FOLHA LARGA SUL RENEWABLE ENERGY

Document Prepared By Waycarbon Soluções Ambientais e Projetos de Carbono Ltda

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Folha Larga Sul Renewable Energy is a Project that consists on the implantation and operation of wind power plants (WPP) in the state of Bahia, Brazil.

Folha Larga Sul Renewable Energy will reduce greenhouse gases (GHG) emissions, avoiding electricity generation from fossil fuels sources. Clean and renewable electricity supply will bring an important contribution to environmental sustainability, reducing the GHG emissions that would occur in the absence of this project. All WPPs will supply clean electricity to the Brazilian National Interconnected System (SIN).

The baseline scenario is the same scenario existing before the start of implementation of the project activity, which is: "the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations according to TOOL07: "Tool to calculate the emission factor for an electric system"".

The initial project activity is a project called Folha Larga Sul Project, composed by three wind power plants. These WPPs, their installed capacity, main technology employed (numbers and model of wind power turbines (WPTs)), location, and operation starting date are presented in Table 1. The Installed Capacity, number or turbines, individual capacity and WPP location were evidenced by the Installation License.

The estimated annual average GHG emission reductions is 332,753 tCO2 and total GHG emission reductions for the crediting period is 3,327,530 tCO2.

TABLE 1 - PROJECT ACTIVITY OF FOLHA LARGA SUL RENEWABLE ENERGY

WPPs	Specific Purpose Company (SPE)	Installed Capacity (MW)	Main Technology Employed	WPP Location (City/State)	Operation Starting Date[1]
Folha Larga Sul Wind Project	**-**	**151.20**	**36 WPTs (with 4.2 MW)**	**Campo Formoso/BA**	01/08/2020
Ventos de São Januário 20	Ventos de São Bento Energias Renováveis S.A	50.40	12 WTPs with 4.2 MW each	Campo Formoso/BA	01/08/2020
Ventos de São Januário 21	Ventos de São Galvão Energias Renováveis S.A	50.40	12 WTPs with 4.2 MW each	Campo Formoso/BA	01/08/2020
Ventos de São Januário 22	Ventos de Santo Eloy Energias Renováveis S.A	50.40	12 WTPs with 4.2 MW each	Campo Formoso/BA	01/08/2020

[1] Operation starting date of each plant according to the Power Purchase Agreement between each wind power plant, Vale Energia S.A. and Vale S.A..

1.2 Sectoral Scope and Project Type

The sectoral scope applied is sectoral scope 1 – Energy (Renewable/Non-Renewable). The Folha Larga Sul Renewable Energy Project is not a Grouped Project.

1.3 Project Proponent

Table 2 – Project Proponents

Organization name	Ventos de São Bento Energias Renováveis S.A.
Contact person	Ivan Hong
Title	Chief Financial Officer
Address	3477, Brigadeiro Faria Lima Avenue, Tower A, 14th Floor. São Paulo/SP. Brazil
Telephone	+55 11 4084 4200
Email	estruturacao@casadosventos.com.br

Organization name	Ventos de São Galvão Energias Renováveis S.A.
Contact person	Ivan Hong
Title	Chief Financial Officer
Address	3477, Brigadeiro Faria Lima Avenue, Tower A, 14th Floor. São Paulo/SP. Brazil
Telephone	+55 11 4084 4200
Email	estruturacao@casadosventos.com.br

Organization name	Ventos de Santo Eloy Energias Renováveis S.A.
Contact person	Ivan Hong
Title	Chief Financial Officer
Address	3477, Brigadeiro Faria Lima Avenue, Tower A, 14th Floor. São Paulo/SP. Brazil
Telephone	+55 11 4084 4200
Email	estruturacao@casadosventos.com.br

Organization name	Vale S.A.
Contact person	Glauco Gonçalves
Title	Strategy, Participations, New Business and Energy Governance Manager
Address	3.580, Dr. Marcos Paulo Simon Jardim Avenue. Nova Lima/MG. Brazil
Telephone	+51 (31) 3916-3997
Email	glauco.goncalves@vale.com

1.4 Other Entities Involved in the Project

WayCarbon, a company specialized in sustainability and climate change, is responsible for analyzing additionality, preparing all necessary documents both for the financial analysis and the Project Description (PD) as well as delivering the PD to the Validation/Verification body according to VCS guidelines and procedures. It is responsible for obtaining, referencing all external parameters presented in this document and for estimating the emission reductions for the whole crediting period.

Organization name	WAYCARBON SOLUÇÕES AMBIENTAIS E PROJETOS DE CARBONO LTDA
Role in the project	Third party Project Description developer
Contact person	Felipe Bittencourt
Title	Director
Address	1000, Paraíba Street, 7th floor. Belo Horizonte/MG. Brazil
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1.5 Project Start Date

According to the VCS Standard, version 4.0, the project start date is the date on which the project began generating GHG emission reductions or removals. Therefore, the project start date of Folha Larga Sul Renewable Energy is 01/08/2020 (DD-MM-YYYY) *(Operation Starting Date of the Folha Larga Sul Project as defined by the Power Purchase Agreement, between each WPP and Vale Energia S.A. and Vale S.A, signed at 12/12/2018)*.

1.6 Project Crediting Period

The project crediting period shall be a maximum of ten years which may be renewed at most twice.

The first crediting period of the project will be from 01/08/2020 to 31/07/2030.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Table 3 – Project Scale

Project Scale	
Project	
Large project	X

Table 4 – Estimated GHG Emission Reductions

Year	Estimated GHG emission reductions or removals (tCO_2e)
2020	139,483
2021	332,753
2022	332,753
2023	332,753
2024	332,753
2025	332,753
2026	332,753
2027	332,753
2028	332,753
2029	332,753
2030	193,270
Total estimated ERs	**3,327,530**
Total number of crediting years	**10**
Average annual ERs	**332,753.00**

1.8 Description of the Project Activity

The project activity is formed by the installation of a greenfield grid-connected renewable energy power generation.

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, as reflected in the combined margin (CM) calculations described in the TOOL07: “Tool to calculate the emission factor for an electricity system”.

The clean and renewable electricity delivered to Brazilian Interconnected System by the project provides an important contribution to environmental sustainability by reducing carbon dioxide emissions that otherwise would have occurred in the absence of the project. The project activity reduces GHG emissions avoiding electricity generation from fossil fuel sources, which would be generated (and emitted) in the absence of the project.

The emission reduction provided by the project is calculated according version 19.0 of the Large-Scale Consolidated Methodology ACM0002 – Grid-connected electricity generation from renewable sources (hereafter called ACM0002 Methodology).

Table below shows some technical characteristics of the plants. Installed capacity is evidenced by Installation License of each WPP. Plant Load Factor is evidenced by the Energy Production Report, issued on 19/07/2018 (DD-MM-YYYY) by engineering company Camargo Schubert. Number of turbines and individual capacity are again presented in Table 5to summarize technical characteristics. The average lifetime of the equipment is 20 years[2].

Table 5 - Technical Characteristics of Folha Larga Sul Renewable Energy

WPPs	Installed Capacity (MW)	Plant Load Factor (%)	WPTs
Ventos de São Januário 20	50.4	57.7	12 WPTs with 4.2 MW each
Ventos de São Januário 21	50.4	57.4	12 WPTs with 4.2 MW each
Ventos de São Januário 22	50.4	56.8	12 WPTs with 4.2 MW each

1.9 Project Location

Coordinates of each plant of Folha Larga Sul Project are presented as follows[3]:

- Ventos de São Januário 20: LAT 10° 26' 29.8" / LONG 40° 27' 40.7", LAT 10° 27' 59.8" / LONG 40° 31' 13.9", LAT 10° 27' 12.8" / LONG 40° 30' 57.3"
- Ventos de São Januário 21: LAT 10° 25' 36.9" / LONG 40° 30' 20.8", LAT 10° 27' 08.3" / LONG 40° 30' 51.5", LAT 10° 27' 09.2" / LONG 40° 30' 53.0"
- Ventos de São Januário 22: LAT 10° 28' 25.0" / LONG 40° 31' 26.3", LAT 10° 30' 29.4" / LONG 40° 31' 30.0", LAT 10° 30' 28.1" / LONG 40° 31' 28.8"

A KML file was submitted to the VVB (Validation and Verification Body) that will perform validation and verification. All three Wind Power Plants are located at Campo Formoso, in the Bahia state.

1.10 Conditions Prior to Project Initiation

Folha Larga Sul Renewable Energy activity will install grid-connected greenfield wind power plants in Brazil. All wind power plants (WPPs) will supply clean electricity to the Brazilian National Interconnected System (SIN).

Prior to the implementation of the project activity, no wind power plant was operational in the location where the project will be implemented. The baseline scenario is the same as the conditions existing prior to project initiation as described at section 2.4.

[2] ANEEL (2009). Manual de Controle Patrimonial do Setor Elétrico. Annex of Normative Resolution nº 367/2009, 02 June 2009. Available at: <http://www.aneel.gov.br/cedoc/aren2009367_2_primeira_Ver.pdf>, page 209.The table describes the annual depreciation rate for wind turbines. Considered a 5% annual depreciation ratio, the turbine lifespan is 20 years (time necessary for 100% depreciation). Last access on June 05, 2019.
[3] Available in the Installation License of each WPP.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Folha Larga Sul Renewable Energy activity has all licenses necessary for implementation. The most relevant local laws and regulations related to Folha Larga Sul Renewable Energy are defined by the National Council for the Environment, as per the resolution n. 462, of July 24th of 2014. The approval of the National Agency of Electric Energy (ANEEL) is also required, as defined by law n. 9.427, of December 26th of 1996. The environmental licensing is a legal obligation prior to the installation of any construction or activity potentially pollutant or degrading to the environment in Brazil.

Installation Licenses of each wind power plant are valid. Their number and expiration date are shown below.

- Ventos de São Januário 20: Installation License. Ordinance number at INEMA n. 17.279 Expiration Date: 15/11/2022.

- Ventos de São Januário 21: Installation License. Ordinance number at INEMA n. 17.300. Expiration Date: 21/11/2022.

- Ventos de São Januário 22: Installation License. Ordinance number at INEMA n. 17.314. Expiration Date: 22/11/2022.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The project consists of three (3) companies (SPEs) that are each constructing a wind power plant in adjoining location and, as such, will share common facilities such as the substation and transmission line. The companies are Ventos de São Bento Energias Renováveis S.A.. Ventos de São Galvão Energias Renováveis S.A. and Ventos de Santo Eloy Energias Renováveis S.A., which respectively own the WPPs Ventos de São Januário 20, Ventos de São Januário 21 and Ventos de São Januário 22.

Vale S.A. signed two power purchase agreements with each SPE, the first one valid for the period from 01/08/2020 to 31/12/2022 and other for the period from 01/01/2023 to 31/12/2042, which account for the majority of the long term contracted energy from the project. In addition, Vale S.A. signed a call option all three SPEs, where it has the option to buy a part or the entirety of the SPEs. The deadline for this decision is march 31th of 2022.

Therefore, Ventos de São Bento Energias Renováveis S.A.. Ventos de São Galvão Energias Renováveis S.A., Ventos de Santo Eloy Energias Renováveis S.A. and Vale S.A. are owners of the project.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable. The project is not included in any other emission trading program or mechanism.

1.12.3 Other Forms of Environmental Credit

Not applicable. The project has not sought of received any other form of GHG-related environmental credit, including renewable energy certificate.

1.12.4 Participation under Other GHG Programs

Not applicable. The project was not registered and is not seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

Not applicable. The project was not rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not applicable. The project is not a Grouped Project.

Leakage Management

Not applicable. According ACM0002, no leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

Commercially Sensitive Information

Not applicable. No commercially sensitive information has been excluded from the public version of this project

Sustainable Development

Folha Larga Sul Renewable Energy contributes to the sustainable development through the promotion of economic growth without compromising future generations, respecting the concept of Sustainable Development established by Brundtland Report, elaborated by the World Commission on Environment and Development. This report defines the term “sustainable development” as “the development that satisfies the present necessities, without compromising the capacity of future generations of supplying their own necessities”.

Through the following actions, Folha Larga Sul Renewable Energy contributes to the sustainable development of its region and country:

- It reduces greenhouse gas emissions (CO2) from the Brazilian Interconnected System;
- It generates extra income for landowners, while they can continue using the area for other activities, thus it increases and diversifies the lands productivity;

- Besides generating income for landowners, it stimulates the regional economy by increasing tax revenues for the local government and direct and indirect job opportunities for local workers and service suppliers. The resulting economic stimulus will improve capital stock in the region, which can allow investment in the infrastructure, productive capacity and consequently the satisfaction of the population's basic needs. Thus, it can promote a virtuous cycle in the local economy;

- The described economic stimulus goes along with a general improvement of the local infrastructure such as road, electricity transmission system and stimulus for education;

- It will use equipment which have domestic content and, therefore, induce the development of national technology and improvement of domestic know-how. By promoting the establishment and growth of the necessary industry equipment and services, the project will contribute to the increasing availability of wind generation technology, which will, consequently, reduce maintenance costs and risks of the technology in the country;

- The project operation requires services from skilled operators and maintenance staff and therefore stimulates the development of a proficient tertiary sector in the region, thus creating opportunities for education, professionalization and employment;

- It is an important complement and diversification to the run-of-river hydroelectric generation. As Brazil's hydro and wind regimes are largely complementary, their combination allows to partially compensate the lack of hydropower storage capacity with minimal installation of thermal power generation units, while still providing enough energy security based on a portfolio of these complementary renewable sources.

