applicable.

A.7. Debundling

>>
Not Applicable.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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ACM0002 “Grid-connected electricity generation from renewable sources”, Version 14.0.0

Tools referenced in this methodology:

1. Tool to calculate the emission factor for an electricity system – Version 04.0.0

B.2. Applicability of methodologies and standardized baselines

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The Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002, version 14.0.0) is applicable to the project as it is demonstrated below:

Applicability Conditions in ACM0002 / Version 14.0.0	**Applicability to this project activity**
This methodology is applicable to grid-connected renewable power generation project activities that a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); b) involve a capacity addition; c) involve a retrofit of (an) existing plant(s); or d) involve a replacement of (an) existing plant(s).	The project activity consists on the installation of new wind farm at a site where no renewable power plant was operated prior to the implementation of the project activity. The project activity is hence a greenfield plant.
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is the installation of a wind power plant.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal capacity additions projects which use Option 2: on page 16 to calculate the parameter $EG_{PJ,y}$): 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 does not involve any capacity additions, retrofits or replacements, and hence this requirement is not applicable to the project activity.

In case of hydro power plants one of the following conditions must apply: a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or **c)** 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 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 the following conditions must apply: a) The power density calculated for the entire project activity using equation (5) is greater than 4 W/m^2; b) Multiple reservoirs and hydro power plants are located at the same river and where are designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; c) Water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; d) 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; **e)** Total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	The project activity is not a hydro power plant. Hence this condition is not applicable to the project activity.
The methodology is not applicable to the following: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants; c) Hydro power plants that result in the creation of a new single reservoirs or in the	Project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activity, biomass fired plants or construction of new reservoir or increase in an existing reservoir and hence, applicability is meat.

increase in an existing single reservoirs where the power density of the reservoir is less than 4 W/m^2	
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project is not a retrofit, replacement, or capacity addition; hence, this condition is not applicable to the project activity.

Applicability of the tools:

- **"Tool to Calculate the Emission Factor for an Electricity System" v. 04.0.0** has been applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that supplies electricity to a grid. In this project, the emission factor for the project electricity system has been calculated for grid power plants only (off-grid power plants have not been included).
- **"Tool to Calculate Project or Leakage CO_2 Emissions from Fossil Fuel Combustion"** is not applicable as the project activity does not have project or leakage emissions as no fossil fuel is consumed.
- **"Combined tool to identify the baseline scenario and demonstrate additionality"** is not applicable as the project activity is the installation of a Greenfield facility that provides a product to market where the output could be provided by other existing facilities or new facilities that could be implemented in parallel with the CDM project activity.

B.3. Project boundary, sources and greenhouse gases (GHGs)

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	Source	GHG	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	According to methodology it is a minor emission source and hence is not considered in estimations.
		N_2O	No	According to methodology it is a minor emission source and hence is not considered in estimations.
Project activity	Emissions from La Venta II Wind Project	CO_2	No	Since the proposed project is a renewable wind power project, project emissions are considered zero as per the latest version of methodology ACM0002.
		CH_4	No	Since the proposed project is a renewable wind power project, project emissions are considered zero as per the latest version of methodology ACM0002.
		N_2O	No	Since the proposed project is a renewable wind power project, project emissions are considered zero as per the latest version of methodology ACM0002.

B.4. Establishment and description of baseline scenario

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

Changes required for methodology implementation in 2nd and 3rd crediting periods

At the start of the second and third crediting period the following two issues have to be addressed:

1. Assess the continued validity of the baseline; and
2. Update the baseline.

The validity of the baseline scenario is assessed using the methodological tool *"Assessment of the validity of the original/current baseline and update of the baseline at the renewal of a crediting period"*, Version 03.0.1.

Step 1: Assess the validity of the current baseline for the next crediting period.

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

In assessing the continued validity of the baseline, a change in the relevant national and/or sectoral regulations between two crediting periods has to be examined at the start of the new crediting period. If at the start of the project activity, the project activity was not mandated by regulations, but at the start of the second or third crediting period regulations are in place that enforce the practice or norms or technologies that are used by the project activity, the new regulation (formulated after the registration of the project activity) has to be examined to determine if it applies to existing plants or not. If the new regulation applies to existing CDM project activities,

the baseline has to be reviewed and, if the regulation is binding, the baseline for the project activity should take this into account.

The current baseline is in compliance with México's Electricity Public Service Law ("EPSL"), which is still active. In addition, in November 2008 the Mexican Government passed the renewable energy law, which aims to promote the use of renewable energy sources and clean technology for the electricity generation for purposes other than public electricity. Since the electricity generated by La Venta II project is used only by the public service, the law is not applicable to the project, and thus the project activity complies with all national laws and/or sectoral policies.

Step 1.2: Assess the impact of circumstances:
There have been new power plants which have been built connecting to the national grid which has had an impact on the grid emission factor. The grid emission factor has therefore been updated to reflect the impact of such circumstances.

Also, according to the projection elaborated by SENER within the Electricity Sector Outlook 2013 - 2027 for the electricity generation in Mexico organized per technology type, the use of fossil fuels continues to prevail in the next fifteen years. The productions percentages for 2011 and the forecast for 2026 are shown in table 1 below.

Table 1: Projected changes to electricity mix in Mexico

	2012	2027
Fossil Fuel	71.7%	74.5%
Nuclear	3.0%	1.8%
Geothermal	1.5%	1.2%
Wind power	1.1%	4.1%
Hydropower	21.7%	18.4%
Other Renewable	0.0%	0.0%
Total (MW)	53,114	88,200

Source: SENER "Prospectiva del sector eléctrico 2013-2027. Graph 5.19 p. 152

Due to the fact that similar circumstances prevail as when the project was submitted for registration, the continued validity of the current baseline is plausible.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested:
Not applicable to the current project activity

Step 1.4: Assessment of the validity of the data and parameters:
There have been additional power plants which have been built and added to the relevant grid. The grid emission factor has been updated based on the latest available data from the Ministry of Energy and the corresponding IPCC default values for fuel type, therefore the baseline needs to be updated for the subsequent crediting period and we go to step 2.

Step 2: Update the current baseline and the data and parameters:
The grid emission factor has been updated based on the latest available data from the Ministry of Energy.

Step 2.1: Update the current baseline:
Given that the application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is still valid for the subsequent crediting period, then this baseline can be used for the renewed crediting period.

Therefore, the baseline is affected by two specific factors for this project: a) Grid Emission Factor (GEF) and b) energy generation which is a function of the load factor. From the time of the first crediting period, as explained in Step 1.1 above, there are no other relevant laws or circumstances which have impacted the grid emission factor apart from the business as usual - building of new power plants. These have been captured in an updated GEF.

Moreover, the load factor is maintained similar to the value of the first crediting period, i.e., at 42.17% capacity factor for the 2nd crediting period. The total emission reductions achieved during the first crediting period were lower than the ex-ante calculations due to lower energy production during the monitored period. This was due to temporary issues causing availability problems:

- Variability of the wind speed (i.e. speed less than or greater than recommended operating range)
- Damage suffered by the components of the wind generators.
- Disconnection from the grid by the system operator (CENACE).

As these are temporary issues, the expected generation has been kept at 307,728 MWh per annum.

Therefore it is can be validated that the original baseline is still valid for the project activity.

Step 2.2: Update the data and parameters

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

Accordingly, this step has been implemented and the relevant parameters in the emission factor calculations have been updated. The baseline data used to calculate baseline emissions in the first crediting period used data sets from 2003, 2004 and 2005. This version of the PDD has updated the baseline data using data from 2010, 2011 and 2012. The data used in the updated PDD for the second crediting period represents the latest available data. For details, please see Section B.6.3.

B.5. Demonstration of additionality

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The following steps from the “Tool for the demonstration and assessment of additionality” Version 2 will be completed below[8].

STEP 0 – Preliminary screening based on the starting date of the project activity
STEP 1 – Identification of alternatives to the project activity consistent with current laws and regulations
STEP 2 – Investment Analysis
STEP 3 – Barrier Analysis
STEP 4 – Common Practice Analysis
STEP 5 – Impact of CDM Registration

[8] Analysis undertaken for registration of project for first crediting period.

STEP 0 – Preliminary screening based on the starting date of the project activity
Project participants do not wish to have the crediting period starting prior to the registration of the project. Hence, step 0 is waived for the project.

