VTRM RENEWABLE ENERGY 2

Document Prepared By Waycarbon Soluções Ambientais e Projetos de Carbono Ltda

770, José Vieira de Mendonça Street, 502. Belo Horizonte/MG. Brazil

Phone: +55 (31) 3401-1074

E-mail: fbittencourt@waycarbon.com

https://waycarbon.com/

Project Title	VTRM Renewable Energy 2
Version	01
Date of Issue	18-June-2019
Monitoring Period	02-August-2017 to 28-February-2019
Prepared By	Waycarbon Soluções Ambientais e Projetos de Carbono Ltda
Contact	Alexsandro Antônio Cota alexsandro.cota@venergia.com.br +55 (11) 97476-1400 3970, Rebouças Avenue, Second Floor. São Paulo/SP. Brazil

Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

VTRM Renewable Energy 2 is a grouped project that consists on the implantation and operation of wind power plants (WPPs) in Brazil. As a grouped project, it allows several instances of the same activity to be described under one single document. Besides, new instances can be included in the Grouped Project in the future, as long as they comply with the eligibility criteria set in the Joint Project Description Document.

VTRM Renewable Energy 2 will reduce greenhouse gases (GHG) emissions, avoiding electricity generation through 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 "Tool to calculate the emission factor for an electric system"".

The initial project activity instance is a complex called Ventos do Piauí Complex, composed by seven 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 estimated annual average GHG emission reductions is **439,950 tCO_2** and total GHG emission reductions for the crediting period is **4,399,508 tCO_2.**

The total GHG emission reductions generated in this monitoring period is **482,465** tCO2e.

TABLE 1 - NEW PROJECT ACTIVITY INSTANCE OF VTRM RENEWABLE ENERGY 2

WPPs	Specific Purpose Company (SPE)	Installed Capacity (MW)	Main Technology Employed	WPP Location (City/State)	Operation Starting Date[1] (dd/mm/yyyy)
Ventos do Piauí Wind Complex	**-**	**205.80**	**98 WPTs (with 2.3 MW)**	**Curral Novo do Piauí/PI**	**02/08/2017**[2]
Ventos de São Vicente 08	Ventos de Santo Vinicius Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	06/10/2017
Ventos de São Vicente 09	Ventos de Santo Alberto Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	06/12/2017
Ventos de São Vicente 10	Ventos de Santo Agostinho Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	17/11/2017
Ventos de São Vicente 11	Ventos de Santa Albertina Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	09/11/2017
Ventos de São Vicente 12	Ventos de São Casimiro Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	29/08/2017
Ventos de São Vicente 13	Ventos de São Adeodato Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	19/09/2017
Ventos de São Vicente 14	Ventos de Santo Afonso Energias Renováveis S.A	29.40	14 WTPs with 2.1MW each	Curral Novo do Piauí/PI	02/08/2017

[1] Operation starting date of each plant can be cross-checked with ANEEL Dispatches that authorizes each plant to start operation.
[2] Operation starting date of the first turbine of the Complex Ventos do Piauí as defined by ANEEL Dispatch 2,328, issued at 01/08/2017.

1.2 Sectoral Scope and Project Type

The sectoral scope applied is sectoral scope 1 – Energy (Renewable/Non-Renewable). VTRM Renewable Energy 2 is a grouped project.

1.3 Project Proponent

Table 2 – Project Proponents

Organization name	VTRM ENERGIA PARTIPAÇÕES S.A.
Contact person	Alexsandro Antônio Cota
Title	Mr.
Address	3970, Rebouças Avenue, Second Floor. São Paulo/SP. Brazil
Telephone	+55 (11) 97476-1400
Email	alexsandro.cota@venergia.com.br

Organization name	WAYCARBON SOLUÇÕES AMBIENTAIS E PROJETOS DE CARBONO LTDA
Contact person	Felipe Bittencourt
Title	Mr.
Address	770, José Vieira de Mendonça Street, 502. Belo Horizonte/MG. Brazil
Telephone	+55 (31) 3401-1074
Email	fbittencourt@waycarbon.com

1.4 Other Entities Involved in the Project

Not applicable.

1.5 Project Start Date

According to the VCS Standard, version 3.7, the project start date is the date on which the project began generating GHG emission reductions or removals. Therefore, the project start date of VTRM Renewable Energy 2 is 02/08/2017 (dd/mm/yyyy) *(Operation Starting Date of the First Turbine of the Complex Ventos do Piauí as defined by ANEEL Dispatch 2,328, issued at 01/08/2017)*.