Further Information

Not applicable.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The methodology applied to the Project is ACM0002: "Grid-connected electricity generation from renewable sources" (version 19.0)[4]. This methodology also refers to the following tools:

a) TOOL01: Methodological Tool "Tool for the demonstration and assessment of additionality", version 07.0.0;

b) TOOL02: Methodological Tool "Combined tool to identify the baseline scenario and demonstrate additionality", version 07.0;

[4] Available on the UNFCCC CDM website.

c) TOOL03: Methodological Tool “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”, version 03.0;

d) TOOL05: Methodological Tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, version 03.0;

e) TOOL07: Methodological Tool “Tool to calculate the emission factor for an electricity system”, version 07.0;

f) TOOL10: Methodological Tool “Tool to determinate the remaining lifetime of equipment”, version 01;

g) TOOL11: Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, version 03.0.1;

h) TOOL24: Methodological Tool “Common Practice”, version 03.1;

i) TOOL27: Methodological Tool “Investment Analysis”, version 09.0.

2.2 Applicability of Methodology

In this section, project proponents show how the project activity meets each of the ACM0002 applicability condition: “Grid-connected electricity generation from renewable sources” (version 19.0) and which tool is applicable to the project activity given its applicability conditions.

Applicability Condition 01:

ACM0002 methodology is applicable to grid-connected renewable energy power generation project activities that:

a) Install a greenfield power plant;

b) Involve a capacity addition to (an) existing plant(s);

c) Involve a retrofit of (an) existing operating plants/units;

d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or

e) Involve a replacement of (an) existing plant(s)/unit(s).

Folha Larga Sul Renewable Energy is a project that involves greenfield wind power plants[5]. Therefore, option “a” is applied.

Applicability Condition 02:

The methodology is applicable under the following conditions:

[5] As demonstrated by the three wind power plants project’s ordinances, the project activity consists on greenfield wind power plants. For WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 these ordinances are numbered 518, 517 and 516 respectively.

a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;

b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.

Folha Larga Sul Renewable Energy is a project that involves greenfield wind power plants[5]. Therefore, option "a" is applied.

Applicability Condition 03:

In case of hydro power plants, one of the following conditions shall apply:

a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or

b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (3), is greater than 4 W/m^2; or

c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or

d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply:

   i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2;

   ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity;

   iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be:

      (1) Lower than or equal to 15 MW; and

      (2) Less than 10 per cent of the total installed capacity of integrated hydro power project.

Folha Larga Sul project Activity consists on the implementation of wind power plants[5]. Therefore, this applicability condition is not applied.

Applicability Condition 4:

In the case of integrated hydro power projects, project proponent shall:

a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or

b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.

Folha Larga Sul project Activity consists on the implementation of wind power plants[5]. Therefore, this applicability condition is not applied for the project.

Applicability Condition 5:

The methodology is not applicable to:

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

b) Biomass fired power plants/units;

Folha Larga Sul project activity consists on the implementation of greenfield wind power plants[5]. Therefore, the applicability condition is not applied.

Applicability Condition to TOOL01: Methodological Tool "Tool for the demonstration and assessment of additionality", version 07.0.0:

The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.

Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.

Considered that the methodology includes the TOOL01 at the section "normative references"[6], the applicability condition is applied.

Applicability condition to TOOL02: Methodological Tool "Combined tool to identify the baseline scenario and demonstrate additionality", version 07.0:

The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies. This could include, inter alia, a listing of relevant alternative scenarios that should be considered in Step 1, any relevant types of barriers other than those presented in this tool and guidance on how common practice should be established.

The methodology ACM0002 refers to the TOOL02 on section "Identification of the baseline scenario", subsection "Baseline scenario for retrofit or rehabilitation or replacement of an existing power plant"[7]. The project activity consists on greenfield wind power plants. Therefore, the applicability condition is not applied..

Applicability condition to TOOL03: Methodological Tool "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", version 03.0;

This tool provides procedures to calculate project and/or leakage CO2 emissions from the combustion of fossil fuels. It can be used in cases where CO2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.

According to the methodology ACM0002, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"[8]. In addition, the project activity consists on greenfield wind power plants, where there is no combustion of fossil fuels[5]. For this reason, the applicability condition is not applied.

Applicability condition to TOOL05: Methodological Tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 03.0;

Applicability Condition 1:

If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:

[6] Methodology ACM0002, version 19, at the Section "normative references", page 6.
[7] Methodology ACM0002, version 19, at the Section "identification of the baseline scenario", page 11.
[8] Methodology ACM0002, version 19, at the Section "Emission from fossil fuel combustion ($PE_{EF,y}$)", page 13.

(a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;

(b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or

(c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.

The project activity baseline consists on greenfield wind power plants. For this reason, no emissions are calculated for electricity consumption.[9]. Therefore, this applicability condition is not applied .

<u>Applicability Condition 2:</u>

This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated:

(a) Scenario I: Electricity is supplied to the grid;

(b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or

(c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.

The project activity consists on greenfield wind power plants that supply electricity to the grid and to consumers, and the tool was mentioned at the methodology to monitor electricity supplied to the grid and to consumers[10]. For this reason, the scenario III of the applicability condition is applied.

<u>Applicability condition to TOOL07: Methodological Tool "Tool to calculate the emission factor for an electricity system", version 07.0;</u>

[9]The three wind power plants project's ordinances state that energy production will be commercialized by the grid. For WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 these ordinances are numbered 518, 517 and 516 respectively.

[10] The three wind power plants project's ordinances state that energy production will be commercialized by the grid. For WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 these ordinances are numbered 518, 517 and 516 respectively.
Power Purchase Agreements between each WPP and Vale S.A.
Methodology ACM0002, version 19, at the Section "Monitoring methodology", page 25.

Applicability condition 1:

This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).

Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.

The project activity supplies electricity to the grid[9]. Therefore, the applicability condition is applied.

Applicability condition 2:

In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.

Under this tool, the value applied to the CO2 emission factor of biofuels is zero.

The project electricity system is totally located outside an annex I country[11]. Therefore, the applicability condition is applied to the project.

Applicability condition to TOOL10: Methodological Tool "Tool to determinate the remaining lifetime of equipment", version 01:

The tool provides guidance to determine the remaining lifetime of baseline or project equipment. The tool may, for example, be used for project activities which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities.

Methodologies referring to this tool should clearly specify for which equipment the remaining lifetime should be determined. The remaining lifetime of relevant equipment shall be determined

[11]The three wind power plants project's ordinances state that the project electricity system is within the state of Bahia, in Brazil, and will provide energy to the Brazilian grid. Brazil is not an Annex I country as listed in the UNFCCC website (available at: https://unfccc.int/process/parties-non-party-stakeholders/parties-convention-and-observer-states, last access on December 19, 2019). The ordinance numbers are 518, 517 and 516 for WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 respectively.

prior to the implementation of the project activity. Project participants using this tool shall document transparently in the CDM-PDD how the remaining lifetime of applicable equipment has been determined, including (references to) all documentation used.

Under this tool, impacts on the lifetime of the equipment due to policies and regulations (e.g. environmental regulations) or changes in the services needed (e.g. increased energy demand) are not considered. Methodologies referring to this tool shall, where applicable, provide specific guidance on how regulations that warrant the replacement of the equipment before it has reached the end of its technical lifetime should be addressed.

The methodology refers to this tool at the calculation $DATE_{BaselineRetrofit}$, a parameter not applied to the project activity[12]. Therefore, the applicability condition is not applied.

Applicability condition to TOOL11: Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", version 03.0.1:

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.

The project activity is a new project, at the first crediting period[13]. Therefore, the applicability condition is not applied..

Applicability condition to TOOL24: Methodological Tool "Common Practice", version 03.1:

This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality.

The project activity applies the methodological tool "Tool for the demonstration and assessment of additionality". Therefore, the applicability condition is applied.

[12] According to the methodology ACM0002, section "Baseline Emissions", subsection "Calculation of $EG_{PJ,y}$. sub subsection "Greenfield power plants", page 17, if the project activity is the installagion of a greenfield power plant, the equation presented must be applied. For this reason, the parameter $DATE_{BaselineRetrofit}$ is not applied, and consequently, the tool is not required.
The three wind power plants project's ordinances identify that all WPP are not yet installed. Therefore, no retrofitting or equipment exchange apply. For WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 these ordinances are numbered 518, 517 and 516 respectively.
[13] The three wind power plants project's ordinances identify that all WPP are not yet installed. Therefore, this must be the project first crediting period. For WPPs Ventos de São Januário 22, Ventos de São Januário 21 and Ventos de São Januário 20 the mentioned ordinances are numbered 518, 517 and 516 respectively.

Applicability condition to TOOL27: Methodological Tool "Investment Analysis", version 09.0.

This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", the guidelines "Non-binding best practice examples to demonstrate additionality for SSC project activities", or baseline and monitoring methodologies that use the investment analysis for the demonstration of additionality and/or the identification of the baseline scenario.

The project activity applies the methodological tool "Tool for the remonstration and assessment of additionality". Therefore, the applicability condition is applied.

2.3 Project Boundary

Table 6 – Project Boundaries

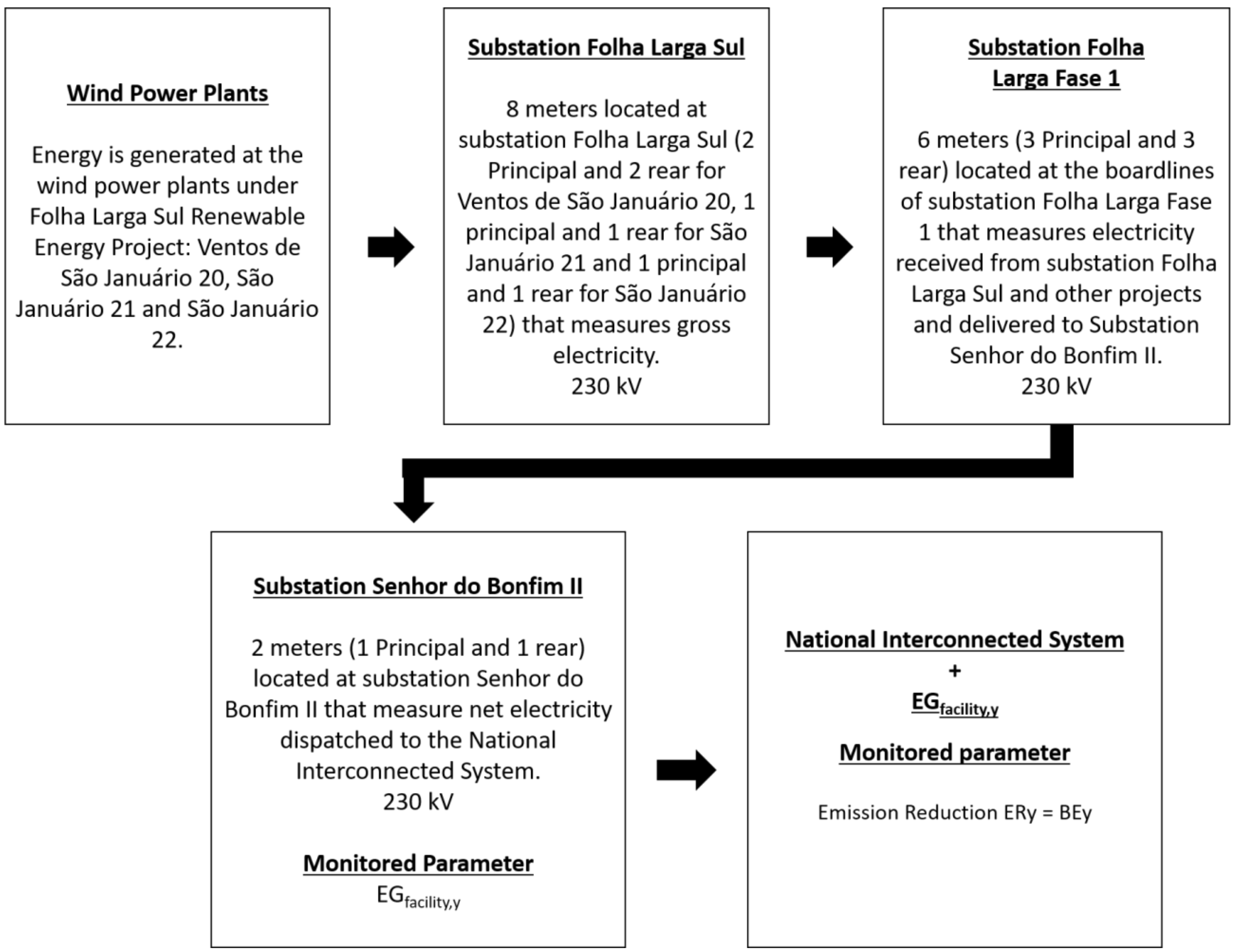
Source		Gas	Included	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	Not applicable	Not applicable
Project Activity	For dry or flash steam geothermal power plants, emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable to this project activity
		CH4	No	Not applicable to this project activity
		N2O	No	Not applicable to this project activity
	For binary geothermal power plants, fugitive emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable to this project activity
		CH_4	No	Not applicable to this project activity
		N_2O	No	Not applicable to this project activity
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hydrocarbon/ refrigerant	No	Not applicable to this project activity
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Not applicable to this project activity
		CH_4	No	Not applicable to this project activity
		N_2O	No	Not applicable to this project activity
	For hydro power plants, emissions of CH4 from the reservoir	CO_2	No	Not applicable to this project activity
		CH_4	No	Not applicable to this project activity
		N_2O	No	Not applicable to this project activity

The spatial extent of the project boundary includes wind power plants of Folha Larga Sul, Substation Folha Larga Sul, Substation Folha Larga Fase 1 and Substation Senhor do Bonfim II 2, where project activity is conducted.