STEP 1 - Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:
In addition to the alternative of implementing the proposed project activity not undertaken as a CDM project activity, there are two identified realistic and credible alternatives available to the project participants that provide outputs or services comparable with the proposed CDM project activity:

1. Implement the project as a wind power plant development without CDM assistance[9].
2. Implement the project as a natural gas combined cycle power plant[10].
3. Do not implement any power generation project.

Sub-step 1b. Enforcement of applicable laws and regulations
The identified alternatives are in compliance with all applicable legal and regulatory requirements. The 3 identified alternatives comply with México's Electricity Public Service Law ("EPSL"). Articles 1, 2, 3 and 4 of México's EPSL confirm that the alternatives are a real possibility available to the project developer, as follow:

- Article 1 of México's EPSL confirms that it is the exclusive right of the Mexican nation to generate, conduct, transform, distribute, and provide electricity as a public service. Therefore, there will not be granted concessions to privates and the nation will make good use of the goods and natural resources that are required to perform this right through the CFE.
- Article 2 of México's EPSL confirms that every act related with the electricity public service is of public character.
- Article 3 of México's EPSL confirms that the following are not public services:
    - Electricity generation for self-consumption, cogeneration or small production
    - Electricity generation developed by private producers to be sold to the CFE
    - Electricity generation to be exported derived from cogeneration, private production and small production.
    - Electricity imported from persons exclusively for self-consumption.
    - Electricity generation for emergencies because of electricity public service interruptions.
- Article 4 of México's EPSL confirms that electricity public service involved the following:
    - The planning of the Mexican National Grid.
    - The generation, conduction, transformation, distribution and selling of electricity.
    - The developing of all constructions, installations and works that require planning, execution, operation and maintenance of the national electric system.

[9] Defining the application area of the alternatives as the State of Oaxaca, out of the renewable energy technologies that could be used in the zone: hydro, solar and nuclear (geothermal plants will not be available in the zone): none of them can be considered as "likely": A hydro's output would have been of less quality than the project's because as Mexico's rainy season only last 2 months (September and October) the load factor of a hydro would be around 30% against that for the project which is 43%; solar technology is very sensitive to strong winds which are abundant in Oaxaca and this technology is inexistent in the IMNG; and nuclear is not a widely spread technology (there is only one nuclear power plant of 1,365 MW in the IMNG which is much larger than the project).

[10] As this technology presents the highest net efficiency conversion ("NEC") among fossil fuel-fired power plant technologies available in the country, it ousts other types of fossil fuel –fired power plant technologies that are most expensive to operate.

Because the 3 alternatives identified are in compliance with all applicable laws and regulations and are also realistic and credible alternatives available to the project participants, the project is additional under step 1.

STEP 2 – Investment Analysis

This analysis shows why the proposed project activity is economically and financially less attractive than other alternatives identified, without the revenue from the sale of CERs. To conduct the investment analysis the following four sub-steps will be taken:

Sub-step 2a. Determine an appropriate analysis method

The CDM project activity generates financial and economic benefits other than CDM related income, therefore the Cost Analysis (Option I) cannot be taken. Out of the comparison analysis (Option II) and the benchmark analysis (Option III), the comparison analysis (Option II) was chosen.

Sub-step 2b - Option II. Apply the comparison analysis

The identified financial indicator is the: The Levelized Cost of Energy Production ($/MWh).

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

The formula for the calculation of the Levelized Cost of Energy is the following:

Cost per MWh = [Investment x CRF + O&M Annual] /Annual Generation (MWh)

Where:

Investment =	Total investment in the project ($).
CRF =	Capital recovery factor equals the equivalent annual cost of the capital investment/capital investment.
CRF =	Annuity of Investment Cost at 12% discount rate and years of annual payments equal to years of operating life[11] / Investment Cost.
O&M =	Annualized operation and maintenance costs. It does neither include financial costs nor income tax[12].
Generation =	Annual average generation in MWh.

Cost per MWh ($/MWh) = [(Equivalent Annual Investment Cost + Annual O&M Cost) ($)]/Annual Generation (MWh)

[11] And zero ending cash balance.

[12] Since the latter will depend on an unknown variable which is the project net income.

Assumptions and Variables:

Assumptions	
Discount Rate - Source: The Sponsor	12%
Exchange Rate - Source: Official Newspaper (Jan 17, 2006)	10.7

The Project (83.3MW - 21 years) Variables:	
Installed Capacity (MW):	83.3
Annual Generation	307,728
Cost per MWh - La Venta II ($) - Source: The Sponsor	1.030
Cost per MW - La Venta II ($) - Source: The Sponsor	36,314.96
Initial Investment ($) - Source: The Sponsor	103,711,577.4

Gas Combined Cycle Plant (83.6MW - 30 years) Variables:	
Installed Capacity (MW):	83.60
Cost per MWh - CC Gas ($) - Source: COPAR	40.39
Fuel ($/MWh) - Taken from COPAR doc. Page A4 Table A1	39.21
Cost per MW - CC Gas ($) - Source: COPAR page A7	26,786.38
Load Factor - Source: COPAR Page 1.8 Table 1.2	80%
Generation (MWh)	585,869
Initial Investment ($) - Source: Gas Turbine World 2004-05 Handbook Page 38	48,989,600
NEC plant 291 MW (from COPAR doc. Page 1.8 Table 1.2)	50.36%
Income for Installed Capacity (MW-year)	125,249

Source: The stated ones in table above; mainly COPAR 2005, Gas Turbine World 2004-05 Handbook, the sponsor.

The gas CC plant's levelized cost has been subtracted in the income for capacity that the gas CC plant receives but the project does not receive, to make the comparison possible.

Levelized Cost for the project (83.3 MW – 21 years) and for a combined cycle gas-fired power plant (83.6 MW – 30 years):

The Project (83.3 MW) - 21 years	
Equivalent Annual Investment Cost	**13,714,828.5**
Annual O&M Cost	**3,341,996.01**
Generation	**307,728.00**
Levelized Cost	**55.43**

CC Gas Power Plant (83.6 MW) - 30 years	
Equivalent Annual Investment Cost	**6,081,748**
Annual O&M Cost	**15,433,004**
Generation	**585,869**
Levelized Cost	**36.72**

Source: World Bank calculation using assumptions and variables stated above.

Since the project has a higher cost indicator than the alternative (55.43$/MWh > 36.72$/MWh), the project cannot be considered the most financially attractive alternative.

Sub-step 2d. Sensitivity Analysis

The following variables will undergo a sensitivity analysis to prove the robustness of the conclusion given in sub-step 2c.

The Project:

a) Load Factor (+-20%)

b) The Initial Investment Cost (+-20%)

The Project	Load Factor*80%	Load Factor*100%	Load Factor*120%
Initial Investment *120%	80.17	64.34	53.79
Initial Investment *100%	69.03	55.43	46.36
Initial Investment *80%	57.89	46.51	38.93

Source: World Bank calculation.

Both the project's initial investment ($103,711,577) and the project's load factor (42.17%) are multiplied by 80%, 100%, 20%, respectively; and it is shown that at all scenarios the project is still more expensive than the alternative (36.72$/MWh). By analysing the comparative charts above, it can be concluded that the project is additional at all load factors and at all initial investment costs run in the sensitivity analysis.
Hence, since the project financially unattractiveness concluded in Sub-Step2c. has proven to be robust to reasonable variations in the critical assumption, the project is unlikely to be the most financially attractive alternative. This means the project is additional under step 2.

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

Wind power plants projects face barriers that prevent them from being carried out if they are not registered as CDM activities. In particular, the project faced three main barriers: investment barrier, technological barriers and barriers due to prevailing practice.

a) Technological barrier: The project will be the first large scale wind power plant built to be operating in Mexico. Basically the project will confirm the vast research done on strong wind potential on this region of Oaxaca – this research started some years ago. This research has been enforced by the project developer, who built La Venta I (1.575 MW) small wind power plant demonstrative project in 1994, which is as of today the largest wind power plant in operation in the country and the only one in the IMNG[13].
b) Barrier due to prevailing practice: Mexico is rich in oil and gas reserves; this clearly explains why the prevailing practice in Mexico is fossil fuel-fired electricity generation as of today, and this path is envisaged to continue, as the country still has a vast gas potential unused for electricity generation, which is to be further explored in the coming years.

