Project design document form
(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Los Santos Wind Power Project
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	4
Completion date of the PDD	18/05/2020
Project participants	Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) Carbonbay GmbH & Co. KG
Host Party	Costa Rica
Applied methodologies and standardized baselines	AMS-I.D.ver. 18- Grid connected renewable electricity generation.
Sectoral scopes	01
Estimated amount of annual average GHG emission reductions	11,383 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

The project consists of fifteen 850kW GAMESA wind power turbines installed in Cooperativa de Electrificación Rural Los Santos' (COOPESANTOS) concession area in El Guarco and Desamparados, Costa Rica. The project requires a total investment of approximately US$ 38 million for an installed capacity of 12.75 MW.

The technology applied is: The project activity utilizes 15 horizontal axis GAMESA G52-850 WTGs with a rated capacity of 850 kW each. The turbine lifetime according to the detailed datasheets for the GAMESA G52-850 is of 20 years.

The project feasibility study calculated a plant load factor of 42.68% and the turbine supply contract guarantees a minimum of 42 GWh per year.

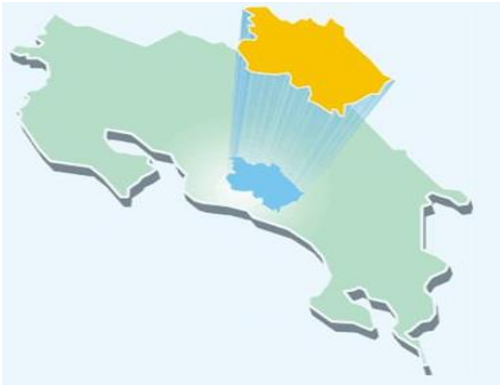
A.2. Location of project activity

>>

The project is located in the Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) concession; specifically, near the villages of La Paz y Casamata in Costa Rica, Central America.

Figure 1: Overall location of the Project Activity

Figure 2: Precise location of the Project Activity



The coordinates of each of the turbines are:

Los Santos WPP WTG location per WGS-84 in Decimal Degrees		
WTG	**Point X**	**Point Y**
1	-83.988589825	9.7897531113
2	-83.98860966	9.7883634826
3	-83.989456506	9.7873123643
4	-83.994728062	9.7804501239
5	-83.995051061	9.77956023
6	-83.995144276	9.7785940543
7	-83.995391708	9.7778119651
8	-83.995728875	9.7770686646
9	-83.989123902	9.7765678523
10	-83.988797486	9.7756851295
11	-83.978657513	9.7599926323
12	-83.979018405	9.759236338
13	-83.978944143	9.7552176092
14	-83.977049062	9.7540770716
15	-83.977161488	9.7532034666

A.3. Technologies/measures

>>

The technology applied is: The project activity utilizes 15 horizontal axis GAMESA G52-850 WTGs with a rated capacity of 850 kW each. The total installed capacity of the project activity is 12.75 MW

The turbine lifetime according to the detailed datasheets for the GAMESA G52-850 is of 20 years.

The project feasibility study calculated a plant load factor of 42.68% and the turbine supply contract guarantees a minimum of 42 GWh per year.

The technical specifications of the installed equipment are as follows:

Parameter	Specification
Operating Data	
Rated power	850 kW

Cut-in wind speed	4 m/s
Rated wind speed	13 m/s
Cut-off wind speed	25 m/s
Rotor	
Type	3 Blades, Upwind / Horizontal axis
Diameter	52 m
Rotational speed at rated power	14.6 to 30.8 rpm
Swept area	2,124 m^2
Gearbox	
Type	1 planetary stage / 2 helical stages
Ratio	1: 74.5
Nominal Load	850 kW
Generator	
Type	Double feed generator
Speed at rated power	1.320:2.340 rpm
Rated power	850 kW
Rated voltage	690 V AC (phase to phase)
Frequency	60 Hz

The main and backup electricity meters are located at the substation, located in the La Lucha substation.

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

The validity of the original/current baseline for the Los Santos Wind Power Project renewal of the crediting period is assessed against the tool for "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", version 03.0.1.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Costa Rica (Host Party)	Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) (Private Entity)	No
Germany	Carbonbay GmbH & Co. KG.	No

A.5. Public funding of project activity

>>
There is no public funding involved in the project activity from Parties included in Annex I.

A.6. History of project activity

>>
To most relevant dates in the development of the project are: The WTG Purchase contract is dated on 05/05/2010. The construction contract was signed on 27/05/2010. The initial ERPA was signed on 16/06/2010.

The commercial operation of the project started on 11/11/2011.

Furthermore, the project activity meets the following criteria required by the CDM Project Standard:

(a) The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);

(b) The proposed CDM project activity is not a project activity that has been deregistered.

(c) The proposed CDM project activity is not nor never has been a CPA that has been excluded from a registered CDM PoA;

(d) The project activity is not nor has it ever been a registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

>>
A proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

• with the same project participants
• in the same category and technology/measure; and
• registered within the previous 2 years and
• whose project boundary is within 1 km of project boundary of the proposed small-scale project activity at the closest point

The proposed small-scale project activity does not satisfy any of the conditions mentioned. Therefore, it is not a de-bundled component of a large project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

>>
The project applies following methodology:

Grid connected renewable electricity generation
Version 18.0
Sectoral scope(s): 01
https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

The project is a small-scale project activity and falls under the category I.D as per the Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

The applicable tools are:

Tool to calculate the emission factor for an electricity system
Version 07.0

Reference:

"General guidelines for SSC CDM methodologies, information on additionality (attachment A to Appendix B) and "General guidance on leakage in biomass project activities" (attachment C to Appendix B) provided at mutatis mutandis.

This methodology also refers to the latest approved versions of the following approved methodologies and tools:

(a) "Project emissions from cultivation of biomass";

(b) "ACM0002: Grid-connected electricity generation from renewable source";

(c) "AMS-I.A.: Electricity generation by the user";

(d) "AMS-I.C.: Thermal energy production with or without electricity";

(e) AMS-I.F.: Renewable electricity generation for captive use and mini-grid";

(f) "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

(g) "Tool to calculate the emission factor for an electricity system";

(h) "Tool to determine the remaining lifetime of equipment";

(i) "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

B.2. Applicability of methodologies and standardized baselines

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This methodology is applicable to project activities that:	Applicability to the Project activity
a) Install a Greenfield plant; b) Involve a capacity addition in (an) existing plant(s); c) Involve a retrofit of (an) existing plant(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s).	The project is a grid – connected renewable energy power generation that is a Greenfield plant (category "a"). Please refer to feasibility study of the project activity for further information.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	The project activity is not a hydropower plant. Please refer to feasibility study of the project activity for further information.
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity is a renewable energy project has an installed capacity below 15 MW. Please refer to feasibility study of the project activity for further information.
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is a wind power project. Please refer to feasibility study of the project activity for further information.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the	The project activity is a Greenfield wind power project with an installed capacity below 15 MW. Please refer to feasibility study of the project activity for further information.

project should be lower than 15 MW and should be physically distinct from the existing units.	
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	The project activity is a Greenfield wind power project with an installed capacity below 15 MW. Please refer to feasibility study of the project activity for further information.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.	The project activity is a wind power project. Please refer to feasibility study of the project activity for further information.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The project activity is a wind power project. Please refer to feasibility study of the project activity for further information.