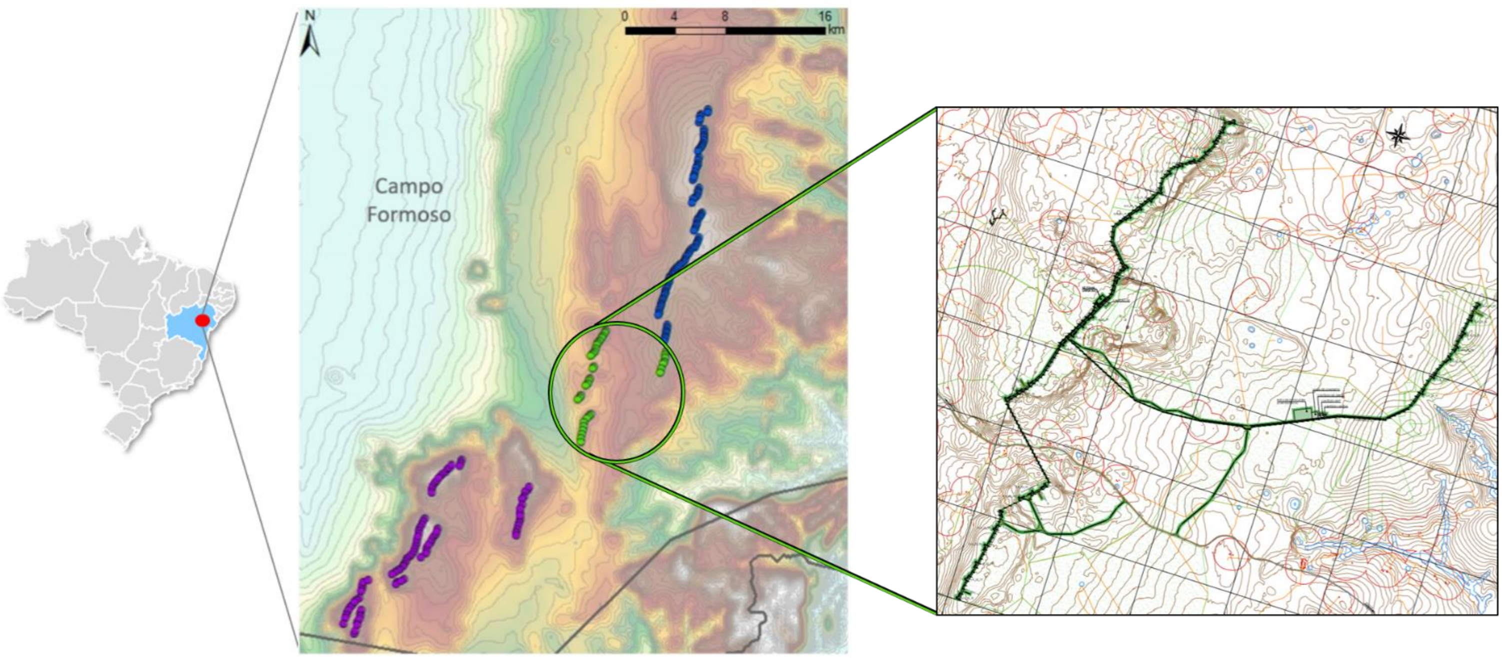
Energy is generated by the Wind Power Plants, which are directly connected to Substation Folha Larga Sul. The energy is directed to Substation Folha Larga Fase 1 and then to Substation Senhor do Bonfim II, where it is dispatched to the National Interconnected System.

Generation Operating Center (*Centro de Operação da Geração – COG*, in Portuguese) and the regulatory team are responsible for measurement activities. They collect and storage all measurement data. The entities are also responsible for analysing $EG_{facility,y}$. information. They monitor data provided by the meters and cross-check it with information provided by Electricity Commercialization Chamber (CCEE).

The diagram below shows the physical locations of the various installations or management activities taking place as part of the project. Black arrows represent the energy flow.



There are no GHG emission sources in the project boundary nor are considered leakage emissions. Therefore, the emission reduction is equivalent to baseline emissions.



The following image shows the installations of the Folha Larga Sul Renewable Energy Project, Located at Campo Formoso, in the state of Bahia.

2.4 Baseline Scenario

Since the project activity is the installation of a greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in “TOOL07: Tool to calculate the emission factor for an electricity system” (version 7.0).

2.5 Additionality

The demonstration of additionality follows the CDM TOOL01 “Tool for the demonstration and assessment of additionality”, version 07.0.0.

The tool provides a stepwise approach to demonstrate and assess the additionality of a project activity.

These steps are:

• Step 0: Demonstration whether the proposed project activity is the first-of-its-kind;

• Step 1: Identification of alternatives to the project activity;

• Step 2: Investment analysis;

• Step 3: Barriers analysis; and

• Step 4: Common practice analysis

Step 0. Demonstration whether the proposed project activity is the first-of-its-kind

This is step is not applied once the proposed project activity is not the first-of-its-kind.

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

Regulations

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

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

The realistic alternatives to the project activity are:

(a) P1: The project activity not implemented as a CDM project;

(b) P2: The continuation of the current situation, that is to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system; and

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

The Brazilian Regulatory Framework provides autonomy to the economic agents about the investments to be done in the electric sector. Both scenarios identified are in compliance with mandatory legislation and regulations.

A brief description of Brazilian Regulatory is presented in this section:

The Brazilian Regulatory Framework went through important structural and conceptual changes over the past 2 decades, resulting in three different electricity regulatory models: the state-based model (until 1995); the free market model (1995 to 2003) and the new model, implemented in 2004 and valid up to date. Under the state-owned model, the energy sector was dominated by almost exclusively state-owned and verticalized companies that covered the segments of generation, transmission and distribution. During the period of state monopoly, the major part of the currently existing generation capacity has been built, mostly consisting of large hydropower plants with important energy reservation capacity.

From 1995 on, due to lack of capacity to further finance the necessary investments for the expansion in energy generation, transmission and distribution, the government initiated a partial privatization process, structured by four main pillars: i) creation of a competitive environment (free market), with a gradual elimination of the captive consumers; ii) partial dismantling of the state owned verticalized companies by dividing and privatizing the segments of generation, transmission and distribution; iii) allowing free access to the transmission lines for generators and consumers; and iv) placing the operation and planning responsibilities to the private sector[14].

The adoption of the free market model allowed the participation of private entities and the implementation of the Concession Law (Law No 8,987 of February 13, 1995) and promoted the construction of some renewable plants in Brazil.

Unfortunately, the model did not provide the investment in generation capacity needed to satisfy the growing demand and it resulted in an energy crisis in 2001, when energy consumption of consumers and industry was rationed, and Brazil's economic development was badly hit. As a response to this crisis, a new regulatory framework was put in place in 2004, resulting in a more active role of Brazil's government by virtually suspending the privatization process initiated in the 1990's and centralizing the functions of electricity planning at national government level,[5] while promoting private sector investments to fund the required expansion in generation capacity. This new regulatory model provided a more efficient mechanism of power procurement between generators and distributors, primarily by creating two parallel electricity trading environments: the Regulated Contracting Environment, referred to as ACR (*Ambiente de Contratação Regulada*), where energy is finally contracted based on the lowest tariffs defined by a regulated auctioning process, and the Free Contracting Environment, referred to as ACL, or *Ambiente de Contratação Livre* (ACL).

As mentioned previously, economic agents are free to decide about the investments to be done in the electric sector, respecting Regulatory framework. Therefore, it does not exist either restrictions nor impositions to the project activity and to its alternatives. Alternatives to the project activity (P1 and P2) are plausible and consistent with mandatory laws and regulations.

Step 2. Investment analysis

According to the TOOL01: "Tool for the demonstration and assessment of additionality", project participants shall determine whether the proposed project activity is not:

- The most economically or financially attractive;
- Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

[14] Aguiar F.L. Modelo Institucional do Setor Elétrico Brasiliero, 2007, available at https://www.realestate.br/dash/uploads/sistema/images/File/arquivosPDF/DST_FernandoAguiar.pdf, last access on November 1st, 2019.

The investment analysis follows the CDM TOOL27: “Investment analysis”, version 09.0.

To conduct the investment analysis, the following steps must be used:

Sub-step 2a. Determine appropriate analysis method

In order to determine the appropriate analysis method, the following options are available to be used in the additionality analysis:

- Option I - Apply simple cost analysis;
- Option II - Apply investment comparison analysis;
- Option III - Apply benchmark analysis.

According to the Tool, if the VCS project activity and the alternatives identified in Step 1 generate financial or economic benefits other than carbon credits related income, then the investment comparison analysis (Option II) or the benchmark analysis (Option III) shall be used. The benchmark analysis will be applied, because it is the most appropriated for this type of activity in Brazil. Moreover, the Option II shall be applied when there are credible alternative scenarios existed to the project activity. As there are no alternative to compare with the project’s indicator (Internal Rate of Return) the Option III shall be applied.

Therefore, the Option III was chosen.

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

Financial indicator identification

Project’s Internal Return Rate (IRR) is selected as an appropriated financial indicator. The cash flow was performed in real terms, i.e. without considering the impact of inflation, and after payment of taxes. The resulting financial indicator therefore is a post-tax project IRR given in real terms and therefore compatible with the benchmark defined in the following lines.

The project IRR calculation follows what it is indicated by the CDM TOOL27: “Investment Analysis”, version 09.0.

The IRR calculation is carried out by considering all three wind farms as a single one (and in individual basis for each one of the wind farms). This approach is more realistic and conservative once the three wind farms are located in adjoining sites and were developed considering several synergies that in a standalone basis are not feasible. The terms and conditions, including values for CAPEX and OPEX, were negotiated and structured jointly to reach a project of 151.2MW, instead of 50.4MW (individual capacity of each WPP)[15].

[15] Brazil has specific rules for the commercialization of energy and some incentives for renewable sources, which may imply a structural modelling of the WPP. For example, there is a discount applied to the transmission and distribution system usage tariffs for renewable generating units and this discount had a power limitation of up to 30 MW by 2015, which caused large wind projects to be split into small power plants of 30 MW.

Benchmark identification.

According to the Investment Analysis Methodological Tool (TOOL27), version 09.0, one appropriate benchmark to a project IRR is the estimation of the Weighted Average Capital Cost (WACC). This is a rate used to discount cash flows and it takes into consideration the cost of debt and the cost of equity of a typical investor in the sector of the Project Activity.

Therefore, the WACC is calculated through the formula below:

WACC = Re x We + Rd x Wd x (1-Tc)

Where:

Re Cost of equity (-);

We Percentage of financing that is equity (-);

Rd Cost of debt (-);

Wd Percentage of financing that is debt (-);

Tc Corporate tax rate (-);

- **Cost of equity (Re):**

The average cost of equity is calculated using Capital Asset Pricing Model (CAPM). This is a valid methodology for markets where financial instruments are liquid, indicating that currently traded papers represent a valid reference of market conditions. There is significant evidence of such liquidity in the Brazilian market, as listed below:

- In TOOL27 (version 09.0), paragraph 20, some conditions that commonly show liquidity are present. Conditions a, c and e are met by all countries identified in the annex, which is the case for Brazil (page 13);

- Condition b is met whenever the total market cap of publicly traded companies represents at least 20% of the county's GDP. Given that average market cap was circa USD 1.1 tn[16] and 2012 GDP was USD 2.465 tn[17], such condition is met;

- Several market analyses involving publicly traded companies use CAPM as a methodology for equity cost calculation[18] (e.g.: Drogasil Raia, EDP, Braskem, Natura, Energisa, Gerdau) denoting its widely adopted practice.