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 02/08/2017 to 01/08/2027.

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)
2017	75,999
2018	366,408
2019	429,979
2020	465,101
2021	465,101
2022	465,101
2023	465,101
2024	465,101
2025	465,101
2026	465,101
2027	271,415
Total estimated ERs	**4,399,508**
Total number of crediting years	10
Average annual ERs	**439,950**

1.8 Description of the Project Activity

The project activity is a grouped project formed by the installation of greenfield grid-connected renewable energy power generation. All project instances of the project activity should include greenfield wind power plants.

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 "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 Operation License of each WPP. Plan Load Factor, by report issued on 08/01/2016 (dd/mm/yyyy) by engineering company AWS TruePower. Number of turbines and individual capacity (Source: Operation License of each Plant) are again presented in
Table 5 to summarize technical characteristics. The average lifetime of the equipment is 20 years[3].

Table 5 - Technical Characteristics of VTRM Renewable Energy 2

WPPs	Installed Capacity (MW)	Plant Load Factor (%)	WPTs
Ventos de São Vicente 08	29.4	58.85	14 WPTs with 2.1 MW each
Ventos de São Vicente 09	29.4	59.01	14 WPTs with 2.1 MW each
Ventos de São Vicente 10	29.4	58.69	14 WPTs with 2.1 MW each
Ventos de São Vicente 11	29.4	57.97	14 WPTs with 2.1 MW each
Ventos de São Vicente 12	29.4	58.38	14 WPTs with 2.1 MW each
Ventos de São Vicente 13	29.4	59.56	14 WPTs with 2.1 MW each
Ventos de São Vicente 14	29.4	59.35	14 WPTs with 2.1 MW each

1.9 Project Location

Coordinates of each plant of Ventos do Piauí Complex are presented as follows[4]:

- Ventos de São Vicente 08: LAT 8° 0’ 50.73” / LONG 40° 38’ 18.07”
- Ventos de São Vicente 09: LAT 8° 0’ 42.05” / LONG 40° 39’ 4.54”
- Ventos de São Vicente 10: LAT 8° 0’ 23.50” / LONG 40° 38’ 16.24”
- Ventos de São Vicente 11: LAT 7° 59’ 37.69” / LONG 40° 38’ 3.84”
- Ventos de São Vicente 12: LAT 8° 0’ 22.70” / LONG 40° 36’ 48.19”
- Ventos de São Vicente 13: LAT 7° 59’ 36.79” / LONG 40° 39’ 9.67”
- Ventos de São Vicente 14: LAT 7° 59’ 44.50” / LONG 40° 35’ 20.39

[3] 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 June 05, 2019.
[4] Available in the Installation License of each WPP.

A KML file was submitted to the VVB (Validation and Verification Body) that will perform validation and verification.

1.10 Conditions Prior to Project Initiation

VTRM Renewable Energy 2 activity is a grouped project that 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 project instances are and will be implemented. The baseline scenario is the same as the conditions existing prior to project initiation as described at section 2.4.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

VTRM Renewable Energy 2 activity has all licenses necessary to build and operate entrepreneurships. The most relevant local laws and regulations related to VTRM Renewable Energy 2 correspond to the environmental laws and National Agency of Electric Energy (ANEEL) approval. 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. The Brazilian licensing process presents as an important characteristic the community participation on decision through Public Audiences.

Operation Licenses of each wind power plant are valid. Their number and expiration date are showed below. ANEEL Dispatches that authorizes each Special Purpose Company (SPCs) to start to operate are also presented.

- Ventos de São Vicente 8: Operation License number D000447/17 / Expiration Date: 29/08/2021; ANEEL Dispatch 3,396, issued in 05/10/2017 and Dispatch 3,513, issued in 18/10/2017.

- Ventos de São Vicente 9: Operation License number D000509/17 / Expiration Date: 06/10/2021; ANEEL Dispatch 4,107, issued in 05/12/2017.

- Ventos de São Vicente 10: Operation License number D000510/17/ Expiration Date: 06/10/2021; ANEEL Dispatch 3,836, issued in 16/11/2017 and Dispatch 3,927, issued in 22/11/2017.