National policies are currently fostering the national use of combined cycle plants as can be seen in the following table:

Programming of Installed Capacity Requirements for the IMNG (2006-2013)

	2006	2007	2008	2009	2010	2011	2012	2013	Total (MW)	Total (%)
Gas Combined Cycle	2,269	1,168	134	1,517	1,124	1,520	1,586	904	10,222	62%
Renewable	85	754	101	101	126	101	1,001	-	2,269	14%
Coal					700				700	4%
Not Determined							1,248	1,992	3,240	20%
	2,354	1,922	235	1,618	1,950	1,621	3,835	2,896	16,431	100%

Source: World Bank with data provided by CFE – Programming Area.

The document Energy National Program 2001-2006 page 26 affirms that Mexico has the 9th place in oil reserves and the 9th place in natural gas reserves and that the fiscal income strongly

[13] There is another wind power plant existent in the country named Wind Power Plant Guerrero Negro of 0.6 MW but this plant does not belong to the IMNG and is even smaller that La Venta I demonstrative project. Guerrero Negro is located in Baja California Sur.

depends on the income generated by the oil national industry. In page 76[14] of this document it is stated that only by a growth in the national fossil fuel industry higher than the growth in the gross domestic product, Mexico could avoid the dependency on fuel provisions from abroad. In this sense, the government has a special interest in promoting the fossil fuel potential of the country because it is the directly impacted by the performance of this industry. In page 81[15] of this document it is stated an especially favorable position towards investment in the natural gas industry, among any other source to generate energy.

The large participation of fossil fuel technology in the electricity generation matrix of the IMNG can be seen in the following table (IMNG generation average 2005-2003):

Tech. Part	Tecnology	MWh 2005-2003
15%	Coal	29,664,595
31%	Natural Gas Combined Cycle	60,513,582
0%	Wind	4,957
1%	Geothermal	1,503,031
12%	Hydro	24,146,988
5%	Nuclear	10,166,783
5%	Natural Gas Symple Cycle	9,651,782
1%	Diesel	1,783,210
30%	Residual Fuel Oil	58,554,996
	Total	195,989,924

Source: World Bank using data from CENACE.

As shown in the table above, the renewable energy share in the IMNG is only 18%, and the wind source technology is almost inexistent.

Sub-step 3b. Show how the identified barriers would not prevent the implementation of at least one of the alternatives:
The two identified barriers that the project faced will not prevent the alternative: “implement the project as a natural gas-fired power plant” (alternative 2) and “not implementing any power generation project” (alternative 3).

(b) Technological barrier (Barrier 2)
(b.1.) Does not prevent Alternative 2: There is vast experience in Natural gas–fired combined cycle power plant (Alternative 2) and this technology has a higher market share in the country.
(b.2) Does not prevent Alternative 3: Technological complexities would not prevent inactivity or “not implementing any power generation project” but on the contrary it would foster this alternative for the sponsor.

(c) Barrier due to prevailing practice (Barrier 3):
(c.1.) Does not prevent Alternative 2: In fact natural gas-fired combined cycle power plants (Alternative 2) are foreseen to be the most attractive technology to be used in the IMNG in the coming years, and fossil fuel fired power plant in general is the widely spread technology existent in the IMNG already.
(c.2) Does not prevent Alternative 3: There are no penalties to “not investing” (Alternative 3), thus this alternative does not face any barrier.

Since the alternatives are affected less strongly/not prevented by the identified barriers that the project has to faced, they are viable alternatives and should not be eliminated from consideration. Two barriers have been identified that would prevent the implementation of this type of proposed project activity (wind power plants) but did not prevent/affect less strongly at least one of the alternatives identified; consequently, the project is additional under Step 3.

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[14] Under Objective 1 of the Energy Sector Program 2001-2006: Secure a sufficient provision of energy at international standards and competitive prices counting with energy companies: public and private with world class.
[15] Under Objective 3 of the Energy Sector Program 2001-2006: Promote the participation of Mexican enterprises in energy infrastructure projects.

STEP 4. Common Practice Analysis:

Sub-step 4a. Analyze other activities similar to the proposed project activity[16]

The only two wind power plants existing in the country are grid-connected La Venta I (1.575 MW) and off-grid Guerrero Negro (0.6 MW). Fossil fuel technology in the country is widely-spread, and combined cycle natural gas fired power plants are the preferable choice for the future, as it presents the highest net efficiency conversion among fossil fuel technologies available in the country.

Sub-step 4b. Discuss any similar options that are occurring[17]

No similar activities (wind power plants) are occurring without carbon finance help. The project will be the first large scale wind power plant to be built and to be operating in the IMNG.

Under Sub-Steps 4a and 4b, the claim that the proposed activity is common practice is not called into question. Thus, the project is not common practice but a very unusual occurrence that endangered its existence without attaining CDM Status. Meaning the project is additional under Step 4.

STEP 5. Impact of CDM Registration

CDM registration will alleviate the financial hurdles of the project (Step 2. Investment analysis) since it would provide risk-free revenue[18], attached to the project's annual generation. The CERs revenues were used to offset the project's investment costs by about 10.2%, decreasing the project's levelized cost by about 8.2%. The sponsor considered the impact of CDM revenues very important for the project's financial viability.

As of today[19], taking a credible CERs price of \$7.23 per tCO_2e[20] - CERs revenues could improve the project's financial gap by \$4.52/MWh[21] or by 24%.

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[16] Analysis avoids CDM projects.

[17] Analysis avoids CDM projects.

[18] Except for CDM risk.

[19] Additionality analysis undertaken for registration of project in first crediting period

[20] Reference: State and Trends of Carbon Market 2006.

[21] (55.43-36.72)-(50.90-36.72)=\$4.52/MWh.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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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.14.0.0 the emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$ (1)

Where:
ER_y = Emissions reductions in year y (tCO_2e)
BE_y = Baseline emissions in year y (tCO_2e)
PE_y = Project emissions in year y (tCO_2e)

Project emissions
For wind power generation project activities, PE_y=0.

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:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ (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/yr)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

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

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

$EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid. It shall be determined as a difference between (i) quantity of electricity supplied by the project plant/unit to the grid and quantity of electricity delivered to the project plant/unit from the grid.

For the calculation of the emission factor, which will yield the total equivalent CO_2 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” – Version 04.0.0.

The steps to following for calculate emission factor are:

1. Identify the relevant electricity system.
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 system.

The National Interconnected System (SIN) together with the two isolated grid (Baja California and Baja California Sur) formed the Mexican National Electricity System (SEN). However, only the SIN is the relevant electricity system for this project activity. 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:

Table 2: Imports and Exports to Mexican Grid

	2010	**2011**	**2012**
Exports (MWh)	518,000	692,000	474,000
Imports (MWh)	176,000	335,000	1,825,000
Net Exchange (MWh)	**342,000**	**357,000**	**-1,351,000**

Source: SENER. “Prospectiva del sector eléctrico 2013-2027. Chart 3.17 p. 105”

For imports from an on-line electricity system located in another country, the emission factor is 0 tCO_2/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.

For this project Option I is chosen and only grid power plants are included in the calculation.

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 CO_2 emissions in Mexico. The simple OM method has been selected from the four options proposed in the “Tool to calculate the emission factor for an electricity system”. Dispatch data analysis cannot be applied for this project due to the lack of available published data. 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 both the average of the five most recent years and in the long-term average for hydroelectricity production, as demonstrated in Table 3 below.

Table 3: Share of power generation by technology in Mexican Grid

	2008	**2009**	**2010**	**2011**	**2012**
	Power share	**Power share**	**Power share**	**Power share**	**Power share**
Dual	2.91%	5.22%	4.39%	4.46%	4.28%
Combined cycle	45.65%	48.38%	47.77%	46.30%	45.55%
Gas turbine and internal combustion	1.71%	2.11%	1.91%	2.03%	2.83%
Coal	7.53%	7.17%	8.83%	8.49%	8.68%
Nuclear	4.15%	4.46%	2.42%	3.89%	3.35%
Standard Thermoelectric	18.34%	18.31%	16.73%	18.47%	20.59%
Renewables (Hydro, Geo, Wind …)	19.71%	14.35%	17.94%	16.36%	14.71%
Total Generation (MWh)	100.00%	100%	100.00%	100.00%	100.00%
Total Generation low-cost/must-run (MWh)	23.86%	18.81%	20.37%	20.26%	18.06%
Total Generation non including low-cost/must-run (MWh)	76.14%	81.19%	79.63%	79.74%	81.94%

Source: "Prospectiva del sector eléctrico 2013-2027. Chart 3.18. p. 106"

In calculating the simple OM, the ex-ante option of a 3-year generation-weighted average is chosen, and is based on the most recent data available from the Ministry of Energy. Under the ex-ante option, 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 the calculation, data from 2010, 2011 and 2012 is chosen as the data for these years are the most recent available.