[16] Source: World Federation of Exchanges. For more details, please follow the link http://www.world-exchanges.org/
[17] Source: World Bank. Available in https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=BR
[18]
https://www.rd.com.br/Download.aspx?Arquivo=rBrVhKSQ4tNb5bV9hx/4ng==,
http://ri.edp.com.br/ptb/7851/607448.pdf,
http://www.braskem-ri.com.br/download/RI/21543,
https://natu.infoinvest.com.br/enu/5019/Aesop_RelatorioNatura_FINAL.pdf,
https://ri.energisa.com.br/ptb/7951/589555.pdf,

The cost of equity (Re) is calculated throw the formula below[19]:

Re= Rf + Beta x (Rm - Rf)

Where:

Re	Cost of equity (expected return on equity);
Rf	Risk free rate;
Beta	Adjustment factor to reflect the risk of projects. This value corresponds to the average beta of energy companies in emergent countries, leveraged to the capital structure of the project activity;
Rm	Expected Market Return;

In this project activity, the risk free rate corresponds to the average rate of Brazilian Treasury Note, series B (NTN - B) with a maturity of 28 years (NTN-B Principal 150545) for 2017[20], the previous year of the investment decision (considered as the date of the Auction: 31/08/2018). This value, in real terms, corresponds to 5.31%.

For Beta establishment was consulted A. Damodaran reference available for Power Companies in Emergent countries in 2017.The average unlevered beta corresponds to 0.59[21]. This value was levered for the proposed project activity capital structure trough the formula[22]:

Beta unlevered = Beta levered / (1+ D/E x (1-T)), where:

D= Debt;

E= Equity;

T= Interest and taxes

http://ri.gerdau.com/ptb/7556/Anexo%203%20-%20Laudo%20de%20Avaliao.pdf

[19] Available at < https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&cad=rja&uact=8&ved=2ahUKEwiCk-DO0NTfAhVBkpAKHfSBC7wQFjAEegQIBRAC&url=http%3A%2F%2Fwww.stern.nyu.edu%2F~adamodar%2Fpptfiles%2Fdam2ed%2Fdiscountrates.ppt&usg=AOvVaw1-rCs8vmpF_FAGo-BpxSsq >.

[20] According to the Tool 27 (Investment analysis, version 09.0), the risk free rates should be based on local sovereign debt and should have a maturity date close to the Project lifetime (at least 10 years) and sufficient liquidity. The parameter used is a Brazilian Treasury Note with a maturity of 28 years (NTN-B Principal 150545) obtained at the National Treasury website: <http://www.tesouro.gov.br/-/balanco-e-estatisticas>. Furthermore, Tool 27 recommends the adoption of the latest sovereign debt data available at the time of the investment decision. For this reason, the NTN-B of 2017 was selected (the previous year of the investment decision of the project activity - Auction date: 31/08/2018).

[21] Available at < http://pages.stern.nyu.edu/~adamodar/New_Home_Page/dataarchived.html>. Year: 2017, Emergent Countries, Industry Group: Power. Average Beta results in 0.59.

[22]https://web.bndes.gov.br/bib/jspui/bitstream/1408/10954/2/RB%2025%20Custo%20de%20Capital%20de%20Distribuição%20de%20Energia%20Elétrica%20-%20Revisão%20Tarifária%202007-2009_P_BD.pdf

Typically, in Brazil, power projects have a finance structure of 70%/30%. So, Debt (D) is equal to 70% and Equity (E) is equal to 30%. The interest and taxes (T) were considered zero because the Decree nº3,000 of 2009 establishes that from 01/01/1998 it is forbidden any deduction of taxes incentives from the income tax calculated on the basis of presumed profit. Therefore, the corporate tax rate (Tc) will be zero and there will be no tax benefits for indebtedness.

Although the cash flow was performed for the entire Folha Larga Sul Wind Project, the 3 WPPs that compose it are independent SPEs. The individual revenues of the 3 WPPs are under seventy-eight million Reais per year and for this reason the presumed profit regime (*lucro presumido* in Portuguese) was adopted (Law no. 12.814/2013).

So,

Beta levered= 0.59 x (1+ 70%/30% x (1-0)) = 1.97

According to the survey "Market Risk Premium and Risk-Free Rate used for 59 countries in 2018", the difference between the expected market return and the risk-free rate corresponds to the BR Premium, identified at page 7. Value to be applied: 9.00%[23].

Therefore,

Re = 5.31% + 1.97 x 9.00%

= 23.01%

So, **Re in real terms is equal to 23.01%** and this value was considered in WACC calculation.

- **Percentage of financing that is equity (We) and Percentage of financing that is debt (Wd):**

According to the Investment Analysis Methodological Tool (version 09.0), if the benchmark is based on parameters that are standard in the market, then the typical debt/equity finance structure observed in the sector of the country should be used. In Brazil, in the power sector it is usually adopted a 70%/30% finance structure.

Therefore, the percentage of Equity Financing (We) and the percentage of Financing that is debt (Wd) in the WACC calculation were considered **30%** and **70%** respectively.

- **Cost of debt (Rd):**

The cost of debt (Rd) corresponds to the sum of the financial cost with the basic and risk spreads. Therefore, it can be calculated through the formula below:

Total Financing Cost = Financing Cost + Basic Spread + Credit Spread Risk

[23] FERNANDES, Pablo; et. Al. Market Risk Premium and Risk-Free Rate used for 59 countries in 2018. Apr. 23th 2018. Available at: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3155709>. Last access on November, 2019.

In Brazil, the National Bank for Economic and Social Development, known as BNDES[24] (in Portuguese, *Banco Nacional de Desenvolvimento Econômico e Social*), provides long-term financing for private sector investments, usually in infrastructure projects. Thereby, it plays an important role in the implementation of the governmental policies for economic development.

As the Investment Analysis Methodological Tool (TOOL27), version 09.0, recommends the use of a long-term debt, it was adopted in this report the **financing cost** as the average value of the long rate terms (TLP) of BNDES for the year of the investment decision of the project activity (2018).

The average value for TLP for 2018 is equal to 2.67%[25], expressed in real terms.

Basic spread and **Credit Risk Spread** are also provided by BNDES[26]. For the energy auctions that occurred in 2018, basic spread was equal to 1.3%. Credit spread risk, in its turn, was up to 2.87%, for energy auctions that occurred in April 2015 and April 2016. Data about spread risk for the auction that occurred on 2018 was not available. For conservativeness, the average value of the known spread was considered: 1.44%. Furthermore, on May 2018, BNDES published an article[27], which states the approval of the reduction on the risk spread by 25%-50%. Based on this information, a 50% reduction on the average known value was applied, leading to a final: 0.72%.

Thereby, Rd is defined as:

Rd= Financing cost + Basic Spread + Credit Risk Spread

Rd= 2.67% + 1.3% + 0.72%

Rd= 4.69%

- **Corporate tax rate (Tc):**

As a presumed profit was adopted for the WPPs investment analysis, the Corporate Tax Rate (Tc) was considered zero in the WACC calculation. If real profit was adopted, Tc should be equal to 34%. The tax regime was selected according to Law n. 12,814/2013 that establishes that corporate entities revenues under seventy-eight million Reais per year can adopt presumed profit instead of real profit.

Although the cash flow has been made considering a consolidated approach, the 3 WPPs' revenues are calculated separately, as they consist of individual SPEs. Thereby, the individual

[24] BNDES is a federal bank that finances long terms investments in all segments of the Brazilian economy, including renewable energy sector. For more details, please see < https://www.bndes.gov.br/wps/portal/site/home >.
[25]Available at <https://www.bndes.gov.br/wps/portal/site/home/financiamento/guia/custos-financeiros/taxa-juros-longo-prazo-tjlp>. TJLP from Jan-Mar:5.5%. >. TJLP from Apr-Jun: 6%. Average value: 5.75%
[26]BNDES parameters for energy auction of April, 2015, April, 2016 and 2018. Available at <https://www.bndes.gov.br/wps/portal/site/home/financiamento/produto/leiloes-infraestrutura/leiloes-geracao-energia-abril-2015>, <https://www.bndes.gov.br/wps/portal/site/home/financiamento/produto/leiloes-infraestrutura/leilao-geracao-2016> and < https://www.bndes.gov.br/wps/portal/site/home/financiamento/produto/leiloes-infraestrutura/leilao-geracao-2018>. Last access: Oct. 2019.
[27] BNDES. BNDES promove nova redução de spread de custos financeiros. Available at: <https://www.bndes.gov.br/wps/portal/site/home/imprensa/noticias/conteudo/bndes-promove-nova-reducao-de-spreads-e-de-custo-dos-financiamentos>. Last access: Oct. 2019

revenues of the 3 WPPs are under seventy-eight million Reais per year and for this reason the presumed profit regime (*lucro presumido* in Portuguese) was adopted (Law no.12.814/2013). The sum of the costs and revenues of each WPP is equivalent to the costs and revenues of the consolidated project considered in the proposed report.

Considering all the parameters exposed, the WACC calculation corresponds to 10.18%, as can be demonstrated below:

WACC = Re x We + Rd x Wd x (1-Tc),

= 23.01% x 30% + 4.69% x 70% x (1-0)

= 10.18%

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

Input parameters used in the investment analysis, together with a description of how the values for these parameters were obtained, are presented in this section.

In order to obtain synergy and scale, project owners have opted to conduct all negotiations with main suppliers of the project (CAPEX and OPEX) considering all three wind power plants together. Consequently, the project could reach better (lower) prices for CAPEX and OPEX. For VCS additionality analysis, the financial analysis was carried out considering the consolidated project. This is a conservative approach once it assumes lower costs and scale obtained.

The cash flow of Folha Larga Sul Project is fully presented to the VBB (Validation and Verification Body) that will perform validation and to any entity linked to the VCS that request it for proving the project additionality.

Before presenting the main inputs taken into consideration in the equity cash flow, it is important to describe some comments on the assumptions adopted in the investment analysis that considered orientations of the CDM Executive Board (EB).

<u>General Features of the Investment Analysis and calculation of the Financial Indicator</u>

- **<u>Assessment Period:</u>** The cash flow considers an economic plant lifetime of 23 years which is in line with the Power Purchase Agreements. This agrees with the provisions of the CDM Methodological TOOL27: Investment Analysis, version 09.0. item 6, which defines that the IRR calculation must preferably reflect the expected operational lifetime of the project activity.

- **<u>The value of the assets of the project activity at the end of the assessment period:</u>** As the assessment period covers the whole 20 year expected operational lifetime of the project, no residual value should be considered.

- **<u>Depreciation:</u>** the period of assets depreciation is also 20 years according to guidance from the Manual of Power Sector Asset Control (*Manual de Controle Patrimonial do Setor*

Elétrico, page 209), published by ANEEL[28]. Because it is an accounting item which does not involve disbursements, depreciation was not considered for purposes of project IRR calculation.

- **Financial Analysis:** Financial analysis is presented for Folha Larga Sul Project.
- **Project IRR Calculation:** The purpose of the project IRR calculation is to determine the viability of the project to service debt. Aligned with item 14 of the CDM Methodological TOOL27: Investment Analysis, version 09.0, the cost of financing expenditures shall not be included in the calculation of project IRR in order to avoid double count of financing cost.
- **Operational Starting Date:** The cash flow considered the operation start date of the individual plants as presented at TABLE 1.
- **Nature of the Cash Flow:** The project cash flow has been performed in real terms, i.e. without considering the impact of inflation.

Sectoral Policies E-

In its twenty second meeting and referring to its decisions from EB 16 (CDM Executive Board Meeting 16), the CDM Executive Board reaffirmed that national and/or sectoral policies and circumstances are to be taken into account on the establishment of a baseline scenario, without creating perverse incentives that may impact host Parties' contributions to the ultimate objective of the Convention. Accordingly, the Board agreed to define E- policy as:

"National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs)"

Further the Board agreed that such policies should be addressed as follows:

E- Policies *"that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario (i.e. the baseline scenario could refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place).*

Accordingly, the Additionality Tool includes a footnote to the calculation of financial indicators in investment analysis which states that the inclusion of subsidies in investment analysis is subject to the guidance on such policies.

The importance of this concept has been reinforced by the CMP 5 in Copenhagen affirmed that *"it is the prerogative of the host country to decide on design and implementation of policies to*

[28] Source: ANEEL (2009). Manual de Controle Patrimonial do Setor Elétrico. Annex of Normative Resolution nº 367/2009, 02
June 2009. Available at: http://www.aneel.gov.br/cedoc/aren2009367_2_primeira_Ver.pdf. Last access on May 31th, 2019.

promote low greenhouse gas emitting technologies; and *the Executive Board shall ensure that its rules and guidelines do not create perverse incentives for emission reduction efforts.*

Some current Brazilian energy regulations effectively offer a set of regulatory and economic incentives that aim at promoting renewable electricity sources to guarantee country's electricity expansion based on renewable and low carbon emitting technologies.

The existence of these incentives requires their adequate treatment in the additionality assessment and specifically in the investment analysis. For this purpose, the following paragraphs identify and discuss the relevant regulations and define their treatment according to the rules and principles defined by EB 22.

Policy E-: Reduction of the Distribution/Transmission Fee (TUSD/TUST-G) for Complementary Renewable Energy sources.

Through Resolution N°745, of 22 November 2016[29], ANEEL established a discount of 50% of the applicable distribution/transmission fee (TUSD/TUST-G) for complementary renewable energy projects, such as wind power generation projects, with installed capacity injected in the grid between 30,000 kW and 300,000 kW.