- Ventos de São Vicente 11: Operation License number D000511/17/ Expiration Date: 06/10/2021; ANEEL Dispatch 3,764, issued in 08/11/2017.

- Ventos de São Vicente 12: Operation License number D000363/17/ Expiration Date: 19/07/2021; ANEEL Dispatch 2,670, issued in 28/08/2017, Dispatch 2,974, issued in 15/09/2017 and Dispatch 3,401, issued in 06/10/2017.

- Ventos de São Vicente 13 Operation License number D000362/17/ Expiration Date: 19/07/2021; ANEEL Dispatch 3,015, issued in 18/09/2017.

- Ventos de São Vicente 14: Operation License number D000248/17/ Expiration Date: 31/05/2021. ANEEL Dispatch 2,328, issued in 01/08/2017 and Dispatch 2,529, issued in 17/08/2017.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

For each plant, it was created a Special Purpose Company (SPC) due to tax reasons. A Holding called Ventos de São Vicente Holding S.A is the owner of all SPCs. VTRM Energia Participações S.A (VTRM) is the only shareholder of this holding.

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

VTRM Renewable Energy 2 is a grouped project. This project is formed by grid-connected greenfield wind power plants located in Brazil. The project applies Consolidated Methodology ACM0002 – Grid-connected electricity generation from renewable sources, version 19.0.

The eligibility criteria for inclusion of new instances of each project activity are:

1. Meet the applicability conditions of Consolidated Methodology ACM0002 – Grid-connected electricity generation from renewable sources. This shall be evidenced by the document of inclusion of each new instance.

2. As the new project instances have to be greenfield projects, the baseline scenario shall be the one given by the Consolidated Methodology ACM0002 – Grid connected electricity generation from renewable sources, version 19.0, which is "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".

3. New project instances must be greenfield wind power plants connected to the grid. This shall be evidenced by Environmental Licenses (Previous License, Installation License or Operation License).

4. New project instances must be located in Brazil (Geographic area of the project). This shall be evidenced by Environmental Licenses (Previous License, Installation License or Operation License).

5. Each new project instances must face financial constraints and demonstrate additionality using investment analysis method. The financial analysis for each instance will be compared to an appropriated benchmark scenario and shall be evidenced by additionality analysis in the document of inclusion of each new instance. The steps of the Methodological Tool for the Demonstration and Assessment of additionally (version 07.0.0) must be followed:

   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.

   The conditions of the Investment Analysis Tool (version 09.0) and the Common Practice Tool (version 03.1) must also be meet.

6. Each new project instance should detail its own monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body. This shall be evidenced by the document of inclusion of each new instance;

7. Have a start date that is the same as or later than the grouped project start date (02/08/2017). This shall be evidenced by legal documents related to the operational starting date of the new project instance (Operation License, ANEEL Dispatch or other legal document that shows the operational starting date of the new project instance);

8. Have evidence of the new project instance ownership. The project owner of the new project instance shall provide evidence of having ownership over new project instance. This shall be evidenced by legal documents that proof ownership over the new project instance.

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

VTRM Renewable Energy 2 contributes to the sustainable development once contributing to the economic growth without compromising the 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, VTRM Renewable Energy 2 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 the landowners, while they can continue using the area for other activities, thus it increases and diversifies the lands productivity;
- Besides generating income for the 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 a 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)[5]. 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) TOOL07: Methodological Tool "Tool to calculate the emission factor for an electricity system", version 07.0;

(c) TOOL24: Methodological Tool "Common Practice", version 03.1;

[5] Available on the UNFCCC CDM website.

(d) 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).

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).

VTRM Renewable Energy 2 is a grouped project that involves greenfield wind power plants. Therefore, option "a" is applied.

Applicability Condition 02:

The methodology is applicable under the following conditions:

(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.