As discussed above, the proposed CDM project satisfies the applicability criteria suggested in the AMS I.D (Ver. 18).

The project activity meets the requirements as a Type I: Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent). In this context:

(i)"Output" is the installed/rated capacity as indicated by the manufacturer of the equipment or plant, irrespective of the actual load factor of the plant. The installed/rated capacity of renewable electricity generating units that involve turbine generator systems shall be based on the installed/rated capacity of the generator;

(ii) Regarding the "appropriate equivalent" of 15 MW, decision 17/CP.7, paragraph 6(c)(i) refers to MW, but the project participants may refer to MW(p), 19 MW(e) or MW(th). As MW(e) is the most common denomination, MW is defined as MW(e), and otherwise an appropriate conversion factor shall be applied;

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

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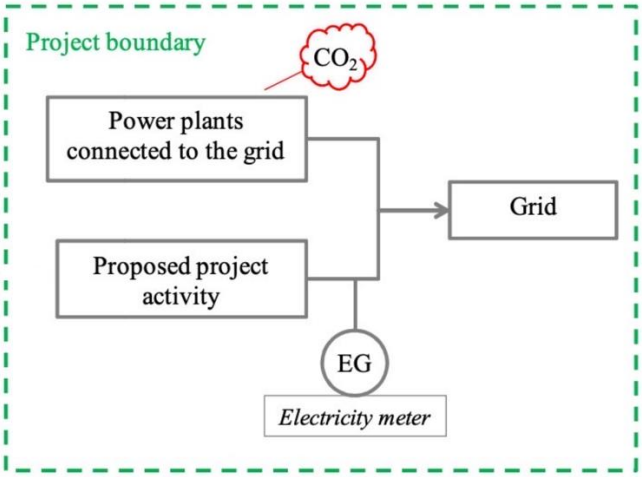
As referred to methodology AMS-.I-D Grid connected renewable electricity generation, the project boundary encompasses the physical, geographical site of the renewable generation source as well as all power plants connected physically connected to the same electricity system as the project activity.

The project boundary is defined by the wind turbines installation and the control station of the Los Santos Wind Power Project and the National Interconnected System (NIS), the defined electricity system for the project activity. Only CO2 emission in the boundary will be considered.



	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	Minor emission source
		N_2O	No	Minor emission Source
Project activity	C02 emissions from the project activity	CO_2	No	The proposed project activity uses wind as the sole source of energy. Thus, there is no generation of CO_2
		CH_4	No	The proposed project activity uses wind as the sole source of energy. Thus, there is no generation of CH_4
		N_2O	No	The proposed project activity uses wind as the sole source of energy. Thus, there is no generation of N_2O

B.4. Establishment and description of baseline scenario

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As the project activity is the installation of a Greenfield power plant, the baseline scenario is the following as described in the applied CDM methodology (AMS I.D Ver. 18):

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

The validity of the original/current baseline for the Los Santos Wind Power Project renewal of the crediting period is assessed against the tool for "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", version 03.0.1.

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

The current baseline of the project activity meets all the relevant mandatory national and sectoral policies. The national utility in Costa Rica continues to promote the use of renewable energies, which is reflected by the increase in use of renewable energy technologies and decrease in use of fossil fuels that feed the national electrical system.

None of the regulations stated by the relevant national authorities have any impact upon the baseline scenario, and the project activity has consistently complied to these policies and regulations to achieve the national energy and emission reduction targets.

Step 1.2: Assess the impact of circumstances

The government of Costa Rica has stated for several years now that it intends to decarbonize and reach carbon neutrality in this decade. The project activity baseline scenario was the continuation of the current practice without any additional investment, and since there are no new fuels or raw materials used in the energy generation of the project activity, which could have impacted the electricity and fuel prices in the identification of the baseline emission, the current practice of the baseline emission is still valid.

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.

The baseline scenario of the project activity was the continuation of the current equipment without any additional investment before the end of the crediting period or the availability of a new technology. The remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity exceeds the crediting period for which renewal is requested.

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

The data and parameters that were determined at the previous crediting period and not monitored during the crediting period are still valid for the subsequent crediting period except for the combined margin CO2 emission factor for the Costa Rica interconnected electrical system.

Step 2.1: Update current baseline

Based on the latest approved version of methodology applicable to this project activity, the baseline Emission Factor has been updated and is described in section B.6.2 of this PDD

Step 2.2: Update the data and parameters

The updated data and parameters in the table in section B.6.2 of this PDD.

B.5. Demonstration of additionality

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Barrier Analysis

In accordance with Attachment A of Appendix B of the Simplified Modalities and Procedures for the Small-Scale CDMProject Activities, a barrier analysis could be carried out in order to demonstrate project additionally, as described below:

“Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.”

The LSWPP faced a variety of barriers and challenges which make it unique. Of particular importance is the insignificant penetration of wind power within the Costa Rican grid which constituted a considerable prevailing practice barrier for the project, especially as it relates to securing financing. It will be demonstrated that the overall reticence against wind power projects has meant that all wind power plants in Costa Rica, which constitute less than 3% of the Costa Rica grid, have been compelled to seek carbon financing in some form to secure financial closure.