This sectoral policy was established on 22 Nov 2016, and therefore after 11 November 2001. Thus, it represents a "*comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies"* and classifies as E- policy. Accordingly, the incentive shall not be considered for the baseline scenario and the investment analysis, taking into consideration the "*hypothetical situation without the national and/or sectoral policies or regulations being in place".*

Policy E-: Exemption of ICMS and IPI on WTG contracts

IPI stands for a tax over industrialized products and ICMS a tax for circulation of goods and services. Since 2009 the federal government agreed to exempt wind turbines from paying these taxes (CONVÊNIO ICMS 101/97)[30]. Considering that this policy is specific for wind turbines, or rather, the policy creates incentives for less GHG emission intensive technology (Type E- policy). So, the exemption of these taxes was not considered in the cashflow.

<u>Assumptions used in the Cash Flow</u>

After discussion about some assumptions according to CDM "Methodological tool Investment analysis", version 09.0., the inputs used in the project cash flow are presented below.

[29] ANEEL (2016). Normative Resolution n° 745, 22 November 2016. Available at: https://www2.aneel.gov.br/aplicacoes/audiencia/arquivo/2016/038/resultado/ren2016745.pdf. Last accessed: Oct 2019.
[30] CONVÊNIO ICMS 101/97. Available at < http://app1.sefaz.mt.gov.br/sistema/legislacao/legislacaotribut.nsf/07fa81bed2760c6b84256710004d3940/f219de0bc8dbf2ce832567940040cc22?OpenDocument>. Last accessed: June 2019.

Table 7 - Financial Assumptions

Item	Description	Unit	Values
Installed Capacity	Installed Capacity, as evidenced by Installation License of each entrepreneurship and by independent report issued by engineering company Camargo Schubert.	MW	• **Folha Larga Sul Project: 151,2**
Electricity generated for sale	It was considered the plant load factor of each plant supplied by independent report issued by engineering company Camargo Schubert.	MWh/year	• **Folha Larga Sul Project: 758,791**
Electricity Price	It was considered the electricity price contracted through ANEEL auctions (ACR), PPA (Power Purchase Agreements) and PLD (*Preço de Liquidação das Diferenças)*.	R$/MWh	• **Folha Larga Sul Project: 120.41**

Investment and Operational Costs			
Item	**Description**	**Unit**	**Values**
Investment (CAPEX)	Budgeted according to contracts and quotations established with Wind Turbine Generators Supplier (Vestas); Civil Works (Cortez Engenharia); Electric Works (Motrice Soluções, TSEA, Oengenharia, I.G. Transmissão e Distribuição); Owner Engineering (Hill International and Laureano e Meirelles Engenharia); Environment (Papyrus Consultoria Ambiental and Maron Consultoria); Advisory, Land and Insurance (Damous Incorporações e Construções LTDA);	R$	• **Folha Larga Sul Project: 836,301,197.44**
O&M Costs	Budgeted according to WTG Quotation between the Complex and the Supplier (Vestas). The cost is the same for each plant per year and this contract is expected to be renewed.	R$/year/ WTG	• **Folha Larga Sul Project: 242,318.61**
Other Operational Expenses	Budgeted according to the agreement between Vale and Casa dos Ventos, regarding the entire project, and internal Assumptions for General and Administrative Expenses, TUST, Aneel Supervision Taxes, Land Lease, Insurance and Environment.	R$/year	• **Folha Larga Sul Project: 8,317,490.28**

Taxes			
Item	**Description**	**Unit**	**Values**
PIS/COFINS	Budgeted as applicable Brazilian Law 10,637, Law 10,833 and Normative Instruction 247.	%	3.65 (Over Gross Revenue)
CSLL	Budgeted as applicable Brazilian Law 9,249 and Law 9,431	%	9.00 (Over 12% of the Gross Revenue)
IRPJ	Budgeted as applicable Brazilian Law 9,249 and Law 9,430 (up to income = R$ 240,000)	%	15.00 (Over 8% of the Gross Revenue)
IRPJ Additional	Budgeted as applicable Brazilian Law 9,249 and Law 9,430 (income > R$ 240,000)	%	10.00 (Over the income above R$240,000)

Investment analysis results

The Project Internal Rate of Return, in real terms, resulting of the cash flow based on the assumptions is presented in the table below:

Table 8 - Project Indicators X Benchmark

Project IRR	Benchmark (WACC)
6.26%	10.18%

The investment analysis was conducted according to option III of the "Tool for the demonstration and assessment of additionality" and the result shows that project's financial indicator is less favorable than the benchmark. Consequently, it can be concluded, that the project activity cannot be considered as financially attractive.

Sub-step 2d. Sensitivity analysis

The main variables that can affect the project's finances are (i) revenues of the project; (ii) CAPEX and (iii) O&M costs.

The sensitivity analysis considers only those scenarios that could contribute to increase economic and financial attractiveness of the project aiming to confirm how solid the analysis of sub-steps 2b and 2c are.

Given the investment analysis included all relevant scenarios that could, in any way, affect the additionality, and the -10% variation on the scenarios would only imply on even more additional outcomes, these scenarios were not reported at this project description.

It was also assessed the variation that would be required on the scenarios for the IRR to reach the benchmark. Only scenarios with positive variations were found. For this reason, this approach was considered conservative. Table below presents how changes in the main parameters affect project IRR.

Table 9 – Sensitivity Analysis

	Variation	IRR	To IRR= Benchmark
Revenues increase	10%	7.79%	26.29%
CAPEX reduction	10%	7.63%	24.53%
O&M costs decrease	10%	6.57%	Impossible value

Discussion about likelihood of each scenario is presented as follows.

Project Revenues:

The wind power project's revenue depends solely on two factors: the electricity generated and the electricity sales price, which will be discussed individually. They are in effect related, once uncertainties and variations in the electricity generation have an impact on the commercial conditions, electricity pricing and thus revenues and fines.

Part of the electricity of the project's plants were already sold in the Auction promoted by CCEE (*Câmara de Comercialização de Energia Elétrica*) and the prices are already established according to auction results, for the years of 2024 to 2043. Another part of the electricity to be generated by the plants was sold through bilateral agreements in the ACL, or *Ambiente de Contratação Livre*, and the resulting power purchase agreements are valid for different periods. The first one determines the price for the period between August 2020 to December 2022, and the second one determines the price for the period between January 2023 to December 2042. The remaining energy generated will be sold at the price determined for the PLD (Liquidation Price for the Differences – *Preço de Liquidação das Diferenças*). The PLD is variable, and determined ex ante, on a weekly basis, according to energy demand and hydrological conditions, by the CCEE. According to BNDES, for financing purposes, a reference price for the PLD of R$ 90,00 should be considered[31]. Therefore, variation on price is expected.

Regarding the volume of energy generated, the project is subject to significant variations and uncertainties. The quantity of electricity sold is very close to total load factors. To reach the benchmark an increase of 26.29% in revenues over the course of the entire WPP's activity would be necessary.

According to the generation monitoring reports, published by Brazil's National Interconnected System Operator[32] (Operador Nacional do Sistema Elétrico – ONS), the average deviation from

[31] https://web.bndes.gov.br/bib/jspui/handle/1408/17480 chapter 5.

[32] ONS Report "Boletim Mensal de Geração Eólica". From October 2018 to September 2019, available at:
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica-set_2019.pdf>
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica_ago2019.pdf>
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim%20Mensal%20de%20Gera%C3%A7%C3%A3o%20E%C3%B3lica%202019-07.pdf>
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim%20Mensal%20de%20Gera%C3%A7%C3%A3o%20E%C3%B3lica%202019-06.pdf>
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim%20Mensal%20de%20Geração%20Eólica%202019-05.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim%20Mensal%20de%20Gera%C3%A7%C3%A3o%20E%C3%B3lica%202019-04.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica_mar%C3%A7o_%202019.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_%20E%C3%B3lica_fev_%202019.pdf>.

the electricity expected (based on plant load factors) and real electricity generated of all plants of the North-eastern Submarket of the Brazilian interconnected System is 5.44%, for the period of October 2018 to September 2019.

It is also important to consider that deviations from estimated generation can vary according to local geomorphologic factors, seasonal factors, and between years. Hence, it is worth noting that even the scenario of revenue generation increase of 10% in the sensitivity analysis is unlikely to be maintained for such a long period.

<u>CAPEX</u>

CAPEX represents the most important investment of the enterprise. At the time of this VCS Project Description, the major components of the CAPEX were already contracted or budgeted. Thus, CAPEX reduction scenario is very unlikely. To reach the benchmark, it would be necessary a reduction of 24.53% in the CAPEX, an impossible scenario.

<u>O&M Costs</u>

The result of the sensitivity analysis shows that a 10% reduction in O&M Costs when compared to the base case assumption would not materially affect the Project's return. Even if the O&M cost was disregarded (O&M Cost = 0), Equity IRR would not reach the benchmarking.

Thus, it is unlikely that these items may undergo changes that contribute with an increase in the economic and financial attractiveness that is not covered by the variation range between 0 and 10%. In addition, all negative variation on these items would imply in an even more additional scenario, or less economic and financial attractive scenarios. Therefore, the variation range between 0 and 10% cover all relevant scenarios that could, in any way, affect the additionality of the project.The tool for demonstration and assessment of additionality indicates that: If after the sensitivity analysis it is concluded that the proposed project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive, then proceed to Step 3 (Barrier analysis)."

This way, as the sensitivity analysis showed that the proposed activity is unlikely to be financially/economically attractive, it must proceed to Step 3 (Barrier analysis).

Step 3. Barrier analysis

This step is optional and was not applied for this project. Continue to step 04.

<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_E%C3%B3lica_jan_2019.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica_dez_2018.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica_nov_%202018.pdf>.
<http://www.ons.org.br/AcervoDigitalDocumentosEPublicacoes/Boletim_Eolica_out_2018.pdf>.
Last access: Oct 29th, 2019.

Step 4. Common practice analysis

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

The common practice analysis follows the stepwise approach suggested by CDM TOOL24: “Common practice”, version 03.1. Each step and respective result are presented below:

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

Outcome: The installed capacity of Folha Larga Sul Project is 151.2 MW. Therefore, the capacity range applicable is from 75.6 MW to 226,8 MW.

- Step 2: identify similar projects (both CDM and non-CDM) which fulfil all the following conditions:

(a) The projects are located at the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Outcome:

To develop this step, the following procedure was applied:

All operational plants connected to the Grid. Source were identified at ANEEL database[33].

Selection of renewable plants (applying the same measure).

Considering the Start date of the Project Activity as the day the plant begins to operate (August 1st, 2020), all renewable plants that are in operation were selected.

[33] ANEEL, 2019. Available at: http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.cfm

Only plants with the capacity output calculated on STEP 1 were selected (75.6 MW to 226.8 MW).

For Wind Power Plants, a database supplied by ABEEÓLICA was used. Through this database, all WPP projects were identified. Some projects group several plants as they are closely located, share the same developer, suppliers and overall conditions. They could be compared to the Folha Larga Sul Wind Power Plant Project. At ANEEL database, operational plants of each project are presented solely based on their registration conditions, disregarding projects that group two or more WPPs. The plants identified under a joint project group at ABEEÓLICA database were crosschecked with the information at ANEEL database.