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 (tCO_2/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:
    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.

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

(4)

Where:

$EF_{grid,OM,simple,y}$ = Simple operating margin CO2 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 2010, 2011 and 2012 (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 Prospective 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-ante and as follows:

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

(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 (GWh)
$EF_{EL,m,y}$ = 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

$EF_{grid,BM,y}$ was calculated according to the “Tool to calculate the emission factor of an electricity system” version 04.0.0. 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 (SET5-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 ($AEG_{SET-\geq 20\%}$, in MWh)-

c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET_{sample}).

In 2012 the set of five power units that started to supply electricity to the grid most recently, generated a total of 3,514,495 MWh (1.48% of the total generation of the project electricity system); and the set of power plants that started to supply electricity to the grid most recently and comprise 20% of the annual electricity generation of the project electricity system generated a total of 51,128,118 MWh. Therefore, SET≥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.

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 calculated ex-ante during the second crediting period.

To calculate the CO_2 emission factor ($EF_{EL,m,y}$) of power units *m* in year *y* (tCO_2/MWh), Option A2 was used, as data on electricity generation and the fuel types and the efficiency of the power unit are available. Data on fuel consumption per power units are not available. The following equation is applied:

$$EF_{EL,m,y} = \frac{EF_{co2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where,

$EF_{EL,m,y}$ =	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,iy}$ =	Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/TJ) obtained from IPCC
$\eta_{m,y}$ =	Average net efficiency of power plant *m* in year y in (ratio) obtained from "Prospectiva del Sector Eléctrico 2012-2026"
m =	All power units serving the grid in year y except low-cost/must/run power units
y =	The relevant year as per the data vintage chosen in Step 3

The set of emission factors of power unit *m* calculated ex-ante will be reviewed at the beginning of the next crediting period based on the official and publicly available data.

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.

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

The combined margin emissions factor is calculated as follows:

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

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 the BM and OM, the information used can be found in the “Prospectiva del sector eléctrico" 2013-2027; 2012-2026; 2010-2025; 2009-2024; 2008-2017; 2007-2016, prepared by the Secretaría de energía[22]. Information on net electricity generation in 2012 was taken from CFE report named “Generation 2012” (which has been provided to the DOE).

Leakage
No leakage emissions are considered. The main emissions 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 emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

Emission reductions
Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (7)$$

Where:
ER_y = Emission reductions in year y (t CO_2e/yr)
BE_y = Baseline emissions in year y (t CO_2/yr)
PE_y = Project emissions in year y (t CO_2e/yr)

[22] These documents can be accessed at http://www.energia.gob.mx/portal/Default.aspx?id=1433.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”
Source of data	Revised 2006 IPCC and Electricity Sector Outlooks publications: 2013-2027, 2012-2026, 2010-2025, 2009-2016, 2008-2017, 2007-2016. [23]. Information on net electricity generation in 2012 was taken from CFE report named “Generation 2012”
Value(s) applied	0.535
Choice of data or measurement methods and procedures	Calculated according to the “Tool to calculate the emission factor for an electricity system” Version 04.0.0.
Purpose of data	Calculation of baseline emissions.
Additional comment	This value is fixed for the crediting period.

Data/Parameter	$NCV_{i,y}$
Data unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	SENER, México, National Energy Balance 2012[24], Chart 38, page 95
Value(s) applied	Fuel oil: 39.78 GJ/m^3 Natural gas: 0.040 GJ/m^3 Diesel: 35.54 GJ/m^3 Coal (national): 19.43 GJ/Ton
Choice of data or measurement methods and procedures	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).
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{CO2,i,y}$
Data 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.

[23] These documents can be accessed at http://www.energia.gob.mx/portal/Default.aspx?id=1433.

[24] Document available at: <http://www.sener.gob.mx/res/PE_y_DT/pub/2012/Balance%20Nacional%20de%20Energia%202012%20(Vf).pdf >

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 04.0.0.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	EG_y
Data unit	MWh
Description	Net electricity generated in the project electricity system in year y
Source of data	Electricity Sector Outlooks: "Prospectiva del sector eléctrico 2013-2027. Chart 3.18. p. 106".
Value(s) applied	193,312,000 in year 2010 206,994,000 in year 2011 216,417,000 in year 2012
Choice of data or measurement methods and procedures	As indicated in the "Tool to calculate the emission factor for an electricity system" Version 04.0.0.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EG_{m,y}$
Data unit	MWh
Description	Net electricity generated by power plant m in year y
Source of data	CFE report "Generation 2012"
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 04.0.0.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$n_{m,y}$
Data unit	%
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	"Prospectiva del Sector Eléctrico 2012-2026" Chart 63, page 203,
Value(s) applied	
Choice of data or measurement methods and procedures	Internal Combustion: 44.25% Combined Cycle: 51.53% Gas Turbine: 39.25%
Purpose of data	Calculation of baseline emissions

Additional comment	-

Data/Parameter	$FC_{i,y}$
Data unit	Mass or volume
Description	Amount of fuel type i consumed in the project electricity system in year y
Source of data	Electricity Sector Outlooks: "Prospectiva del sector electrico 2012-2026 & 2013-2027"
Value(s) applied	Values provided in Appendix 4
Choice of data or measurement methods and procedures	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).
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

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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 (2010, 2011 and 2012) using the following equation:

(7)

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

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 2010 is 0.577 tCO_2/MWh (see details in Appendix 4).
- The Operating Margin emission factor calculation for 2011 is 0.581 tCO_2/MWh (see details in Appendix 4).
- The Operating Margin emission factor calculation for 2012 is 0.595 tCO_2/MWh (see details in Appendix 4).

The 3-year weighted average Operating Margin is 0.585 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 2013-2027, 2012–2026, 2010-2025, 2009–2024, 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) for the most recent year.

Generation data of the most recently built power plants has been provided by the Electricity Federal Commission (CFE).

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:

1) Order all the plants that were most recently commissioned according to the following criteria:
    a) Year of commissioning, starting with the most recent year,
    b) Plants with same year of commissioning by carbon intensity (emission factor per unit of electricity produced), starting with the lowest carbon intensity,
    c) 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.
2) 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.
3) 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).
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:

Table 4: Build Margin Plants[25]

Name	Effective Capacity (MW)	Technology	Net Generation (MWh) 2012	Accumulated Generation (MWh)
2012				
Zumpimito	6	HID	18,073	18,073
Manzanillo I	157x3	TG	3,408,710	3,426,783
Tres Virgenes	1	FV	1,361	3,428,144
La Venta III	102	Wind	84,225	3,512,369
Oaxaca I - CDM Project	102	Wind	-	-
Oaxaca II - CDM Project	102	Wind	-	-
Oaxaca III - CDM Project	102	Wind	-	-
Oaxaca IV - CDM Project	102	Wind	-	-
2011				
Yuumil iik	0	Wind	2,126	3,514,495
2009				
Iztapalapa	-	TG	214,030	3,728,525
Coapa	-	TG	163,321	3,891,846
Santa Cruz	-	TG	124,164	4,016,010
Magdalena	-	TG	197,865	4,213,875
San Lorenzo Potencia	382	CC	2,196,077	6,409,952
2008				
Humeros	40	GEO	314,222	6,724,174
Ciudad del Carmen	16	TG	20,624	6,744,798
2007				
La Venta II - CDM Project	40	Wind	-	-
El Cajón (Leonardo Rodríguez Alcaine)	750	HID	335,122	7,079,920
Tamazunchale (PIE)	1,135	CC	7,236,398	14,316,318
Río Bravo II (Emilio Portes Gil)	495	CC	3,306,704	17,623,022
Río Bravo III (Emilio Portes Gil)	495	CC	3,746,107	21,369,129
Río Bravo IV (Emilio Portes Gil)	500	CC	3,321,153	24,690,282
Ecatepec (LFC)	0	TG	109,340	24,799,622
Remedios (LFC)	0	TG	7,819	24,807,441
Victoria (LFC)	0	TG	111,701	24,919,142
Villa de Flores (LFC)	0	TG	168,810	25,087,952
Cuautitlán (LFC)	0	TG	124,641	25,212,593
Coyotepec (LFC)	0	TG	324,057	25,536,650
Vallejo (LFC)	0	TG	113,958	25,650,608
Holbox	0	CI	6,772	25,657,380
2006				
Tuxpan V (PIE)	495	CC	2,842,973	28,500,353
Valladolid III (PIE)	525	CC	2,158,468	30,658,821
Altamira V (PIE)	1,121	CC	6,849,628	37,508,449
Chihuahua II (El Encino)	619	CC	4,473,150	41,981,599
Atenco (LFC)	-	TG	114,571	42,096,170
2005				
Ixtaczoquitlán	0	HID	12,577	42,108,747
Botello	0	HID	69,587	42,178,334
Hermosillo	250	CC	1,577,703	43,756,037
Rio Bravo IV	500	CC	3,321,153	47,077,190
La Laguna II	498	CC	4,050,928	51,128,118