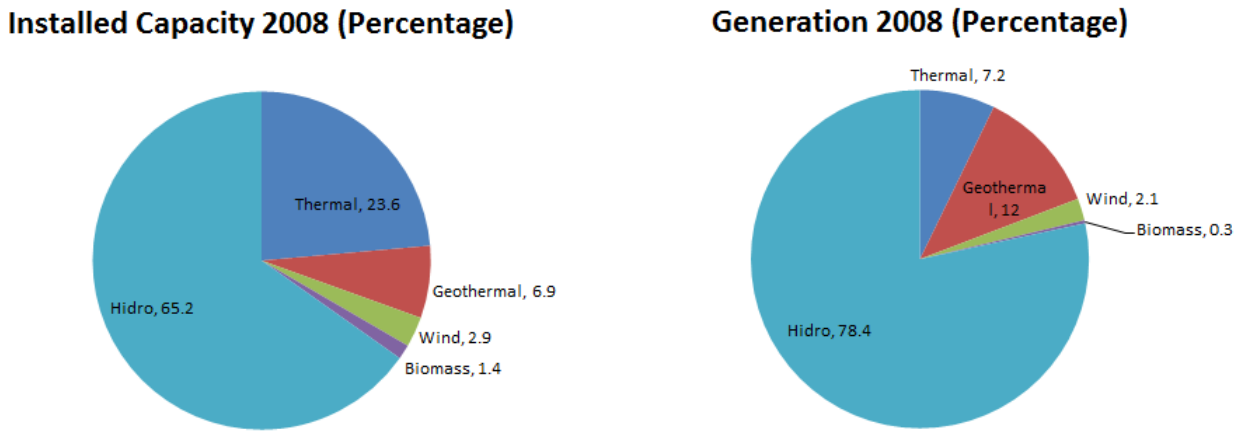
Barrier due to prevailing practice

The Costa Rican electrical sector is run exclusively by the Instituto Costarricense de Electricidad (ICE), which is an autonomous state institution with the legal mandate of providing electricity to the Costa Rican society requires for its development. It was created by the "Decreto-Ley No.449" of April 1949 which established amongst its duties the development of the plans for the electrical development of the country. These plans are summarized in the "Plan de Expansion de la Generacion" (Generation Expansion Plan, PEG from its Spanish acronym); the most current of these was published on September 2009 covers the years 2010-2021.

Electrical generation is carried out by five public service companies (the LSWPP would make Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) the sixth of these) and 28 private generators. The public service companies are the ICE, the Compañía Nacional de Fuerza y Luz (CNFL, a subsidiary of ICE), the Junta Administradora del Servicio Eléctrico de Cartago (JASEC), the Empresa de Servicios Públicos de Heredia (ESPH), the Cooperativa de Electrificación de San Carlos (COOPELESCA) and the Cooperativa de Electrificación Rural de Guanacaste (COOPEGUANACASTE).

The sum of these public service companies, the private generators and their respective distribution grids make up the National Interconnected System (NIS) which, as of December 2008 (latest date for which official statistics have been published) had an effective installed capacity of 2,313 MW and generated a total of 9,413 GWh. The following figure illustrates the composition of that installed capacity and the actual generation per source for the same year.

Figure 3: Installed capacity and generation by energy source



Source: ICE PEG 2010-2021

As is clear from the preceding graphs hydroelectric power is the basis of the NIS accounting for 65.2% of the installed capacity and 78.4% of the generated energy, while wind power makes up 2.9% of the installed capacity of the NIS and generates only 2.1% of the total energy. This heavy underrepresentation of wind power in a country with an estimated 600 MW of gross wind power potential is due in no small measure to ICE's strong and documented distrust of wind power as substantial component of the NIS. This negative outlook on wind power articulated in the current PEG, which states "Although the usable potential is extremely interesting, the intermittence which characterizes wind makes it impossible to significantly increase its participation without establishing important backups within the system. It has been determined that the best way is to gradually increase the wind power penetration to control and compensate the side effects which it causes in the system".

This institutionalized distrust in wind power within the Costa Rican electrical sector is even more evident amongst the rural electrification cooperatives which do not own any of the existing wind power plants.

The World Bank's "Costa Rica Competitiveness Diagnosis and Recommendations"4 ranked Costa Rica as number 117 of 180 countries in terms of business climate and described the electricity sector as financially and technically unsuitable due to lack of investments and complexity and lack of clarity in the prevailing regulations. The negative effect of the public distrust of wind power projects on the perceived risk of these types of projects has been of great impact to the Project Activity.

Due to this situation there are only 4 wind power projects in operation in Costa Rica, the general characteristics of which are outlined below:

Name	Opertions Start	Installed Capacity (MW)	2008 Generation (GWh)	O&M ($/kW-year)	% of Installed Capacity
Tejona	2002	20	53	45.3	1%
Tilaran	1996	20	72	45.3	1%
Aeroenergia	1998	6	25	45.3	0%
Tierras Morenas	1999	20	48	45.3	1%
	Subtotal	66	198		3%

It should be noted that Tilarán, Aeroenergía and TierrasMorenas are privately owned and operated and were all developed as Activities Implemented Jointly under the Pilot Phase5 . As such these projects had access to a wider array of financing sources from the private sector and also had access to noncommercial finance conditions and grants as a result of their being developed for the specific purpose of reducing emissions reductions for Annex I parties.

La Tejona, on the other hand, was built for ICE under the Build-Operate-Transfer (BOT) model and was registered as a CDM Project Activity in May 2007. The Proyecto Eolico Guanacaste, a 49.5 MW wind power project which is currently under construction is also being built for ICE under the BOT model and was also registered as a CDM on February 11, 2011.

As per Executive Board guidance similar activities developed as a CDM project activity is not to be included in the common practice; it follows that projects developed under the AIJ, a precursor of the CDM are to be excluded as well. It is therefore demonstrated that the LSWPP is not a business-as-usual activity and has faced a barrier due to prevailing practice which has historically required carbon-relatedsupport to overcome.

Barrier due to access to financing

Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) began searching for financing options for the LSWPP on April 16, 2009 and included national and international, public and private financial institutions. Despite several promising meetings with a variety of banks, Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)did not receive financing offers. Financing for the project was apparently secured with Chevalerie Institutions et Regles Catholiques via contract signed on September 4, 2009. Based on the assurances of the signed contract Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)initially contracted WTG-supplier GAMESA on December 30, 2009.

However, on January 18, 2010 Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) received word from Chevalerie Institutionset Regles Catholiques that despite all assurances and a signed contract they would not be financing the LSWPP. Chevalerie Institutions et Regles Catholiques cited a judicial order to suspend activities as the reason for reneging on the financing agreement, leaving Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)with a WTG supply contract it could no longer pay for. After being updated on the situation GAMESA agreed to suspend the supply contract until May 5, 2010 in order to give Cooperativa de Electrificación Rural Los Santos (COOPESANTOS) additional time to secure new financing.

A new search for financing was immediately undertaken and after brief negotiations, in May 2010 –just days from GAMESA's deadline-, the Banco Internacional de Costa Rica (BICSA) agreed to finance the LSWPP. BICSA is a Panama-based bank owned by Banco de Costa Rica and Banco Nacional, two of the Costa Rican banks that had previously declined to offer the LSWPP financing. The LSWPPs' commitment to the CDM is one of the key reasons BICSA was willing to finance the project despite its parent companies' previous refusal to do so.

The following table outlines the basic information on the entities and companies involved in financing and implementing the LSWPP (per audited reports, December 21, 2010).