The outcome is presented at the table below:

Table 10 – Outcome Step 2

Energy Source	**Plant**	**Operational Starting Date**	**Installed Capacity (MW)**	**Number**
Biomass	Eldorado Brasil	12/09/2013	214,1	**1**
Biomass	Suzano Mucuri (Antiga Bahia Sul)	01/03/1992	214,1	**2**
Biomass	Aracruz	01/05/2002	210,4	**3**
Biomass	Fibria - MS (Antiga VCP - MS)	07/04/2009	175,1	**4**
Biomass	Porto das Águas	18/11/2011	160,0	**5**
Biomass	Eldorado	04/06/2011	140,0	**6**
Biomass	Barra Bioenergia	15/07/2010	136,0	**7**
Biomass	Cocal II	07/01/2010	131,3	**8**
Biomass	Santa Luzia I	02/12/2010	130,0	**9**
Biomass	Caçú I	29/07/2010	130,0	**10**
Biomass	Veracel	02/01/2006	126,6	**11**
Biomass	Caarapó	14/05/2010	114,0	**12**
Biomass	Klabin	01/01/1961	113,3	**13**
Biomass	Usina Bonfim	12/06/2010	111,0	**14**
Biomass	Conquista do Pontal	22/07/2010	110,0	**15**
Biomass	Bahia Pulp (Antiga Bacell)	-	108,6	**16**
Biomass	Jataí	28/02/2013	105,0	**17**
Biomass	Delta	01/12/2001	101,9	**18**
Biomass	Cenibra	01/01/1976	100,0	**19**
Biomass	Vale do Rosário	01/06/1994	97,0	**20**
Biomass	Angélica	18/03/2009	96,0	**21**

Biomass	Chapadão Agroenergia	01/11/2012	92,0	**22**
Biomass	Mandu	19/06/2006	90,0	**23**
Biomass	LDC Bioenergia Rio Brilhante (Antiga Louis Dreyfus Rio Brilhante)	02/04/2009	90,0	**24**
Biomass	Moema	01/01/1994	89,0	**25**
Biomass	LDC Bioenergia Lagoa da Prata (Antiga Louis Dreyfus Lagoa da Prata)	25/04/2009	85,0	**26**
Biomass	Santa Cruz AB (Antiga Ometto)	22/05/2009	84,0	**27**
Biomass	São José Colina	23/09/2008	83,0	**28**
Biomass	Santa Juliana	09/09/2010	82,0	**29**
Biomass	Ferrari	01/01/1982	80,5	**30**
Biomass	São José	01/05/1994	80,3	**31**
Biomass	Quirinópolis	22/11/2007	80,0	**32**
Biomass	Boa Vista	22/07/2008	80,0	**33**
Biomass	Equipav II	19/12/2008	80,0	**34**
Biomass	Tropical Bioenergia	12/11/2009	80,0	**35**
Biomass	Amandina	10/06/2014	80,0	**36**
Biomass	Pedro Afonso	25/09/2013	80,0	**37**
Biomass	Unidade de Bioenergia Costa Rica	22/11/2011	79,8	**38**
Biomass	Unidade de Bioenergia Água Emendada	24/01/2013	79,8	**39**
Biomass	Gasa	01/01/1996	78,0	**40**
Biomass	Ipaussu Bioenergia	09/11/2011	76,0	**41**
Hydro Power Plant	Passo Fundo	30/03/1973	226,0	**42**
Hydro Power Plant	Cachoeira Caldeirão	05/05/2016	219,0	**43**
Hydro Power Plant	Samuel	17/07/1989	216,8	**44**
Hydro Power Plant	Funil	20/03/1970	216,0	**45**
Hydro Power Plant	Serra do Facão	13/07/2010	212,6	**46**
Hydro Power Plant	Igarapava	31/12/1998	210,0	**47**
Hydro Power Plant	Manso	29/11/2000	210,0	**48**
Hydro Power Plant	Amador Aguiar II (Antiga Capim Branco II)	09/03/2007	210,0	**49**
Hydro Power Plant	Mascarenhas	21/09/1973	198,0	**50**
Hydro Power Plant	Garibaldi	24/09/2013	191,9	**51**
Hydro Power Plant	Salto Pilão	11/12/2009	191,9	**52**
Hydro Power Plant	Ilha dos Pombos	01/01/1924	187,2	**53**
Hydro Power Plant	Paulo Afonso I	30/12/1964	180,0	**54**
Hydro Power Plant	Funil	30/12/2002	180,0	**55**
Hydro Power Plant	Jacuí	01/01/1962	180,0	**56**
Hydro Power Plant	Ponte de Pedra	19/07/2005	176,1	**57**
Hydro Power Plant	Pedra do Cavalo	16/12/2004	160,0	**58**
Hydro Power Plant	Passo Real	01/01/1973	158,0	**59**
Hydro Power Plant	Itiquira (Casas de Forças I e II)	06/11/2002	157,4	**60**
Hydro Power Plant	Bariri (Álvaro de Souza Lima)	26/12/1969	143,1	**61**

Hydro Power Plant	Barra Bonita	20/05/1963	140,8	**62**
Hydro Power Plant	Risoleta Neves (Antiga Candonga)	07/09/2004	140,0	**63**
Hydro Power Plant	Guilman Amorim	02/11/1997	140,0	**64**
Hydro Power Plant	Baguari	09/09/2009	140,0	**65**
Hydro Power Plant	Fontes Nova	01/01/1940	132,0	**66**
Hydro Power Plant	Ibitinga	20/04/1969	131,5	**67**
Hydro Power Plant	Castro Alves	04/03/2008	130,0	**68**
Hydro Power Plant	Monte Claro	29/12/2004	130,0	**69**
Hydro Power Plant	Corumbá IV	01/04/2006	129,2	**70**
Hydro Power Plant	Dona Francisca	05/02/2001	125,0	**71**
Hydro Power Plant	Jauru	06/06/2003	121,5	**72**
Hydro Power Plant	Fundão	23/06/2006	120,2	**73**
Hydro Power Plant	Santa Clara	31/07/2005	120,2	**74**
Hydro Power Plant	Guaporé	08/04/2003	120,0	**75**
Hydro Power Plant	Quebra Queixo	31/12/2003	120,0	**76**
Hydro Power Plant	Salto	25/05/2010	116,0	**77**
Hydro Power Plant	Porto Estrela	04/09/2001	112,0	**78**
Hydro Power Plant	Euclides da Cunha	07/12/1960	108,8	**79**
Hydro Power Plant	Queimado	16/06/2004	105,0	**80**
Hydro Power Plant	Salto Grande	01/01/1956	102,0	**81**
Hydro Power Plant	Jurumirim (Armando Avellanal Laydner)	21/09/1962	101,0	**82**
Hydro Power Plant	14 de Julho	25/12/2008	100,0	**83**
Hydro Power Plant	Pereira Passos	01/01/1962	99,9	**84**
Hydro Power Plant	Corumbá III	24/10/2009	96,4	**85**
Hydro Power Plant	Salto do Rio Verdinho	06/07/2010	93,0	**86**
Hydro Power Plant	Barra dos Coqueiros	19/06/2010	90,0	**87**
Hydro Power Plant	Paraibuna	20/04/1978	87,0	**88**
Hydro Power Plant	Retiro Baixo	03/03/2010	83,7	**89**
Hydro Power Plant	Canoas I	09/05/1999	82,5	**90**
Hydro Power Plant	Caconde	22/08/1966	80,4	**91**
Hydro Power Plant	Coaracy Nunes	30/12/1975	78,0	**92**
Hydro Power Plant	Sá Carvalho	01/01/1951	78,0	**93**
Hydro Power Plant	Passo São João	24/03/2012	77,0	**94**
Wind power plant	Alegria II	30/12/2011	100,7	**95**
Wind power plant	Amontada	20/08/2014	75,6	**96**
Wind power plant	Areia Branca	09/12/2014	90,0	**97**
Wind power plant	Assuruá	05/04/2016	110,5	**98**
Wind power plant	Atlântica	17/01/2009	124,9	**99**
Wind power plant	Baixa do Feijão	21/05/2106	120,0	**100**
Wind Power Plant	Bloco Sul	27/08/2016	126,0	**101**
Wind Power Plant	Cacimbas	10/05/2018	86,1	**102**

Wind Power Plant	Calango	01/01/2016	180,0	**103**
Wind Power Plant	Caldeirão I	19/07/2017	118,8	**104**
Wind Power Plant	Campo dos Ventos	23/06/2016	105,6	**105**
Wind Power Plant	Corredor do Senandes	11/04/2015	108,0	**106**
Wind Power Plant	Delfina	31/10/2017	180,0	**107**
Wind Power Plant	Echo 1	04/05/2012	87,6	**108**
Wind Power Plant	Echo 2	02/03/2016	128,0	**109**
Wind power plant	Echo 4	07/12/2017	83,6	**110**
Wind power plant	Eurus	29/03/2014	95,0	**111**
Wind Power Plant	Faisa	30/10/2014	136,5	**112**
Wind Power Plant	Fontes dos Ventos	04/02/2015	79,9	**113**
Wind Power Plant	Itarema	01/01/2016	207,0	**114**
Wind Power Plant	Lagoa do barro	27/10/2018	195,0	**115**
Wind Power Plant	Morro dos ventos	29/03/2014	116,4	**116**
Wind Power Plant	Morrinhos	01/11/2015	180,0	**117**
Wind power plant	Praia Formosa	26/08/2009	105,0	**118**
Wind Power Plant	Riachão	27/06/2015	145,8	**119**
Wind Power Plant	Santa Vitória do Palmar	27/12/2016	207,0	**120**
Wind Power Plant	São Miguel do Gostoso	20/06/2017	108,0	**121**
Wind Power Plant	Serra azul	14/11/2015	118,0	**122**
Wind Power Plant	Statkraft Bahia	06/07/2012	95,2	**123**
Wind Power Plant	Tianguá	07/10/2016	130,1	**124**
Wind Power Plant	Vamcruz	05/12/2105	93,0	**125**
Wind Power Plant	Ventos de Santa Brígida	01/12/2015	181,9	**126**
Wind Power Plant	Ventos de Santo Augusto	24/03/2017	88,1	**127**
Wind Power Plant	Ventos de São Clemente	01/05/2016	216,1	**128**
Wind Power Plant	Ventos do araripe 3	24/12/2016	112,7	**129**
Wind Power Plant	Ventos do Piauí I	02/08/2017	205,8	**130**
Wind Power Plant	Morro do Chapéu	10/11/2017	203,7	**131**
Wind Power Plant	Renascença	01/12/2014	150,00	**132**
Wind Power Plant	Santa Clara	01/03/2014	180,00	**133**
Wind Power Plant	Serra da Babilônia	12/12/2108	223,25	**134**

- Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall.

Outcome: Thirty (30) plants were identified as CDM Project (Biomass Power Plants Vale do Rosário and Moema, Hydro Power Plants Mascarenhas, Pedra do Cavalo, Baguari, Monte Claro, Fundão, Santa Clara and 14 de Julho, and Wind Power Plants Amontada, Areia Branca, Atlântica, Calango, Caldeirão I, Campo dos Ventos, Corredor do Sernandes, Echo 1, Echo 2, Eurus, Faisa, Fontes dos Ventos, Morro do Chapéu, Morro dos Ventos, Riachão, São Miguel do Gostoso, Serra Azul, Statkraft Bahia, Vamcruz, Renascença and Santa Clara).

Therefore Nall = 104.

- Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number Ndiff.

Outcome: Forty six (46) plants are hydro power plants and thirty nine (39) are thermoelectrics (Biomass). Therefore $N_{diff} = 85$.

- Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

Outcome: F = 1 – 85/104 = 0.1827

According to the Tool, the project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3.

F = 0.1827 and N_{all}-N_{diff} = 19, therefore, the project activity is not a common practice.

After following all steps, it can be concluded that the project is additional.

2.6 Methodology Deviations

Not applicable. There is no methodology deviation in this project.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$ **Equation 01**

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS 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" (t CO_2/MWh)

If the project activity is the installation of a Greenfield power plant, then:

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

Equation 02

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

Calculation of Combined margin CO_2 emission factor for grid connected power generation in year ($EF_{grid,CM,y}$)

According to the "Tool to calculate the emission factor for an electricity system", version 07.0, Project participants shall apply the following six steps:

(a) **Step 1:** Identify the relevant electricity systems;

(b) **Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);

(c) **Step 3:** Select a method to determine the operating margin (OM);

(d) **Step 4:** Calculate the operating margin emission factor according to the selected method;

(e) **Step 5:** Calculate the build margin (BM) emission factor;

(f) **Step 6:** Calculate the combined margin (CM) emission factor.

In this section, project participants describe how these six steps are applied to this project:

(a) **Step 1:** Identify the relevant electricity systems;

According to the tool, “if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD”.

Brazilian DNA defined in 2008, through the resolution nº 8, that the National Interconnected System should be considered a unique electricity system and that this configuration is valid for calculating the CO2 emission factors used to estimate the greenhouse gases emissions reductions electricity generation VCS projects.

(b) **Step 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.

The option I was chosen for the project activity, once the operation margin and build margin emission factor calculated by the Brazilian DNA or alternatively calculated by the project developer are based on data of plants connected to the grid.

(c) **Step 3:** Select a method to determine the operating margin (OM);

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

(a) Simple Operation Margin; or

(b) Simple adjusted Operation Margin; or

(c) Dispatch data analysis Operation Margin; or

(d) Average Operation Margin.

The method chosen for the calculation of operation margin emission factor for the project is the dispatch data analysis operation margin method.

(d) **Step 4:** Calculate the operating margin emission factor according to the selected method;

The method chosen for the calculation of the operation margin emission factor of this project was the dispatch data analysis.

The calculation of the Operation Margin emission factor follows the method by dispatch data analysis (EFgrid,OM-DD,y) and it is calculated and defined by the Brazilian DNA in accordance with the dispatch data supplied by ONS - National System Operator.

According to the "tool to calculate the emission factor for an electricity system", for the dispatch data analysis OM it must be used the year in which the project activity displaces grid electricity and the emission factor must be updated annually during monitoring. This way, data are ex-post.

(e) **Step 5:** Calculate the build margin emission factor

In terms of data vintage, project participants can choose between one of the following two options:

<u>Option 1.</u> 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.

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

The option that was chosen by project participants was Option 2.

(f) **Step 6:** Calculate the combined margin (CM) emission 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 Combined Margin; or

(b) Simplified Combined Margin.

This Project uses option (a) to calculate the combined margin emission factor. The combined margin emission factor is calculated according to the following equation:

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

Equation 03

Where:

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

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

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

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

The "*Tool to calculate the emission factor for an electricity system"* recommends that the following default values should be used for W_{OM} and W_{BM}:

Wind and Solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

All other projects: W_{OM} = 0.5 and W_{BM} = 0.5 for the first crediting period, and W_{OM} = 0.25 and W_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

This way, for the first crediting period of this project, it was adopted the following weights: W_{OM} = 0.75 and W_{BM} = 0.25.