[25] Source: SENER." "Prospectiva del sector eléctrico" 2013-2027, Chart 3.6, page 6; "Prospectiva del sector eléctrico" 2012-2026 Chart 6, page 65; 2010-2025 Chart 17 p.103; "Prospectiva del sector eléctrico 2009-2024 Chart 18 p.96; Prospectiva del sector eléctrico 2008-2017 Chart 19 p.101; Prospectiva del sector eléctrico 2007-2016 Chart 19 p.77; Prospectiva del sector eléctrico 2006-2015 Chart 13 p.57 and Prospectiva del sector eléctrico 2005-2014 Chart 14 p.51. Abbreviations: Hydro: Hydropower plant; Geo: Geothermal plant, CC: Combined cycle plant, fuelled with natural gas, GT: Gas turbine, fuelled with natural gas. IC: Internal combustion. Build Margin plants for 2012 were obtained from the evidence "Generacion 2012" (provided to the DOE)

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

Table 5. Technical data of typical fossil power plants of the types installed in the last years. Best-in-class values have been selected.

Technology	Efficiency (%)
Gas Turbine	39.25
Internal Combustion	44.25
Combined Cycle	51.53

Source: SENER. "Prospectiva del sector eléctrico 2012-2026 Chart 63 p.203"

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 net generation for the power plants in 2012: 236,689,000 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 51.53% will be used, 39.25% for gas turbines and 44.25% 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: 0.385 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} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature).

Therefore, the ex-ante baseline emission factor will be: 0.75*0.585 + 0.25* 0.385 = 0.535 tCO_2/MWh

This baseline emission factor will be fixed for the crediting period.

BE_y (tCO_2e) = EG_y (MWh) x $EF_{grid,CM,y}$ (tCO_2e/MWh)
= 307,728 x 0.535
= 164,634 tCO_2e

Project emissions
As described in section B.6.1., Project emissions, PE_y is equal to zero.

Leakage
As described in Section B.6.1 leakage is not applicable under this methodology.

Emission reductions
ER_y = BE_y – PE_y - LE_y
= 164,634 – 0 – 0
= 164,634 tCO_2e

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)
2014 (July – Dec)	81,189	0	0	81,189
2015	164,634	0	0	164,634
2016	164,634	0	0	164,634
2017	164,634	0	0	164,634
2018	164,634	0	0	164,634
2019	164,634	0	0	164,634
2020	164,634	0	0	164,634
2021 (Jan – June)	83,444	0	0	83,444
Total	1,152,437			1,152,437
Total number of crediting years	7			
Annual average over the crediting period	164,634	0	0	164,634

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Bi-directional electricity meters
Value(s) applied	307,728
Measurement methods and procedures	The metering will be properly calibrated by CFE at least once every two years. Calculated from energy exported by the project to the grid and energy imported by the project from the grid, directly obtained from the metering equipment. Therefore, according to methodology ACM0002 the following parameters are measured: i) The quantity of electricity supplied by the project plant to the grid. ii) The quantity of electricity delivered to the project plant from the grid.
Monitoring frequency	Continuous measurement and monthly recording.
QA/QC procedures	During the second crediting period, all measurements will continue to be conducted with calibrated measurement equipment according to relevant industry/sectoral standards. CFE owns the main billing meter and as such will be the entity maintaining, testing and calibrating it. The electricity meters have an accuracy class of 0.2 as required by the CFE official procedure “Procedimiento para la Elaboración del Balance de Energía Eléctrica”.Calibration will be conducted at least once every two years. Since there are no receipts of sales of the energy generated by La Venta II, measured electricity will be crosschecked with data from “Cédula de Registro de Lecturas Mensual” (Official Monthly Registry Agreement), which is the official document signed by CFE Transmission and Generation Areas every month to conciliate the energy provided by the plant to the national grid which is equivalent to a sales receipt for the energy delivered by the plant.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

B.7.2. Sampling plan

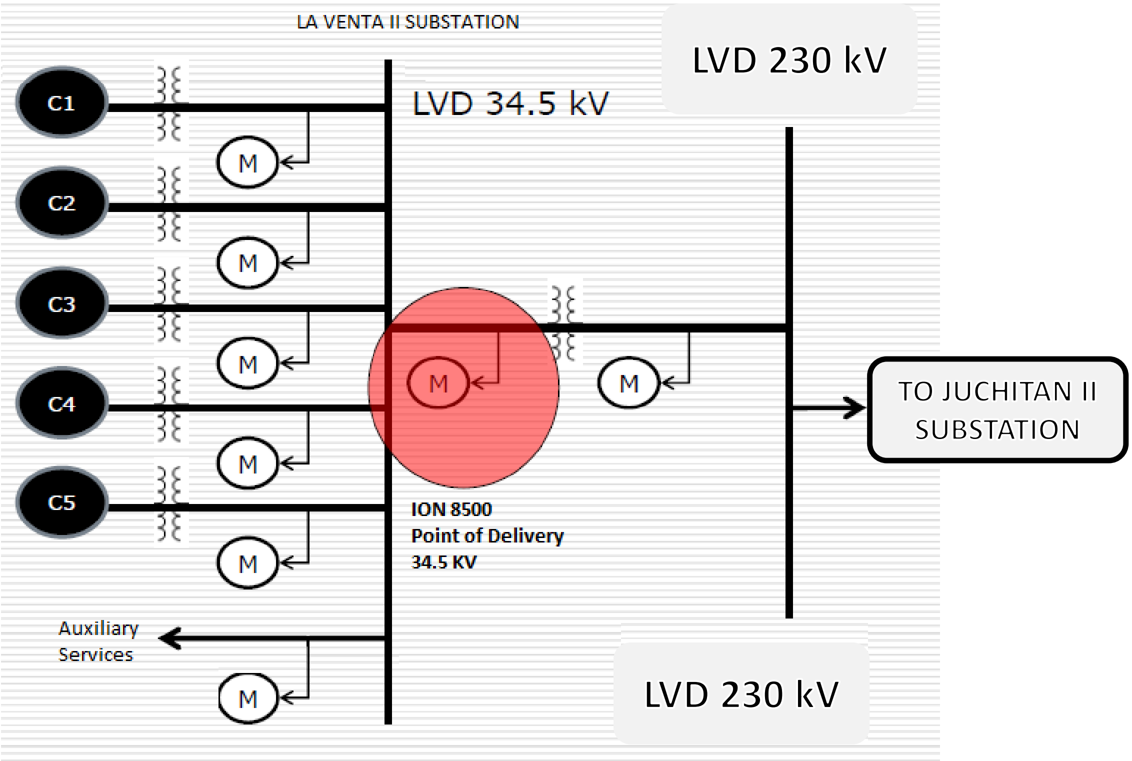
>>
N/A

B.7.3. Other elements of monitoring plan

>>
In 2014, the energy reform entered into force in Mexico with different changes. The law of the Electricity Industry (LIE), established the creation of a wholesale electricity market (MEM) and indicated that CENACE must be an independent entity to operate and monitor the market. In 2016, the MEM started to operate and the legal separation of CFE into subsidiaries was stablished as follows: the CFE Generation was created with six independent subsidiaries, each of them with a group of power plants assigned. As a consequence, the CFE Generation and CENACE have to interact in the MEM using bilateral transactions for the energy generated. La Venta II project started operations in 2007, which means it was fully operational when the MEM was enforced in 2014. Therefore, since la Venta II project started operations before MEM´s enforcement, it did not

affect the monitoring system of the project activity. Specifically, the meter (ION 8500) indicated in the PDD as the point of delivery at 34.5 kV, is the same metering point before and after the appearance of the MEM. Moreover, the consequences of the MEM creation only changed the administrative roles of La Venta II (as a new generator in the market) related to CENACE (the system operator). At the time of writing, CENACE's measurement system is still in operation but it is being updated and adapted to the new regulations of the electric market. As far as La Venta II is concerned, the hourly measurements of the generated electricity are still recorded by CFE, although CENACE is not the sole provider of La Venta II's generation data anymore as occurred before the Post-Registration Change.