	Coopesantos[1]	BICSA

[1] Financial information converted from Costa Rican Colones to US Dollars using the sale exchange rate of the Costa Rican Central Bank for October 30, 2011 http://indicadoreseconomicos.bccr.fi.cr/indicadoreseconomicos/Cuadros/frmVerCatCuadro.aspx?CodCuadro=400

Full Name	Cooperativa de Electrificación Rural Los Santos R.L	Banco Internacional de Costa Rica S.A.
Date of incorporation	January 17, 1965	May 10, 1976
Country	Costa Rica	Panama
Type	Rural Electrification Cooperative	Private company
Ownership	Cooperative, wholly owned by service users	51% Banco de Costa Rica 49% Banco Nacional de Costa Rica
Total Assets	US$ 57,177,382.06	US$ 1,063,795,438
Total Liabilities	US$ 26,065,956.25	US$ 946,449,369
Total Equity	US$ 31,111,425.81	US$ 124,349,279

On a letter dated October 13, 2010 BICSA Regional Manager Margarita Garcia de Paredes explicitly stated that the LSWPP "commitment to the environment, especially to the fight against climate change was an important factor weighed during the project evaluation" further noting that the "commitment to the environment is clearly proven in [Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)'] work under the Clean Development Mechanism'. Of further significant value is the BICSA internal evaluation document dated April 2010 which references Costa Rica's goal of becoming carbon neutral by 2021 and the National Development Plan (PND from its Spanish acronym) put forth by the current Costa Rican government, recognizing these as important to positioning BICSA as the "green bank" for Costa Rican energy projects. The document specifies that "The Los Santos Wind Power Project, in that sense, constitutes a medium to achieve the ambitious targets of the PND" further noting that the project "emission reductions of approximately 9,000 tons a year" and that the project is already pursuing registration under the CDM with Anaconda Carbon while simultaneously negotiating a ERPA with B.V. Mabanaft.

In summary, the LSWPP faced a potentially preventative barrier in the form of access to financing which was caused by the high-risk-perception of wind power projects in Costa Rica. This high-risk-perception is so prevalent that no wind power project in Costa Rica has been developed without requiring preferential financing terms afforded to it by carbon-related mechanisms. Furthermore, the financial institution that eventually funded the LSWPP has clearly and specifically stated that the CDM played a major role in its decision-making process; a claim further evidenced by period documentation.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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The project is a 12.75MW wind farm and therefore small scale project methodologies are applicable. The AMS I.D. methodology "Grid connected renewable electricity generation" was applied for this project.

Baseline emissions

The baseline emission calculation for the project activity is attributable to the CO2 Emission that could have been produced by the fossil fuel-based power plants in absence of the proposed project activity. Therefore, the amount of electricity supplied to the national grid will be multiplied by the grid emission factor of the respective grid to calculate the baseline emissions reduced by the proposed project activity.

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

Where,

BE_y = Baseline emissions in year y (t CO2)

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

$EF_{grid,y}$ = Combined margin CO2 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"(t CO2/MWh)

Calculation of $EG_{PJ,y}$

According to Paragraph 26 of AMS I.D Ver. 18, if the project activity is the installation of a greenfield power plant, the quantity of net electricity generation is as follows;

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

Where,

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

In addition, any amount of electricity imported from the grid to the project power plants, if any, will be considered to calculate the $EG_{PJ,facility,y}$ in accordance with the following equation.

$EG_{PJ,facility,y} = Grid_{out,y} – Grid_{in,y}$

Where,

$Grid_{out,y}$ = Quantity of electricity generation that is exported from the project power plant to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$Grid_{in,y}$ = Quantity of electricity generation that is imported from the grid as a result of the implementation of the CDM project activity in year y (MWh)

Calculation of $EF_{grid,y}$

As per the "Tool to calculate the emission factor for an electricity system" Version 7.0, the following steps have been followed to calculate the emission factor of the grid for this project.

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

STEP 1: Identify the relevant electricity power systems

The project electricity system is delineated using Option 1 because the project electricity system and connected electricity systems are published by the ICE, the Costa Rica's DNA, which generates and manages the energy supply throughout the country

For determining the electricity emission factors, the project participant shall identify the relevant project electricity system. Similarly, the project participants shall identify any connected electricity systems.

The ICE is an independent institution that belongs to the Costa Rican government and that was created With the aim of supplying electricity in the way that society demands in order to achieve development.

The Decree7LawNº 449, which created ICE in April, 1949, states that the ICE shall be fully responsible for its technical management, work programmes, works and Projects and that they shall not depend on any other government agency. The electricity development plans of the country are developed by ICE in accordance with the general policies and guidelines of the National Development Plan (PND) and the National Energy Plan (PNE).

The National Electricity System (SEN) is constituted by the Generation, Transmission and Distribution Systems. All the elements of the SEN are completely interconnected in a single system.

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

Project participants have the option of choosing 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.

Option I has been selected for this project and only grid power plants are included in the calculation of emission factor.

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

The calculation of the operating margin emission factor (EFgrid,OM,y) is based on one of the following methods, which are described under Step 4:

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

Option b) has been chosen to calculate the OM, as the low-cost/must-run sources in Costa Rica are more than 50% of the total generation of the system.

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

• Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

• Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission

For this case, the ex-ante option has been chosen for calculating the operating margin emission factor.

STEP 4: Calculate the operating margin emission factor according to the selected method

To determine the EFEL, m, y, EFEL, k, y, EGm, y y EGk, Option A of the simple OM method was used: Calculation based on average efficiency and electricity generation of each plant and an emission factor for each power unit. Option B is not used due because necessary data for option A is available.
6.4.1.1.1 Determination of EFEL,m,y : The emission factor of each power unit m has been determined by option A1 because for each power unit 'm' data on fuel consumption and electricity generation is available.
6.4.1.1.2 Determination of EGm,y : For grid power plants EGm,y has been determined as per the provisions in the monitoring tables. For off-grid power plants, EGm,y has been determined using Option 1, based on (sampled) data on the electricity generation of off-grid power plants, as per the guidance in appendix 1 Procedures related to off-grid power generation.