3.2 Project Emissions

According to ACM0002: "Grid-connected electricity generation from renewable sources" (version 19.0), for most renewable energy power generation project activities, PE_y = 0. This is applied to grid-connected wind power plants as the enterprises of Folha Larga Sul Renewable Energy.

3.3 Leakage

No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

3.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ **Equation 04**

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)

Baseline Emissions Calculations

As presented on section 3.1, the baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$ **Equation 05**

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS 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" (t CO_2/MWh)

As **Folha Larga Sul Renewable Energy** only comprises greenfield wind power plants, then:

$$EG_{PJ,y} = EG_{facility,y}$$ **Equation 06**

For the period 01/08/2020 to 01/08/2030, $EG_{facility,y}$ was estimated as the product between Installed Capacity of Each Plant, Plant Load Factor and the number of hours per year (8,760 hours per year). Table below shows the estimation of $EG_{facility}$ for this period.

Table 11 - EGfacility Estimation

WPPs	Installed Capacity (MW) (A)	Plant Load Factor (%) (B)	EGfacility,y Estimation C = A x B x 8,760 (MWh)
Ventos de São Januário 20	50.4	57.7	254,736.00
Ventos de São Januário 21	50.4	57.4	253,390.00
Ventos de São Januário 22	50.4	56.8	250,665.00
Total			758,791.00

To calculate the combined margin emission factor, the following equation is used.

$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$$ **Equation 07**

Where:

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

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

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

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

For this first crediting period of the project, WOM = 0.75 and WBM = 0.25.

For ex-ante emission reductions estimations from 01/08/2020 to 31/07/2030, $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ for 2018 were used. This is the latest information available.

For both years, these parameters were calculated by Brazilian DNA[34].

The values are:

$EF_{grid,OM,2018}$ = 0.5390 tCO_2e/MWh

$EF_{grid,BM,2018}$= 0.137 tCO_2e/MWh

Applying these values to Equation 03,

$EF_{grid,CM}$,2018 = 0.75 X 0.5390 + 0.25 X 0.137 = **0.4385 tCO_2/MWh**.

Applying estimation of annual E_{GPJy} to equation 02, BE_y = 758,791 MWh X 0.4385 tCO2e/MWh = 332,753 tCO_2e/year.

[34] Source: MCTI, 2019. http://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/index.html . Accessed on May, 2019.

As this project does not present any emission nor leakage, net emission reduction is equal to baseline emissions as presented in the table below.

Table 12 - Emission Reduction Estimation

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2020	139,483	0	0	139,483
2021	332,753	0	0	332,753
2022	332,753	0	0	332,753
2023	332,753	0	0	332,753
2024	332,753	0	0	332,753
2025	332,753	0	0	332,753
2026	332,753	0	0	332,753
2027	332,753	0	0	332,753
2028	332,753	0	0	332,753
2029	332,753	0	0	332,753
2030	193,270	0	0	193,270
Total	3,327,530	0	0	3,327,530

4 MONITORING

4.1 Data and Parameters Available at Validation

No data and Parameters were necessary and available at validation.

4.2 Data and Parameters Monitored

Table 7 – Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
Source of data	Project activity site: meters at substations Folha Larga Sul, Folha Larga Fase 1 and Senhor do Bonfim II, as determined by TOOL05
Description of measurement methods and procedures to be applied	Electricity Meters installed at the grid interface to monitor net electricity exported to the grid, at the point of connection of the wind power plants to the Substation Folha Larga Sul to measure gross electricity and at the Board line of the Substation Folha Larga Fase 1 to measure electricity losses at the transmission lines. The net electricity delivered to the grid will be prorated between wind power plants considered the gross electricity generated and the energy losses at the transmission lines.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied	758,791.00 MWh (for a complete year)
Monitoring equipment	At substation Folha Larga Sul there are eight meters (four rear and four principal) that registers gross electricity from the Wind Power Plants. At substation Folha Larga Fase 1 there are six meters (three principal and three rear) that registers the energy received at and delivered from the substation. At the substation Senhor do Bonfim II, there are two meters (one principal and one rear) that register net electricity supplied to the grid by all Wind Power Plants. Class, precision and calibration procedures of the meters shall follow Electricity Commercialization Chamber (*Câmara de Comercialização de Energia Elétrica* in Portuguese - CCEE) Guidelines and Procedures.
QA/QC procedures to be	The uncertainty level for these data is low. The electricity supplied to the grid is monitored by the project participants directly from the meters. Generation Operating Center (*Centro de Operação da*

applied	*Geração – COG*, in Portuguese), located in Ceará, and the regulatory team, located in São Paulo, supports measurement data collection. Commercial team cross-checks monthly data collected from the meters managed by COG and the regulatory team, and data provided by CCEE's Website. Meters are calibrated according to CCEE Procedures.
Purpose of data	Calculation of baseline emissions
Calculation method	Eight specific meters are located at the Substation Folha Larga Sul that registers gross electricity generated by all plants; six specific meters are located at the Substation Folha Larga Fase 1 that registers the electricity received (a pair of meters register energy received from the substation Folha Larga Sul specifically, and the two other pairs register energy received from other projects); and two specific meters are located at the Substation Senhor do Bonfim II that registers net electricity generated by all plants to the Grid. The net electricity delivered to the grid will be prorated between all wind power plants, considered the gross electricity registered by each Wind Power Plant, the energy received from the substation Folha Larga Sul at Substation Folha Larga Fase 1 and the energy received from Substation Folha Larga Fase 1 at Substation Senhor do Bonfim II.
Comments	CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

Data / Parameter	$EF_{Grid,BM,y}$
Data unit	tCO2e/MWh
Description	Build margin emission factor for the grid in year y
Source of data	The build margin emission factor $EF_{Grid,BM,y}$ is supplied by Brazilian Designated National Authority of the CDM (Brazilian DNA).
Description of measurement methods and procedures to be applied	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 ex-ante emission reductions estimations from 01/08/2020 to 31/07/2030, $EF_{grid,BM,y}$ for 2018 was used. This is the latest information available. This parameter was calculated by Brazilian DNA.
Frequency of monitoring/recording	Annually
Value applied	0.137 tCO_2e/MWh from 2020 to the end of the crediting period.

Monitoring equipment	Not applicable
QA/QC procedures to be applied	As per the “Tool to calculate the emission factor for an electricity system”.
Purpose of data	Calculation of baseline emissions
Calculation method	As per the “Tool to calculate the emission factor for an electricity system”. Dispatch Data Analysis for BM Building Margin Emission Factor. Data supplied by Brazilian CDM DNA will be used.
Comments	More information was described on item 3.

Data / Parameter	$EF_{Grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Operating margin emission factor for the grid in year y
Source of data	The operating margin emission factor $EF_{grid,OM,y,}$ data is supplied by Brazilian Designated National Authority of the CDM (Brazilian DNA).
Description of measurement methods and procedures to be applied	As Folha Larga Sul Renewable Energy uses Dispatch data analysis OM method for operating margin emission factor, $EF_{grid,OM,y}$ is calculated ex post. For ex-ante emission reductions estimations from 01/08/2020 to 31/07/2030, $EF_{grid,OM,y}$ for 2018 was used. This is the latest information available. This parameter was calculated by Brazilian DNA.
Frequency of monitoring/recording	Monthly
Value applied	0.5390 tCO_2e/MWh from 2020 to the end of the crediting period.
Monitoring equipment	Not applicable
QA/QC procedures to be applied	As per the “Tool to calculate the emission factor for an electricity system”.
Purpose of data	Calculation of baseline emissions
Calculation method	As per the “Tool to calculate the emission factor for an electricity system”. Dispatch Data Analysis for OM Operating Margin Emission Factor. Data supplied by Brazilian CDM DNA will be used.
Comments	More information was described on item 3.

Data / Parameter	$EF_{Grid,CM,y}$
Data unit	tCO_2e/MWh
Description	Combined margin emission factor for the grid in year y
Source of data	The combined margin emission factor will be calculated using the procedures of the "Tool to calculate the emission factor for an electricity system", version 07.0. $EF_{grid,OM,y,}$ and $EF_{grid,\ BM,y}$ data will be supplied by Brazilian Designated National Authority of the CDM (Brazilian DNA). The combined margin emission factor used on the Project will be calculated based on data of National Interconnected System supplied by Brazilian DNA.
Description of measurement methods and procedures to be applied	As per the "Tool to calculate the emission factor for an electricity system". For this the first crediting period of the project, WOM = 0.75 and WBM = 0.25. As Folha Larga Sul Renewable Energy uses Dispatch data analysis OM method for operating margin emission factor, $EF_{grid,OM,y}$ is calculated ex post. 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 ex-ante emission reductions estimations from 01/08/2020 to 31/07/2030, $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ for 2018 were used. This is the latest information available. These parameters were calculated by Brazilian DNA.
Frequency of monitoring/recording	Annually
Value applied	0.4385 tCO_2e/MWh from 2020 to the end of the crediting period.
Monitoring equipment	Not applicable
QA/QC procedures to be applied	As per the "Tool to calculate the emission factor for an electricity system".
Purpose of data	Calculation of baseline emissions
Calculation method	As per the "Tool to calculate the emission factor for an electricity system". Dispatch Data Analysis for OM Operating Margin Emission Factor. Data supplied by Brazilian CDM DNA will be used.
Comments	More information was described on item 3.

4.3 Monitoring Plan

Monitoring has the objective of measuring the emission reductions achieved by the project. The monitoring plan follows the Monitoring Methodology of consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 19.0. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards. The main parameters that will be monitored are:

- $EG_{facility,y}$ - Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr);
- Combined margin emission factor for the grid in year y ($EF_{Grid,CM,y}$)

Monitoring of EGfacility,y

Operation and Maintenance (O&M) team is responsible for the operation and maintenance activities of the plants that compose Folha Larga Sul Power Plants. Generation Operating Center (*Centro de Operação da Geração – COG*, in Portuguese) and the regulatory team are responsible for measurement activities. They collect and store all measurement data. Data is collected in real time.

The COG and the regulatory team are responsible for monitoring and analysing $EG_{facility,y.}$ information. They monitor data provided by the meters and cross-check it with information provided by Electricity Commercialization Chamber (CCEE).

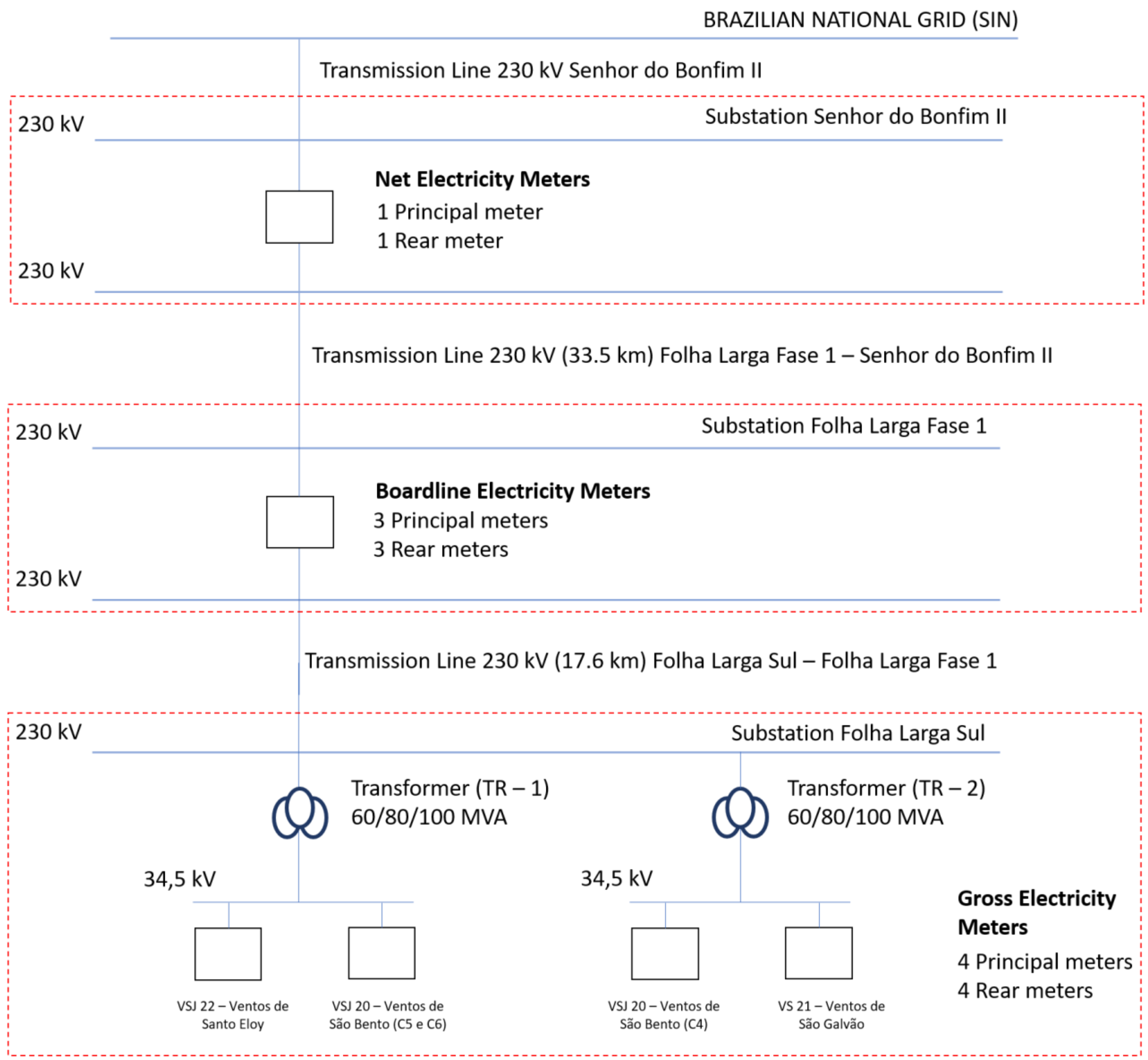
Substation Folha Larga Sul has eight measurement instruments (meters), four principal and four rear, to measure gross electricity generated by each Wind Power Plant. There are also two Transformers (34.5 to 230kV – 60/80/100 MVA) at Substation Folha Larga Sul.