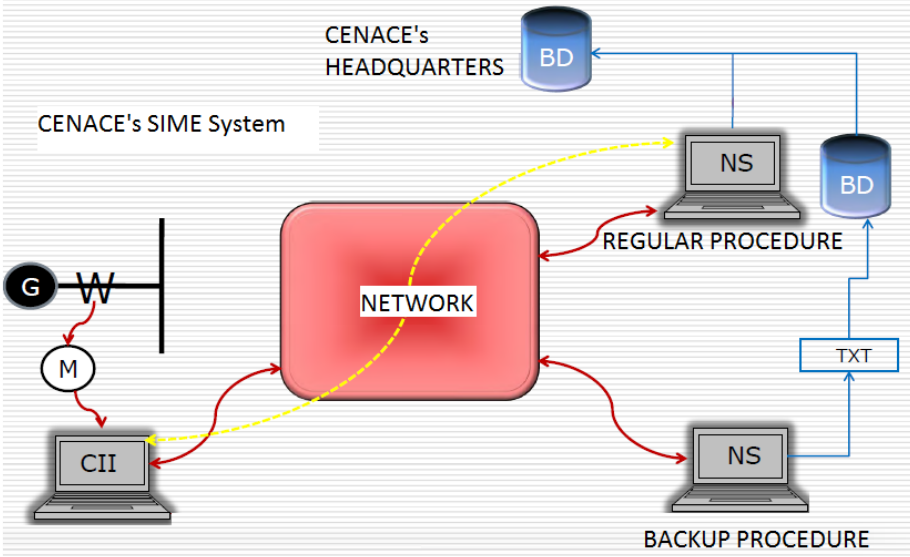
Figure 2. One line diagram and monitoring point



CENACE's measurement system for the electricity delivered by La Venta II is named Sistema Integral de Medicion (SIME, Integral Measurement System). This is a very reliable system that uses the communication Protocol DNP 3.0. The hourly measurements are stored in a concentrator named Concentrador de Informacion de Instalacion (CII), placed at La Venta II substation. This concentrator also sends the hourly generation information to a regional concentrator named Nodo Secundario (NS), placed in CENACE's Area de Control Oriental in Puebla (CENACE's control office for the western area of Mexico, several hundred kilometers away). Three times per day NS extracts from its local database the hourly generation of La Venta II and stores the information in a file named Hoja de Marcha. The Area de Control Oriental sends the information to CENACE headquarters in Mexico City, where it is stored in a file named Balance Diario de Energía (BD, daily balance).

In case of a transmission failure of the files to CENACE, there is a backup procedure to transfer the data in a text format. All servers at CENACE are protected through firewalls and antivirus software to prevent attacks from external sources.

Figure 3. CENACE's Measurement System (SIME)



The electricity meter is subjected to regular maintenance and testing regime, which includes:

- Daily monitoring by Internet, and in real time, of the power, electric tension and other variables;
- Processing per month the historical record of the generation measured by the meter;
- A monthly energy balance per installation;
- Calibration at least once every two years;
- Cleaning of the meter and turning of the screws further if they needed to.

With these checks it is possible to detect any errors that the meters may be presenting.

All monitored data will be archived for at least two years after the end of the crediting period of the project.

Data Crosschecking

According to CFE, there are no receipts of sales of the energy generated by La Venta II delivered to the next recipient of this energy: CFE Transmission Area. Thus, receipt of sales cannot be used for cross-checking of La Venta's II generation.

Instead, CFE Transmission and Generation Areas conciliate every month the energy delivered by La Venta II at the official point of delivery at 34.5 kV. This conciliation consists of an agreement for the energy delivered from Generation Area to Transmission Area. Every month, both parties sign an official internal document named "Cédula de Registro de Lecturas Mensual" that specifies the amount of electricity delivered. This is the official document used in the cross-checking process.

Roles and Responsibilities

CFE has an Emissions Reduction Calculation Procedure (ERCP) with a defined organizational structure for La Venta II Project. This also includes a Quality Assurance and Control procedures in line with CDM requirements.

Figure 4. ERCP Organizational Structure

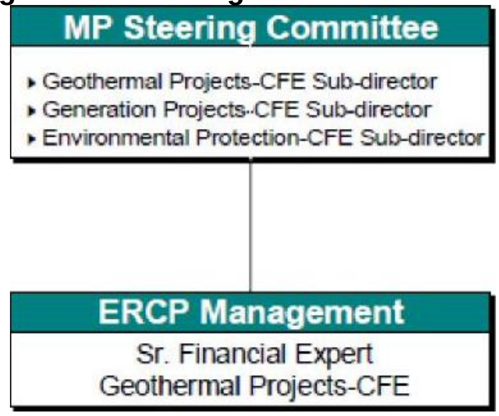


Figure 5. QA /QC procedures

Data	**The project generation data.** **Make coordination with CENACE to be able to implement this document.** **Check calibration of electricity meters, periodically.**
Quality of Data Collection	Which data comes? The above By what means does it come? By E-mail/ CD How does it come? In Excel How frequently does it come? Yearly From whom does it come? From *CENACE* To whom does it comes? ERCP Manager
Quality of Data Processing	Original Data Organized Data Entered Data Processed Data Result
Quality of Data Storage	Prevent Excel versioning problem, by keeping "a new" Excel software package. Keep all data for 2 years after the first crediting period (9 years). Save the ERCP file with the last date in which an alteration was made. Keep all written documentation in a folder.
Quality of Data Delivery	Provide to the verifier e-mails /CD through which the data provider (*CENACE*) delivered the original data Provide to the verifier receipt of sales to final clients Provide to the verifier all calculations made (all steps of data processing) by showing all preliminary versions of spreadsheets saved in disk

Roles and responsibilities for the monitoring and reporting activities are divided among the different areas of CFE, as follows:

CFE Generation Area at La Venta II

- General operation of the plant.
- Preparation of the “Cédula de Registro de Lecturas Mensual”.

CFE Transmission Area at La Venta II Substation

- Calibration and maintenance of the meters.
- Validation of the information in the “Cédula de Registro de Lecturas Mensual”
- (Data Cross-Checking process for the energy delivered to the grid).

CFE CENACE

- Operation and maintenance of SIME system.
- Measurement of the electricity delivered by La Venta II.

CFE Geothermal Projects Area

- Data gathering from CENACE, Generation and Transmission Areas.
- Quality control of the information provided.
- Calculation of the project GHG emission reductions.
- Data processing and preparation of the Monitoring Report.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
09/09/2005

C.2. Expected operational lifetime of project activity

>>
21 years 0 months

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Renewable (second crediting period)

C.3.2. Start date of crediting period

>>
01/07/2014

C.3.3. Duration of crediting period

>>
7 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
An Environmental Impact Assessment ("EIA") was a legal requirement for the project. Under article 5, fraction 5, bullet I of the General Law of Ecologic Equilibrium and Environmental Protection-Ruling in Environmental Impact, any wind power plant developer should previously ask authorization to SEMARNAT (Dirección General de Impacto y Riesgo Ambiental) in regards to environmental impacts.

The environmental authorization for the project given by SEMARNAT date as of July 29th, 2004 and is granted upon compliance with 17 terms[26] and 5 conditions that belong to the 6th term – being the first condition: To elaborate and apply a monitoring program named "Programa de Vigilancia Ambiental". Note that the EIA and Environmental Authorization referred above are for the project with 100 MW capacity; later on, amendments/extensions to the EIA and to the Environmental Authorization were granted for the project of 83.3MW capacity. The project's EIA and is following updates are made available to the designated operational entity ("DOE")[27]. The firm that performed the EIA was Instituto de Ecología, Asociación.Civil ("AC"), a recognized national environmental firm.

D.2. Environmental impact assessment

>>
On the environmental authorization granted to the project, SEMARNAT declared that the environmental impacts of the project can be partially or completely mitigated thus not causing an

---

[26] Which define the characteristics of the plant, to which the authorization is being granted.

[27] Changes to the project conditions were updated i.e. The total impacted area defined in the updated EIA/Environmental Authorization for the project of 83.3MW is 949.84 hectares.

ecological disequilibrium, and so are not significant. SEMARNAT added that the project will be in line with the Ecologic Equilibrium and Environmental Protection General Law (“EEEPGL”)-Ruling in Environmental Impact.