(b) Simple adjusted OM

The simple adjusted OM emission factor (EFgrid,OM-adj,y) is a variation of the simple OM, where the power plants / units (including imports) are separated in low-cost/must-run power sources (k) and other power sources (m). As under Option A of the simple OM, it is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OM\text{-}adj,y} = (1-\lambda_y)\cdot\frac{\sum_m EG_{m,y}\times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y\cdot\frac{\sum_k EG_{k,y}\times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where:

EFgrid,OM-adj,y = Simple adjusted operating margin CO2 emission factor in year y (tCO2/MWh)
λy = Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y

EGm,y = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
EGk,y = Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh)
EFEL,m,y = CO2 emission factor of power unit m in year y (tCO2/MWh)
EFEL,k,y = CO2 emission factor of power unit k in year y (tCO2/MWh)
m = All grid power units serving the grid in year y except low-cost/must-run power units
k = All low-cost/must run grid power units serving the grid in year y
y = The relevant year as per the data vintage chosen in Step 3

EFEL,m,y, EFEL,k,y, EGm,y and EGk,y should be determined using the same procedures as those for the parameters EFEL,m,y and EGm,y in Option A of the simple OM method above.

If off-grid power plants are included in the operating margin emission factor, off-grid power plants should be treated as other power units *m*. No off-grid power plants are included in the EF calculations.

Net electricity imports must be considered low-cost/must-run units *k*. No net imports are accounted in the defined calculation period.

The parameter λ*y y* is defined as follows:

$$\lambda_y\,(\%) = \frac{\text{Number of hours low - cost / must - run sources are on the margin in year y}}{\text{8760 hours per year}}$$

Lambda (λ*y*) should be calculated as follows :

Lambda was determined by approach 2 applying the step wise procedure provided in appendix 3 of Tool 07 because the LASL is more than one-third of the HASL in a project electricity/ grid system demonstrated based on the yearly data for the years used to determine the OM emission factor.

Step (i) Plot a **load duration curve**. Collect chronological load data (typically in MW) for each hour of the year *y*, and sort the load data from the highest to the lowest MW level. Plot MW against8760 hours in the year, in descending order.

Step (ii) Collect power generation data from each power plant/unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants/units (i.e. Σ*k EGk,y*).

Step (iii) Fill the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low cost/must-run power plants/units (i.e. Σ*k EGk,y*).

Step (iv) Determine the .Number of hours for which low-cost/must-run sources are on the margin in year *y*. First, locate the intersection of the horizontal line plotted in Step (iii) and the load duration curve plotted in Step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, then one may conclude that low-cost/must-run sources do not appear on the margin and λ*y* is equal to zero.

In determining λ*y* only grid power units (and no off-grid power plants) should be considered.

Following the calculations, the value obtained was:

$EF_{grid,OM\text{-}adj\ 2016\text{-}2018}$= 0.3640 tCO2/MWh

The calculations are provided in a separate calculation sheet.

STEP 5: Calculate the build margin (BM) emission factor

To Calculate the build margin (BM) emission factor we choose option 1 for the second crediting period. The build margin emission factor is updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE considering the sources belong mentioned.

The sample group of power units m used to calculate the build margin is determined as per the following procedure:

a. The power units registered as CDM project activities are identify including their annual electricity generation. Set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently, is identified as SET5 units in the EF sheet
b. The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities is determined as AEG total in EF sheet. The 20 per cent of that is calculated.
c. 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 per cent of AEG total and their annual electricity generation is determined as SET ≥ 20 per cent in EF sheet.
d. Between SET5 units and SET ≥ 20 per cent, the set of power units that comprises the larger annual electricity generation, that means SET ≥ 20 per cent, is selected as SET sample in EF sheet.
e. None of the power units in SET sample started to supply electricity to the grid more than 10 years ago, so SET sample is used to calculate the build margin.
f. EF of BM is calculated dividing the total CO2 emissions in 2018 from the power units that used fossil fuel by the annual electricity generation of SET sample in 2018.

The sources used for calculation of BM are:

a. Planificación de la Generación Eléctrica 2018-2034. Mayo 2019. San José, Costa Rica. https://www.grupoice.com/wps/wcm/connect/d91d6f4f-6619-4a2f-834f-6f5890eebb64/PLAN+DE+EXPANSION+DE+LA+GENERACION+2018-2034.pdf?MOD=AJPERES&CVID=mIeNZKV

b. Informe Anual Generación y Demanda 2018. Costa Rica. https://apps.grupoice.com/CenceWeb/documentos/3/3008/11/BOLET%C3%83?N%20ANUAL%202018.pdf

c. Análisis de la generación ARESEP. Costa Rica. https://app.powerbi.com/view?r=eyJrIjoiOTI4ODZiMWItY2M3ZS00MDNjLTlmMmQtMDA1YWNjZDBiYTJjIiwidCI6IjBkNzIzOGY4LWI3ODQtNDk2MC1iZGUyLTZlMzM1MWQyNDcwZCIsImMiOjR9

Option I has been chosen.

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.

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 (AEGSET-5-units, in MWh);

b) Determine the annual electricity generation of the project electricity system, excluding powerunits registered as CDM project activities (AEGtotal, 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 AEGtotal (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 (AEGSET-≥20%, in MWh);

c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SETsample); Identify the date when the power units in SETsample started to

supply electricity to the grid. If none of the power units in SETsample started to supply electricity to the grid more than 10 years ago, then use SETsample to calculate the build margin. Ignore steps (d), (e) and (f).

d) Exclude from SETsample the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set (SETsample-CDM) the annual electricity generation (AEGSET-sample-CDM, in MWh); If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. AEGSET-sample-CDM ≥ 0.2 × AEGtotal), then use the sample group SETsample-CDM to calculate the build margin. Ignore steps (e) and (f).

e) Include in the sample group SETsample-CDM the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

f) The sample group of power units m used to calculate the build margin is the resulting set (SETsample-CDM->10yrs), which has been the option used to calculate the BM emission factor, as the plants that enter into operation in the last 10 years, in addition to the CDM projects do not reach the 20% of the annual electricity generation of the electricity system. One plant which started operation more than 10 years before start of the validation has been included in the set of power plants to reach the 20% conditions.

The set of plants used for the calculation of the build margin factor is made up of the alternative that represents the greatest quantity of energy between the five plants that have been build recently, which generated 20% of the system´s energy.

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

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

Where:

EFgrid,BM,y = Build margin CO2 emission factor in year *y* (tCO2/MWh)
EGm,y = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
EFEL,m,y = CO2 emission factor of power unit *m* in year *y* (tCO2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The CO2 emission factor of each power unit *m* (EFEL,m,y) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin

The simple OM is calculated with the Option A based on the net electricity generation and a CO2 emission factor of each power unit, because this data was found.

Following the calculation above, the build margin emission factor for 2018:

$EF_{grid,BM2018}$ = 0.0426 tCO2/MWh

STEP 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor (*EFgrid,CM,y*) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.

Option a) is chosen.