Energy registered at substation Folha Larga Sul is then directed to Substation Folha Larga Fase 1 through a transmission line (230kV – 17,6 km). Substation Folha Larga Fase 1 also receives energy from other facilities outside the project boundary, for this reason there are three principle and three rear meters which enable an independent measurement of the amount of energy delivered by each facility, named board line meters.

Energy from Substation Folha Larga Fase 1 is then conducted through another transmission line (230kV – 33,5 km) to substation Senhor do Bonfim II. Net electricity supplied to the grid ($EG_{facility,y}$) by Folha Larga Sul Project is controlled by two meters (one principal and one rear). These meters also include energy generated by facilities outside the project boundary. The total amount dispatched to the SIN monitored by these meters will be prorated between each project facility according to the proportional amount of electricity generation measured in the previous connection points.

CCEE Guidelines and Procedures defines the calibration frequency and other maintenance procedures[35]. All meters of the plants are calibrated according to Brazilian Standards. In addition, a specific software will be responsible for collecting, treating and storing of the data. This procedure will occur every semester, and will be performed by a certified company hired by the O&M team.

Diagram below shows the measurement scheme of the project:



[35] Please, see the documents bellow for the procedures mentioned:
<http://www.ons.org.br/%2FProcedimentosDeRede%2FM%C3%B3dulo%2012%2FSubm%C3%B3dulo%2012.3%2FSubm%C3%B3dulo%2012.3%202016.12.pdf>. Last access on December 2019.
<http://www.ons.org.br/%2FProcedimentosDeRede%2FM%C3%B3dulo%2012%2FSubm%C3%B3dulo%2012.5%2FSubmodulo%2012.5_Rev_1.0.pdf>. Last access on December 2019.

In the Diagram, 6 turbines from the Wind power plant Ventos de São Januário 20 are connected to each transformer on Substation Folha Larga Sul (groups C5 and C6 are composed by three turbines each, and goup C4 is composed by the other six turbines).

It is important to state that net electricity supplied to the grid impacts directly the revenues of the plants once electricity is the main product of the project. Therefore, a straight control is performed about this information.

Monitoring of $EF_{Grid,CM,y}$

The Combined margin emission factor for the grid in year y is calculated by consulting company hired by project proponents. Calculations follows Tool to calculate the emission factor for an electricity system, version 07.0 as described on section 02. Data supplied by Brazilian CDM DNA will be used.

5 SAFEGUARDS

5.1 No Net Harm

The environmental impact assessment is part of the environmental licensing, which is a legal obligation in Brazil. Before construction phases, some impacts were identified at the Simplified Environmental Report (*Relatório Ambiental Simplificado* in Portuguese - RAS) and monitoring programs were designed to mitigate these impacts.

At this section, project proponents present negative environmental and social impacts identified at the Simplified Environmental Report and Environmental Impact Report, and actions planned to its mitigation. It is worth pointing out that main impacts of the project were identified as positive impacts but are not mentioned in this section.

The negative impacts identified for the project are:

- Erosion and soil compaction;
- Alteration on air quality;
- Interference on Authorized areas for mining concessions;
- Reduction of carbon stock and sequestration;
- Interference in rural establishments;
- Local landscape modification;
- Interference on water resources;
- Temporary or permanent modifications on soil usage;
- Pollution from dust, solid residues and wastewaters;

- Increase in noise levels;
- Loss of vegetated area and associated biodiversity, including species protected by environmental laws;
- Affectation of refuge areas;
- Interference in legally protected areas, such as legal reservations, permanently protected areas and conservation unities;
- Effects from habitat fragmentation;
- Alteration or suppression of existing vegetation;
- Changes in the fauna's habitats and habits;
- Fauna dislodgement;
- Interruption of Animal's migration routes;
- Modifications in qualitative and quantitative spatial species distribution;
- Flying species collision risks against the wind turbine generator tower and blades;
- Expectation of the population in relation to the project;
- Land lease/acquisition from population;
- Interference in soil usage;
- Interference in areas of ecological interest, traditional communities, historical, cultural or archaeological values as well as in protected areas;
- Land conflicts;
- Loss of livelihood resources;
- Interference or relocation in infrastructure and public equipment;
- Changes in the daily life of resettled population that used to live near the project site, including social, cultural and psychological aspects;
- Alterations in social structure and local economy due to immigration of manpower employed on wind power plants construction, considered its demobilization once the project is concluded.
- Vehicles traffic rises;

To mitigate these impacts, several actions were planned in the Simplified Environmental Report (RAS). The main actions are presented as follows:

- Reposition of legal reserve;
- Land lease/acquisition plan and environmental regularization;
- Environmental education for the local community and manpower involved in the project;
- Management of solid residue Program;
- Social Communication Program;
- Socioenvironmental compensation Programs;
- Traffic control and signalization program;
- Noise monitoring and control program;
- Flora recovery program;
- Dust monitoring and control program;
- Birdlife and Chiropterofauna Monitoring Plan;
- Wildlife Rescue Program.

5.2 Environmental Impact

The environmental licensing is a legal obligation prior to the installation of any entrepreneurship or activity potentially pollutant or degrading to the environment in Brazil. Social participation in decision making through Public Meetings as an important characteristic of licensing process in Brazil.

The obligation of environmental licensing in Brazil is shared by State Environmental Organs and by Ibama – *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* in Portuguese (Brazilian Institute of Environment and Renewable Natural Resources), as part of SISNAMA – *Sistema Nacional de Meio Ambiente* in Portuguese (National Environmental System).

Institute of Environment and Water Resources of Bahia State (INEMA - Bahia) is responsible for environmental licensing of the wind power plants of Folha Larga Sul Project. At the time of this Project Description elaboration, all plants have Installation Licenses issued. The number and validity of each Installation License was presented on section 1.11 of this report.

The process of environmental licensing has three different phases: Prior Licensing, Installation Licensing and Operation Licensing. Prior License (LP) does not authorize the installation of the project. It approves the environmental viability of the project and authorizes its location and technological conception. Besides, it establishes the conditions to be considered in the development of the executive project. The Installation License (LI) authorizes the start of the entrepreneurship construction. The deadline for this license is established by the timetable of the project construction, which cannot be superior to 6 (six) years.

The Operation License (LO) must be requested before the entrepreneurship begins its operation, once it authorizes the start up. Its issuance is conditioned to an inspection to verify whether all the demands and technical details described in the project approved were developed. It is also verifies if they are according to what is expected in the LP and LI. During the licensing process, some entities as Federal Entities Historic Heritage Management (*Órgãos Federais de Gestão do Patrimônio Histórico* – IPHAN), Indigenous National Foundation (FUNAI), Traditional Quilombolas Communities (Fundação Palmares), Health National Foundation (FUNASA) are consulted.

To subsidize the LO phase, the entrepreneur elaborates a group of reports, describing the execution of the environmental programs and mitigating measures expected in the phases of LP and LI.

Potential negative impacts of the plants and actions planned to mitigate them were presented on section 5.1. In this section, we also present positive impacts of the projects identified on Simplified Environmental Report (RAS).

- Increase in taxes collection;
- Contribution for the sustainable development of the region;
- Expectation of the population in relation to the project;
- Increase of land value;
- Direct and Indirect jobs generation, including local workers during construction;
- Creation of new permanent jobs.

5.3 Local Stakeholder Consultation

Local stakeholder Consultation is one of the phases of the Licensing process. According to the CONAMA Resolution n. 237/97, when an environmental license (prior, installation and operational license) is requested or renewed, it must be made public for the communities that may be affected by the project activity, regardless the level of impact it may be submitted to. This procedure consists on informing the main characteristics of the wind power plants, such as installed capacity and location.

In addition, all environmental data and information registered under the National System of Environment (*Sistema Nacional de Meio Ambiente* in Portuguese – SISNAMA) must be available for public consultation as per law n. 10.650 of April 16th of 2003. To meet this requirement, a National Website for Environmental Licensing (PNLA – *Portal Nacional de Licenciamento*

Ambiental in Portuguese) was developed by the Environmental Ministry[36]. Therefore, all the information registered for the project is available at the website for public consultation.

In addition to this standard procedures, local stakeholder consultation was conducted by the Project Proponents, to communicate with local community before the beginning of the implementation of the project, as required by the VCS Standard, informing the design of the project and maximizing participation.

Several different activities were developed to engage local community, as detailed at the Engaging Plan with Interested Parties, listed below:

- Participatory Rapid Diagnosis: the initiative seeks to elucidate the current situation of the community in order to propose activities related to its urgent necessities. For example, the methodology investigates the local employment and income demand as well as the social and environmental impacts of the project in the quality of life of local population;

- Guided visit to the project site: consists on periodical guided visits to the project site for the local community. The activity provides educational information about the entrepreneurship and aim to create a bonding between the project and local communities;

- Production and distribution of informative material and audio-visual: flyers, posters, billboards and audio cars are planned to circulate, promoting the communication of social and environmental actions and programs alongside with local communities;

- Social and environmental care post: this care post operates as a social and environmental executive management point, directly supporting local stakeholders by providing information and favouring a clear communication between all interested parties.

- Informative report: Informative reports is strategically displayed in government agencies, schools and other locations to give access to information about the project implantation. This periodical report provides an overview of the project activities related to labour, local communities and schools in the direct influence area of the project;

- Information stand: the stand circulates in the project area of influence of the project, presenting videos, slides and printed material to inform local stakeholders of the project characteristics and encouraging the bonding with local community and. In addition, this stand is also a space for clarification of any questions about the entrepreneurship;

- Ombudsmen: this activity focus on compiling information demands from local stakeholders. The ombudsmen provides forms and reports for usage in informative stands, informative reports, suggestion boxes and mobile posts, and is responsible for communicating findings and questions to responsible personnel, as well as recording a copy of response files. Requests and suggestions can also be submitted through the app.;

[36] PNLA, Ministry of Environment: <http://pnla.mma.gov.br/o-que-e-o-pnla>. Last access on December 2019.

- Suggestion box: suggestion boxes are displayed in strategical spots with high local stakeholders' circulation in order to gather suggestions, questions and complains about the entrepreneurship. This activity is a communication channel with the local community;

- Participation at meetings and events: the project's social and environmental team will be present in local representativeness meetings and events, in order to represent the entrepreneurship, observe and receive demands from local stakeholders, to be reported with photos and documents;

- Public Hearing: this activity is considered an inauguration event of the entrepreneurship and its social and environmental projects for the local population, presenting its activities and implementation, and registering the presence of local stakeholders with attendance list and photos.

  The audience for the three WPPs was held at the Augusto Galvão Presbyterian College auditory, at Campo Formoso, in March 28th of 2019. The invitation to local community was made through visual publications at the city of Campo Formoso. Five hundred and two people attended the audience, included the mayor of Campo Formoso, city where the project is located.

  The audience began with a presentation of the project activity, the responsible personnel and the activities mentioned under this section to the interested parties. Afterwards, questions were received from the participants and addressed immediately by the project representants. The audience was documented in a minute, where the questions raised, name and answers are dully registered.

- Mobile Post: the mobile post will be at disposal of the project's social and environmental team, serving for periodical visitations to local communities and favouring the contact with local stakeholders;

  Questions raised during public hearing and at the ombudsmen were answered by the responsible areas and dully registered by the Project Proponents. The main subjects mentioned by local stakeholders regarded the employment posts to be created by the project and how to guarantee local community priority to such posts.

5.4 Public Comments

The project was published for public comments as indicated by VCS rules and it did not receive any comments.

APPENDIX 1: TECHNICAL SPECIFICATION

	Model	Rated Power (MW)	Hub height (m)	Rotor diameter (m)	Supplier
Ventos de São Januário 20 WPP	V150-4.2 MW	4.2	105	150.0	Vestas
Ventos de São Januário 21 WPP	V150-4.2 MW	4.2	105	150.0	Vestas
Ventos de São Januário 22 WPP	V150-4.2 MW	4.2	105	150.0	Vestas

Source: CdV Budgetary V150 4MW Supply and Installation Local AOM 5000.