Potential negative environmental impacts identified in the EIA were basically three:

- Bird and bats population endangered (most important environmental problem).
- Land clearing occasioning loss in fauna and in flora.
- Change in the scenery.

The potential negative social impact identified was basically one:

- Land deforestation occasioned by the project will provoke the loss of terrain for agriculture which will affect negatively the economy of the owners of such land[28].

Each potential impact identified in the EIA counts with a mitigation measure which the sponsor is keen to abide to. Note that Article 15 of the EEEPGL-Ruling states that the project developer is in the obligation of repairing, preventing or minimizing any environmental impacts of the project, assuming the totality of the costs incurred for this obligation. The environmental monitoring program named Programa de Vigilancia Ambiental along with a set of terms and conditions established by SEMARNAT on the Environmental Authorization, will be monitored by The Procuraduria Federal de Protección Ambiental (“PROFEPA”).

Additionally, the World Bank and CFE agreed on specific Environmental and Social Monitoring Programs for the project: The “Manual de Vigilancia de la Fauna (Aves y Quirópteros) en la zona de influencia de la central eólica la Venta II, municipio de Juchitán- Oaxaca” and the “Indigenous People Development Program for La Venta II”, respectively.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>

The local stakeholders identified are the habitants of Ejido or locality La Venta[29]. No houses are located within 200 m distance from the WTG. Habitants of Ejido La Venta were interviewed as part of the EIA performed by Instituto de Ecología, Asociación.Civil. Comments were raised through various field research campaigns organized.

E.2. Summary of comments received

>>

The project has been positively accepted by Ejido La Venta, as per Act signed as of July 18th, 2004. The comments received referred basically to the following questions:

- Request for more information about the area to be affected by the project
- Request for information on who was going to be responsible for damages that the project could generate.
- Request for information on what would be the benefits of the project.
- Request that benefits be for all communities surrounding the project not only for the ones which terrain is directed affected by the project.

No other major comments or questions were received as reported in the local stakeholders’ consultation of the EIA. In addition, the sponsor visited the principal authorities of the Ejido La Venta, to inform them about the project and in such actions received the following list of requests for the Ejido:

- Pavement Streets.

[28] Note that land owners affected will be paid an annual rent accorded with the sponsor.

[29] 1,814 habitants, closest locality to the project site.

- Computers
- Vehicles
- Improvements to the local school.
- Free electricity service

Among a larger list of similar requests - not directly related with the project, the sponsor recommended that the Ejido La Venta formalize such requests through a letter. From this point in time, the Social Development Area of CFE took charge on dealing with these requests.

E.3. Consideration of comments received

>>
The sponsor responded all information requests raised by local stakeholders described in E.2 through the meetings with the authorities of Ejido La Venta.

With regards to the social actions requested: The sponsor has opened a trust of 7,834,000 Mexican Pesos (783,400 US Dollars) to be spent in a social agenda agreed with the Ejido La Venta upon Act signed on December 12th, 2005. The social actions accorded to be covered by this budget are the following:

- A classroom for the local science and technology college of Oaxaca.
- Acquisition of computer(s) for the local school.
- Offices for the Ejido “house” or meeting room.
- Pavement of one street of the Ejido.
- Public electrification.
- Leveling of parcels that are within the area of direct impact of the project (where the WTG would be placed) named “polígono de influencia”.

Other commitments of CFE with La Venta project are the following:

- Pay applicable indemnizations in time, and annual rent to land owners affected by the project.
- Restrict the activities of construction and assembling to avoid affecting additional land and/or agricultural land.
- Give training and promote the environmental consciousness among workers to facilitate the implementation of proper environmental measures.

SECTION F. Approval and authorization

>>

Letters of approval have been received from both Mexico and Spain.

Appendix 1. Contact information of project participants

Organization name	Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness
Country	Spain
Address	C/Alcalá 92. City:Madrid. Postcode:28009
Telephone	34-91-436-1494
Fax	34-91-436-15-1
E-mail	0
Website	www.magrama.gob.es
Contact person	Ms. Susana Magro Andrade, Oficina Española de Cambio Climático (OECC)

Organization name	Zeroemissions Carbon Trust S.A.
Country	Spain
Address	Carretera de la Exclusa . City:Sevilla. Postcode:41011
Telephone	34-954978864
Fax	34-954936005
E-mail	nuria.malo@zeroemissions.abengoa.com
Website	www.zeroemissions.com
Contact person	Ms Nuria Malo Montoro,

Organization name	Azuliber 1 S.L
Country	Spain
Address	Camino Prats, s/n Apdo. De Correos No. 39. City:L'Alcora Castellón. Postcode:12110
Telephone	34-964 367 400
Fax	34-964-386-42
E-mail	
Website	www.azuliber.com
Contact person	Mr. Fernando Maseo,

Organization name	Cementos Portland Valderribas S.A.
Country	Spain
Address	José Abascal, 59. City:Madrid. Postcode:28003
Telephone	
Fax	
E-mail	
Website	www.valderrivas.es
Contact person	Mr. Carlos San Felix,

Organization name	Compañía Española de Petróleos S.A. (CEPSA)
Country	Spain
Address	Avenida Punto Com, N. 1. City:Alcala de Henares, Madrid. Postcode:28805
Telephone	34-913376000
Fax	
E-mail	jesus.mota@cepsa.com
Website	www.cepsa.com
Contact person	Mr. Jesus Mota, Head of Department

Organization name	Endesa Generación S.A.
Country	Spain
Address	Ribera del Loira, 60. City:Madrid. Postcode:28042
Telephone	34-656600489
Fax	34-912131052
E-mail	david.corregidor@endesa.es
Website	www.endesa.com
Contact person	Mr. David Corregidor Sanz,

Organization name	E.ON Generación S.L
Country	Spain
Address	Planta 19, Plaza Pablo Ruiz Picasso s/n. City:Madrid. Postcode:28020
Telephone	34-914184417
Fax	34-914184424
E-mail	
Website	www.eon.com
Contact person	Mr. Javier Anzola Perez

Organization name	Gas Natural SDG S.A
Country	Spain
Address	Avenida de San Luis 77. City:Madrid. Postcode:28033
Telephone	34-609752877
Fax	34-915893325
E-mail	cferrer@gasnatural.com
Website	www.gasnatural.com
Contact person	Mr. Carlos Ferrer Ripoll,

Organization name	Hidroelectrica del Cantabrico S.A.
Country	Spain
Address	Plaza de la Gesta 2. City:Oviedo Asturias. Postcode:33007
Telephone	34-902830100
Fax	34-985230699
E-mail	jcmarinas@hcenergia.com
Website	www.hcenergia.com
Contact person	Mr. Juan Carlos García Marinas,

Organization name	Iberdrola Generación S.A.U.
Country	Spain
Address	Avenida de San Adrian, 48. City:Bilbao. Postcode:E-48003
Telephone	0
Fax	0
E-mail	felix.alonso@iberdrola.es
Website	www.iberdrola.es
Contact person	Mr. Félix Alonso de las Fuentes,

Organization name	Comercial De Materiales De Construccion, S.L. (COMAC)
Country	Spain
Address	C/José Abascal, 53. City:Madrid. Postcode:28003
Telephone	34-914411688

Fax	34-914423817
E-mail	azaragoza@oficemen.com
Website	www.oficemen.com
Contact person	Mr. Aniceto Zaragoza

Appendix 2. Affirmation regarding public funding

N/A

Appendix 3. Applicability of methodologies and standardized baselines

N/A

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

General Data Summary:

The Energy Sector Outlook reports (aka "Prospectiva del Sector Eléctrico" in Spanish), which are published annually by the Mexican Energy Secretary (SENER), provided all necessary information to calculate the Operating Margin (OM) and the Build Margin (BM) emission factors. Generation data for each power plant for the most recent year was provided by the Electricity Federal Commission (CFE) and is considered official information.