(a) Weighted average CM
The combined margin emissions factor is calculated as follows:

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

Where:

EFgrid,BM,y= Build margin CO2 emission factor in year *y* (tCO2/MWh)
EFgrid,OM,y= Operating margin CO2 emission factor in year *y* (tCO2/MWh)
wOM= Weighting of operating margin emissions factor (%)
wBM= Weighting of build margin emissions factor (%)

Wind and solar power generation project activities: wOM= 0.75 and wBM= 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

The EFgridCM= 0.2710tCO2/MWh

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for the electricity system in year y
Source of data	Calculated
Value(s) applied	0.2710
Choice of data or measurement methods and procedures	Calculated as per “Tool to calculate the emission factor for an electricity System
Purpose of data/parameter	To calculate baseline emissions.
Additional comments	Calculated as weighted sum of the OM and BM emission factors.

Data/Parameter	$EFCO_{2,i,y}$
Unit	tCO_2/MWh
Description	CO2 emission factor of fossil fuel type i used in power unit m in year y
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	Fuel Oil: 75.5 tCO2/TJ Diesel: 72.6 tCO2/TJ
Choice of data or measurement methods and procedures	Simple adjusted OM: 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); BM: For the first crediting period, ex ante option is chosen, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period

Purpose of data/parameter	To calculate baseline emissions.
Additional comments	N.A

Data/Parameter	EGm,y
Unit	MWh
Description	Net electricity generated by power plant/unit m in year y
Source of data	Data provided by ICE (Instituto Costarricense de Electricidad), state own company.
Value(s) applied	
Choice of data or measurement methods and procedures	Simple adjusted OM: 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); BM: For the first crediting period, ex ante option is chosen,following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
Purpose of data/parameter	To calculate baseline emissions.
Additional comments	N/A

Thermal Power Plants	Power Generation [1] MWh			Fuel type [1]
	2016	2017	2018	
BARRANCA GAS	203	107	129	diesel
GARABITO	167,580	36,321	149,580	búnker 6,40% and 93,59% de diesel
GUÁPILES	4,554	51	1,449	búnker 77,96% and 22,04% de diesel
MOÍN GAS II	2,254	320	1,380	búnker 4,07% and 95,93% de diesel
MOÍN GAS III	3,724	100	244	búnker 33,24% and 66,76% de diesel
MOÍN PISTÓN I	10,472			búnker 0,20% and 99,80% de diesel
OROTINA	3,479	59	1,133	bunker 93% y 7% diesel
SAN ANTONIO GAS	730	458	589	diesel
Total Thermal	**192,995**	**37,415**	**154,504**	

Data/parameter:	$EF_{grid,BM,y}$
Unit	tCO2/MWh
Description	Build margin CO2 emission factor for the project electricity system in the year y
Source of data	Calculated
Value(s) applied)	0.0426
Choice of data or measurement methods and procedures	This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.
Purpose of data	To calculate baseline emissions.
Additional comments	N/A

Data/parameter:	$EF_{grid,OM,y}$
Unit	tCO2/MWh
Description	Operating margin CO2 emission factor for the project electricity system in year y
Source of data	Calculated
Value(s) applied)	0.3472
Choice of data or measurement methods and procedures	This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.
Purpose of data	To calculate baseline emissions.
Additional comments	Calculated as explained in section B.6.1 of this document

Data/parameter:	FCi,m,y
Unit	Mass or volume unit
Description	Amount of fossil fuel type i consumed by power plant / unit m
Source of data	Data provided by ICE (Instituto Costarricense de Electricidad), state own company.
Value(s) applied)	
Choice of data or measurement methods and procedures	Data is obtained from official sources
Purpose of data	To calculate baseline emissions
Additional comments	None

Fuel type [1]	Fuel consumed [1] liters		
	2016	2017	2018
diesel	101,691	60,754	68,137
búnker 6,40% and 93,59% de diesel	36,416,760	8,642,059	34,274,503
búnker 77,96% and 22,04% de diesel	1,012,401	12,930	375,331
búnker 4,07% and 95,93% de diesel	844,319	161,851	688,105
búnker 33,24% and 66,76% de diesel	1,353,989	64,422	190,515
búnker 0,20% and 99,80% de diesel	2,725,463		
bunker 93% y 7% diesel	742,142	15,400	235,497
diesel	307,274	203,248	253,485

Data/parameter:	$NCVi_{,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) 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 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied)	Fuel Oil: 39.8 GJ/ton; Diesel: 41.4 GJ/ton
Choice of data or measurement methods and procedures	Simple adjusted OM: 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); BM: For the first crediting period, ex ante option is chosen, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
Purpose of data	To calculate baseline emissions
Additional comments	None

B.6.3. Ex ante calculation of emission reductions

>>

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

Where:

BE_y = Baseline emissions in year y (tCO2)
$EG_{facility,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)

BE_y = 42,000 MWh * 0.2710 tCO_2/MWh

BEy = 11, 383 tCO2

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	11, 383	0	0	11, 383
Year 2	11, 383	0	0	11, 383
Year 3	11, 383	0	0	11, 383
Year 4	11, 383	0	0	11, 383
Year 5	11, 383	0	0	11, 383
Year 6	11, 383	0	0	11, 383
Year 7	11, 383	0	0	11, 383
Total	79,681	0	0	79,681
Total number of crediting years	7			
Annual average over the crediting period	11, 383	0	0	11, 383

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	**$EG_{facility,y}$**
Unit	MWh
Description	Net quantity of electricity produced by the wind farm and supplied to the Grid
Measured/calculated/ default	Measured.
Source of data	Electricity meter.
Value(s) of monitored parameter	42,000 MWh
Monitoring equipment	Description: Main Meter — Model: Schneider Electric ION 7650 — Serial #: PJ-1103A527-02 — Last Calibrated: 29/09/2014 — Calibration validity: 5 years Description: Back up meter — Model: Schneider Electric ION 7650 — Serial #: PJ-1103A523-02 — Last Calibrated: 12/05/2015 — Calibration validity: 5 years Description: Back up meter — Model: Schneider Electric ION 7650 — Serial #: MJ1501A45605 — Last Calibrated: 11/05/2015 — Calibration validity: 5 years
Measuring/reading/recording frequency	Continuously monitored and at least monthly recording.
Calculation method (if applicable)	Net electricity is defined as the electricity produced minus the imported electricity.

QA/QC procedures	As per the country regulations (RRG-2440-2001), the electricity meters shall be tested or calibrated every 5 years. To guarantee QC/QA, it will be double checked by receipts for electricity sales. The planification department of the Cooperative reads data from the tabular reports of the main and back up meters and makes a consolidated report on a monthly basis, which is then utilized to make invoices for electricity sold.
Purpose of data/parameter	Calculation of emission reductions.
Additional comments	The net electricity is defined as the electricity produced minus the imported electricity. In this case, the meters show automatically the net electricity generated, as they are bidirectional. This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.

B.7.2. Sampling plan

>>
N/A

B.7.3. Other elements of monitoring plan

>>
Management Structure and Responsibilities Overall responsibility for daily monitoring and reporting lies with the project owner. The manager of the proposed project is responsible for review the monthly reported results/data and checks the calibration certificates.

Data Collection: The electricity supplied by the project activity to the grid is measured by calibrated electricity meters 0.2 class. The parameter is monitored at the control room with a Supervisory Control and Data Acquisition (SCADA) system and crosschecked with review of the receipts of electricity sales to Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)' co-operative members and invoices of electricity purchase from the grid company ICE.

It shall be mentioned that a discrepancy between the records on delivered electricity to the grid and the invoices to the ICE can occur due to the following reason:

The Los Santos Wind Park has been build based on the national law 8345 "Participation of Rural Electrification Cooperatives in the National Development". As per Article 9, the national grid can buy the surplus of generated electricity which is not consumed by the members of the cooperative but is not forced to do so. Therefore, not all generated electricity which is delivered to the grid is also paid by ICE, generating for some months a discrepancy between the metered electricity and the invoices.

Data is measured continuously and recorded at least hourly as required by the applicable methodology.

Data Recording: All data collected is recorded monthly into an electronic spreadsheet.

Data Calibration: All measurements are conducted with calibrated measurement equipment according to relevant industry or national standards. As per the country regulations (RRG-2440-2001), the electricity meters shall be tested or calibrated every 5 years (see section 9.1).

Data Report: Data is recorded, and the receipts will be consolidated on a monthly basis and will be checked for quality control purposes with official reports or statistics. If there are discrepancies in the data, the source of the variation will be identified. The data report will be concluded monthly and will be verified by the Project Developer's Head Office.

Data Archives: The data recording, the data report and the invoices are archived, together with this monitoring plan. All data collected as part of monitoring are archived electronically and be kept at least for 2 years after the end of the last crediting period or the last issuance of CERs, whichever is later.

Data Quality Control: An internal procedure to secure the correctness of data is regularly carried out. Data and reports are checked internally to secure correctness of data. In case of mistakes, the source of the variation will be identified, whether it is the main measured value or the control value. The data report is concluded monthly and verified by the Project Developer's Head Office.Corrective actions will be applied to avoid future similar mistakes wherever appropriate.

Training and Monitoring Personnel: All people that participate in the monitoring process are suitably qualified and trained in the operation and maintenance of the plant. They will also receive instructions of the monitoring plan.

Emission factor calculation: The combined margin emission factor is fixed for the first crediting period, using ex-ante data for OM and BM as described in section B.6.1. of this document.

Verification and Monitoring Results: The monitoring report is prepared by the monitoring personnel and/or the designed consulting company, in this case Anaconda Carbon S.A. It contains the data report, the emission factor calculation and the results of the emissions reductions of the project for a certain period.

Leakage monitoring: No energy generating equipment is transferred from another activity to this project and there is no existing equipment to be transferred to another activity. The project activity involves electricity generation from wind. The employed wind energy generator can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. Thus, in no ways and means are required to monitor leakage from the project activity. The project owner can adjust and modify the monitoring plan accordingly in order to meet operational requirements. These changes need to be approved by the verifier during the periodic verifications.

The relevant company personnel involved in the monitoring activities are:

The responsibilities of each function are as follows:

General Manager

1. Signs off on the written statement for each month.
2. Designates the representative for precision testing and calibration.
3. Attaches seals to the meters or designates the appropriate person for this function.

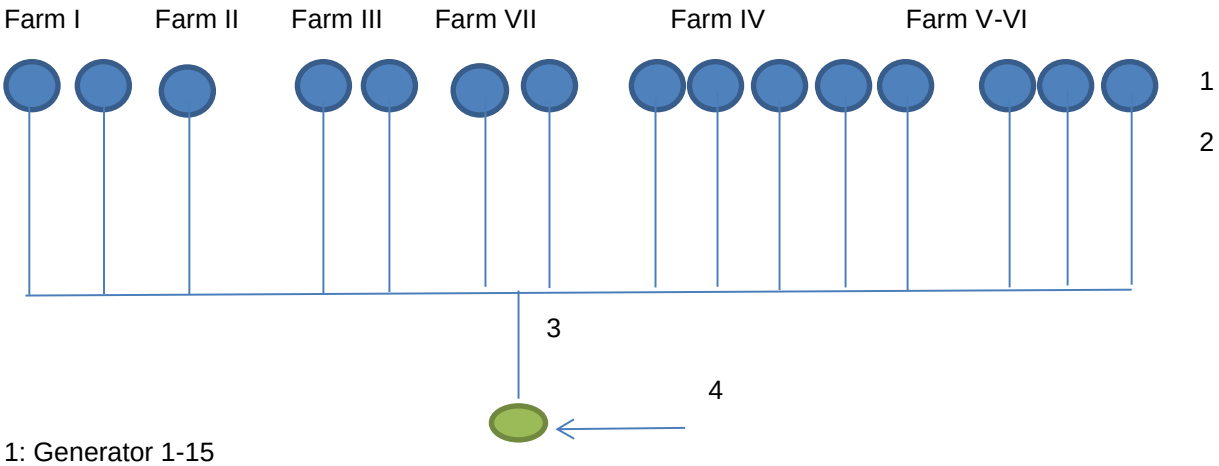
Senior Electrician Operator

1. Drafts the written statement for each month to be delivered to the General Manager for signature.
2. Verifies the readings carried out by the Electrician Operator.
3. Maintains communication with the energy buyer.

Electrician Operator

1. Carries out readings from meters.
2. Stores readings in electronic database.
3. Sends meter readings to Senior Electrician Operator for the monthly written statement.

Metering diagram for the project Los Santos:



1: Generator 1-15

2: Underground three phase line

3: Air three phase circuit

4: Entry to substation “La Lucha” with meter ION and Nexus

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
May 05, 2010 – WTG Purchase contract date

The starting date of the project activity is defined in the “Guidelines for completing the Project Design Document” (V07, EB41) as “the earliest of the date(s) on which the implementation or real action of a project activity begins”. The aforementioned date of May 25, 2010 meets this definition as it precedes both the construction contract and the ERPA and as such establishes the first concrete and irreversible (real) implementation action of the LSWPP.

C.2. Expected operational lifetime of project activity

>>
20 years and 0 months

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
7 years twice renewable

C.3.2. Start date of crediting period

>>
July 1, 2019

C.3.3. Duration of crediting period

>>
7 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

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An Environmental Impact Assessment (EIA) was carried out as per relevant local laws and procedures. The EIA was approved by the National Environmental Technical Secretariat (SETENA), the appropriate office within the Ministry of Environment, Energy and Telecommunications.