Data for calculating the Operating Margin emission factor

The method used to calculate the OM is the simple ex-ante option. The following table summarizes the findings:

	2010	2011	2012
Total Generation (MWh)	242,537,000	259,157,000	261,896,000
Total Generation low-cost/must-run (MWh)	49,401,000	52,498,000	47,304,000
Total Generation non including low-cost/must-run(MWh)	193,136,000	206,659,000	214,592,000
EGy	193,312,000	206,994,000	216,417,000
Emissions CO2 (tCO2)	111,560,344	120,269,006	128,779,273
OM (tCO2/MWh)	0.577	0.581	0.595

The table shown below presents the CO_2 emissions of the Mexican interconnected electricity system for years 2010, 2011 and 2012, per type of fuel. Based on this information, the calculated average Operating Margin emission factor was calculated for 2010-2012, using fuel consumption data provided in the Energy Sector Outlook 2012-2025 (detailed calculation tables are available as part of the project documentation package and have been provided to the DOE).

	2010			2011			2012		
	Fuel consumption (m3/day for fuel oil, natural gas and diesel; tonnes/year for coal) {1}	CO2 Emission Factor (tCO2/TJ) {2}	Emissions CO2 (tCO2)	Fuel consumption (m3/day for fuel oil, natural gas and diesel; tonnes/year for coal) {3}	CO2 Emission Factor (tCO2/TJ) {2}	Emissions CO2 (tCO2)	Fuel consumption (m3/day for fuel oil, natural gas and diesel; tonnes/year for coal) {3}	CO2 Emission Factor (tCO2/TJ) {2}	Emissions CO2 (tCO2)
Fuel Oil	24,902	75.5	27,296,500	28,117.7	75.5	30,821,164	31,156.0	75.5	34,151,591
Natural Gas	73,000,000	54.3	58,334,477	77,500,000.0	54.3	61,930,438	83,300,000.0	54.3	66,565,232
Diesel	1,054	72.6	992,088	1,298.7	72.6	1,222,994	1,517.2	72.6	1,428,757
Coal (National)	14,700,000	87.3	24,937,280	15,500,000.0	87.3	26,294,411	15,700,000.0	87.3	26,633,694
TOTAL			111,560,344			120,269,006			128,779,273

Notes

{1} Source "Prospectiva del Sector Eléctrico 2012-2026" Chart 32, page 140, http://www.sener.gob.mx/res/PE_y_DT/pub/2012/PSE_2012_2026.pdf

{2} 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

{3} Source "Prospectiva del Sector Eléctrico 2013-2027" Chart 5.27, page 16.

{4} Source: SENER, México, National Energy Balance 2012, Chart 38, page 95 - http://www.sener.gob.mx/res/PE_y_DT/pub/2012/Balance%20Nacional%20de%20Energia%202012%20(Vf).pdf

Data for calculating the Build Margin emission factor

Total net generation during 2012: 236,689 GWh

20% of the total generation: 47,338 GWh

For the second Crediting Period, the Build Margin emission factor was calculated *ex ante*, based on the most recent information available on the plants build or additions to the sample m by 2012.

According to the Tool to calculate the emission factor for an electricity system version 04.0.0, the sample group of power units m used to calculate the build margin consists of either:

a) The set of five power units that have been built most recently; or

b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[30].

Project participants should use the set of power units that comprises the larger annual generation. As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid. Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor. Option (b) was selected as it comprises a larger generation that Option (a).

Power plants registered as CDM project activities should be excluded from the sample group m. However if the group of power units, not registered as CDM project activity, identified for estimating the guild margin emission factor include power unit(s) that is (are) built more than 10 years ago then:

i) Exclude power unit(s) that is (are) built more than 10 years ago from the group; and

ii) Include grid connected power project registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.

In this case, CDM project activities were excluded from the list since the power plants built less than 10 years ago was enough to account for the 20% of the system generation. The table below shows the plants included in the m sample.

[30] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.

Name	Effective Capacity (MW)	Technology	Net Generation (MWh) 2012	Accumulated Generation (MWh)
2012				
Zumpimito	6	HID	18,073	18,073
Manzanillo I	157x3	TG	3,408,710	3,426,783
Tres Virgenes	1	FV	1,361	3,428,144
La Venta III	102	Wind	84,225	3,512,369
Oaxaca I - CDM Project	102	Wind	-	-
Oaxaca II - CDM Project	102	Wind	-	-
Oaxaca III - CDM Project	102	Wind	-	-
Oaxaca IV - CDM Project	102	Wind	-	-
2011				
Yuumil iik	0	Wind	2,126	3,514,495
2009				
Iztapalapa	-	TG	214,030	3,728,525
Coapa	-	TG	163,321	3,891,846
Santa Cruz	-	TG	124,164	4,016,010
Magdalena	-	TG	197,865	4,213,875
San Lorenzo Potencia	382	CC	2,196,077	6,409,952
2008				
Humeros	40	GEO	314,222	6,724,174
Ciudad del Carmen	16	TG	20,624	6,744,798
2007				
La Venta II - CDM Project	40	Wind	-	-
El Cajón (Leonardo Rodríguez Alcaine)	750	HID	335,122	7,079,920
Tamazunchale (PIE)	1,135	CC	7,236,398	14,316,318
Río Bravo II (Emilio Portes Gil)	495	CC	3,306,704	17,623,022
Río Bravo III (Emilio Portes Gil)	495	CC	3,746,107	21,369,129
Río Bravo IV (Emilio Portes Gil)	500	CC	3,321,153	24,690,282
Ecatepec (LFC)	0	TG	109,340	24,799,622
Remedios (LFC)	0	TG	7,819	24,807,441
Victoria (LFC)	0	TG	111,701	24,919,142
Villa de Flores (LFC)	0	TG	168,810	25,087,952
Cuautitlán (LFC)	0	TG	124,641	25,212,593
Coyotepec (LFC)	0	TG	324,057	25,536,650
Vallejo (LFC)	0	TG	113,958	25,650,608
Holbox	0	CI	6,772	25,657,380
2006				
Tuxpan V (PIE)	495	CC	2,842,973	28,500,353
Valladolid III (PIE)	525	CC	2,158,468	30,658,821
Altamira V (PIE)	1,121	CC	6,849,628	37,508,449
Chihuahua II (El Encino)	619	CC	4,473,150	41,981,599
Atenco (LFC)	-	TG	114,571	42,096,170
2005				
Ixtaczoquitlán	0	HID	12,577	42,108,747
Botello	0	HID	69,587	42,178,334
Hermosillo	250	CC	1,577,703	43,756,037
Rio Bravo IV	500	CC	3,321,153	47,077,190
La Laguna II	498	CC	4,050,928	51,128,118

Appendix 5. Further background information on monitoring plan

N/A

Appendix 6. Summary report of comments received from local stakeholders

N/A

Appendix 7. Summary of post-registration changes

The PDD Version 11 (dated on 20/03/2014) of the project activity specified the following statement in “Section B.7.3 Other elements of monitoring plan”: *“The PDD specifies that Centro Nacional de Control de Energia (CENACE, the system operator) will be the sole provider of La Venta II’s generation data. The hourly measurements of the electricity generated by La Venta II are recorded by CENACE from the meter located in La Venta II substation*”. However, CENACE is not the sole provider of La Venta II’s generation data anymore due to the changes in the wholesale electricity market (MEM) in Mexico and such change has been amended in the same section of the PDD Version 12 (dated on 30/08/2019), as follows:

> *In 2014, the energy reform entered into force in Mexico with different changes. The law of the Electricity Industry (LIE), established the creation of a wholesale electricity market (MEM) and indicated that CENACE must be an independent entity to operate and monitor the market. In 2016, the MEM started to operate and the legal separation of CFE into subsidiaries was stablished as follows: the CFE Generation was created with six independent subsidiaries, each of them with a group of power plants assigned. As a consequence, the CFE Generation and CENACE have to interact in the MEM using bilateral transactions for the energy generated. La Venta II project started operations in 2007, which means it was fully operational when the MEM was enforced in 2014. Therefore, since la Venta II project started operations before MEM´s enforcement, it did not affect the monitoring system of the project activity. Specifically, the meter (ION 8500) indicated in the PDD as the point of delivery at 34.5 kV, is the same metering point before and after the appearance of the MEM. Moreover, the consequences of the MEM creation only changed the administrative roles of La Venta II (as a new generator in the market) related to CENACE (the system operator). At the time of writing, CENACE’s measurement system is still in operation but it is being updated and adapted to the new regulations of the electric market. As far as La Venta II is concerned, the hourly measurements of the generated electricity are still recorded by CFE, although CENACE is not the sole provider of La Venta II’s generation data anymore as occurred before the Post-Registration Change.*

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.

Version	*Date*	*Description*
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision 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; • Make editorial improvement.
05.0	25 June 2014	Revision 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; • Make 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.

Version	*Date*	*Description*

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document