The Environmental Guarantee Deposit, to be used in case additional mitigation actions are deemed necessary by SETENA was set at a total of US$ 375,046 and was deposited by COOPESANTOS on May 28, 2010.

D.2. Environmental impact assessment

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The EIA (Environmental Impact Assessment) has established that the environmental impacts that would occur during the construction and operational phases will not be significant.

The environmental impact of the project is minimal and meets, or surpasses, the Costa Rica legal requirements for a project of this nature. There will be no trans-boundary impacts resulting from the construction or operation of the project activity.

The following is an abbreviated list of environmental impacts identified by the Environmental Impact Assesment:

- Earth movement and changes to the conformation of the ground.
- Presence of construction machinery.
- Erosion and runoff (during construction period)
- Potential for WTG disturbance of bird flight patterns
- Visual impact of WTG on the landscape
- Solid and liquid wastes generated during construction

All the relevant impacts occur within Costa Rican borders and have been mitigated to comply with the environmental requirements for the project's implementation.

As required by Costa Rican legislation the project Environmental Impact Assessment includes an Environmental Management Plan which specifies the corrective actions, responsible party and timeframe for each Impact identified through the EIA. Corrective actions include the maximization of use of natural terraces and existing roads to minimize earth movements, the use of living fences and temporary canals to avoid excessive runoff and erosion and a minimum distance of 200 meters from standing pools of water to minimize danger to waterfowl.

The EIA and its included Management Plan have been reviewed and approved by the National Environmental Technical Secretariat (SETENA), the appropriate office within the Ministry of Environment, Energy and Telecommunications. The Environmental Guarantee Deposit, to be used in case additional mitigation actions are deemed necessary by SETENA was set at a total of US$ 375,046 and duly deposited by COOPESANTOS on May 28, 2010.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

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Given COOPESANTOS' unique role in the communities it serves as a rural electrification cooperative, a significant majority of the inhabitants of the project area are also users of COOPESANTOS services and as such are represented in the COOPESANTOS General Assembly, which entitles them to have had a direct voice in the development of the Los Santos WPP.

However, to ensure proper representation of all potential stakeholders in the project COOPESANTOS has conducted 24 workshops in 12 communities in the area. The following table summarizes the dates and locations of the stakeholder consultation workshops, which were conducted as three blocks of workshops:

Community	Date of 1st Workshop	Date of 2nd Workshop
El Empalme del Guarco	August 06, 2008	August 13, 2008
La Luchita del Guarco	August 27, 2008	September 01, 2008
Vara del Roble del Guarco	September 03, 2008	September 10, 2008
La Paz del Guarco	September 17, 2008	September 24, 2008
Palmital Sur del Guarco	October 08, 2008	October 15, 2008
Casamata del Guarco	October 24, 2008	October 27, 2008
San Cristóbal de Desamparados	November 05, 2008	November 25, 2008.
Palmital Norte del Guarco	January 14, 2009	January 28, 2009
La Cangreja del Guarco	February 04, 2009	February 11, 2009
La Estrella del Guarco	February 18, 2009	February 25, 2009
Palo Verde del Guarco	March 04, 2009	March 11, 2009
Conventillo del Guarco	March 18, 2009	March 25, 2009

These workshops totalled 264 inhabitants who participated in the stakeholder consultation; the names and phone numbers of each participant were recorded to facilitate future communication and feedback.

E.2. Summary of comments received

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The following tables summarize the results of the workshops:

Overall rating of the project by participants to 1st Workshop				
	Very Good	Good	Regular	Bad
El Empalme del Guarco	13	0	0	0
La Luchita del Guarco	11	0	0	0
Vara del Roble del Guarco	13	0	0	0
La Paz del Guarco	13	0	0	0
Palmital Sur del Guarco	8	0	0	0
Casamata del Guarco	14	0	0	0
San Cristóbal de Desamparados	15	0	0	0
La Estrella del Guarco	8	0	0	0
Palo Verde del Guarco	12	0	0	0
Conventillo del Guarco	6	0	0	0
Total	113	0	0	0

Overall rating of the project by participants to 2nd Workshop				
	Very Good	Good	Regular	Bad
El Empalme del Guarco	4	0	0	0
La Luchita del Guarco	24	0	1	0
Vara del Roble del Guarco	14	0	0	0
La Paz del Guarco	13	0	0	0
Palmital Sur del Guarco	21	0	0	0
Casamata del Guarco	11	0	0	0
San Cristóbal de Desamparados	40	0	0	0
La Estrella del Guarco	5	0	0	0
Palo Verde del Guarco	13	0	0	0
Conventillo del Guarco	6	0	0	0
Total	151	0	1	0

It should be noted that the workshops held at Palmital Norte del Guarco and La Cangreja del Guarco had very small turnout and were therefore folded into consultations held at nearby locations.

E.3. Consideration of comments received

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The Stakeholder Consultation workshops resulted in the creation of the Communal Participation Program (Programa de Participacion Comunal) which is made up of Coordination Committees comprised of inhabitants from each of the communities and which will be advising the Program on the needs and support opportunities of each community as well as being tasked with supervising the development of the agreed upon activities. Activities include support for local infrastructure, education and sustainability development initiatives.

Stakeholders also have a direct voice in COOPESANTOS through the General Assembly where they have a statutory right to be heard as members of COOPESANTOS concession area.

SECTION F. Approval and authorization

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Letter of approval from the Host Part involved in the project activity, has been issued on the 12th of March 2012, and the same has been submitted to the validating DOE.

Appendix 1. Contact information of project participants

Organization name	Cooperativa de Electrificación Rural Los Santos (COOPESANTOS)
Country	Costa Rica
Address	San Marcos de Terrazú
Telephone	+506 2546-2525
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E-mail	info@coopesantos.com
Website	www.coopesantos.com
Contact person	Ronald Ilama

Appendix 2. Affirmation regarding public funding

There is no public funding or Official Development Funding Assistance is involved in financing of the Project.

Appendix 3. Applicability of methodologies and standardized baselines

The applicability of the methodology has been discussed in chapter B.2. No further discussion is required. No standardized baseline is applied for this project.

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

Emission factor and emission reduction calculations and references are provided in a separate calculation sheet.

Appendix 5. Further background information on monitoring plan

Comprehensive Monitoring Information is provided in Section B.7. No further detail is required.

Appendix 6. Summary report of comments received from local stakeholders

The explanation of the comments received from the stakeholder consultation process is detailed in Section E.2 of this PDD and no further detail is required.

Appendix 7. Summary of post-registration changes

Not applicable.

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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.
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).

Version	*Date*	*Description*
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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