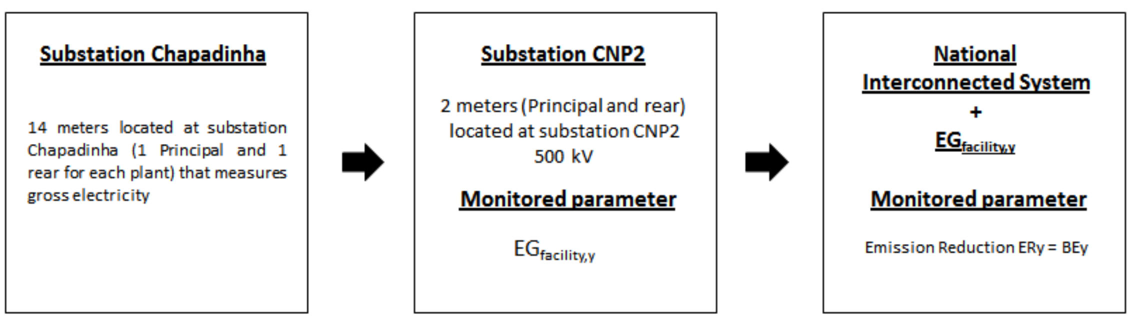
VTRM Renewable Energy 2 is a grouped project that involves greenfield wind power plants. Therefore, option "a" is applied. All other applicability conditions of ACM0002 methodology are not applied to VTRM Renewable Energy 2 once the project involves greenfield wind power plants.

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	There is no project emission	CO_2	No	According to ACM0002: “Grid-connected electricity generation from renewable sources”, there is no project emissions for wind power plants.
		CH_4	No	
		N_2O	No	
		Other	Not applicable	

The diagram below shows the physical locations of the various installations or management activities taking place as part of the initial project instances.



2.4 Baseline Scenario

According to VCS Standard, Version 3.7, the determination of baseline scenario of a Grouped project is based upon the initial project activity instances. The initial project activity instances are those that are included in the project description at validation and shall include all project activity instances currently implemented on the issue date of the project description.

If 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”.

2.5 Additionality

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

The tool provides a step-wise 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[6].

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 "Tool for the demonstration and assessment of additionality", project participants shall determine whether the proposed project activity is not:
The most economically attractive or financially;
Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs);

The investment analysis follows the CDM "Methodological tool 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 CDM project activity and the alternatives identified in Step 1 generate financial or economic benefits other than CDM 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.

[6] Aguiar F.L. Modelo Institucional do Setor Elétrico Brasiliero, 2007, available at http://www.realestate.br/images/File/arquivosPDF/DST_FernandoAguiar.pdf, last access on May 5, 2019.

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 "Methodological Tool Investment Analysis", version 09.0.

The IRR calculation is carried out by considering all seven 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 seven 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 positively affected by the fact that VTRM negotiated and structured a project of 205.8MW, instead of 29.4MW (individual capacity of each WPP)[7].

Benchmark identification.

According to the Investment Analysis Methodological Tool (tool 27), 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 tool 27 (version 08.0), 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[8] and 2012 GDP was USD 2.465 tn[9], such condition is met;
- Several market analyses involving publicly traded companies use CAPM as a methodology for equity cost calculation[10] (e.g.: TAESA, Drogasil Raia, EDP, Braskem, Natura, Energisa, Gerdau) denoting its widely adopted practice.

[7] 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.

[8] Source: World Federation of Exchanges. For more details, please follow the link http://www.world-exchanges.org/

[9] Source: World Bank. Available in https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=BR

[10] http://ri.taesa.com.br/taesa2013/web/arquivos/TAESA_Laudo_04172012_port.pdf,
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,

The cost of equity (Re) is calculated throw the formula below[11]:
Re= Rf + Beta x (US Premium + Country ERP), 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;
US Premium: United States risk premium;
Country ERP: Brazilian equity risk premium.

In this project activity, the risk free rate corresponds to the average rate of United States Treasury Bond (TBond) with a maturity of 10 years (USTB10) for 2014[12], the previous year of the investment decision (considered as the date of the Auction: 21/08/2015). This value, in nominal terms, corresponds to 10.75%.

To deflate the nominal rate was used Fischer Equation[13]:
$(1 + i) = (1 + r) \times (1 + \pi)$, where

r: Real Interest Rate;
i: Nominal Interest Rate
π: Inflation Rate

The inflation rate (Consumer price indices, CPIs) for 2014 was obtained in the Organization for Economic Co-operation and Development (OECD) website[14] and corresponds to 1.62%.

The risk free rate in real terms for 2014 is equal to 8.98% and the calculation parameters are shown in the table below:

Table 7 – Risk free rate in real terms

Year	10-year T. Bond (nominal terms)	Consumer Prices Annual inflation (USA)	10-year T. Bond (real terms)
2014	10.75%	1.62%	8.98%

https://ri.energisa.com.br/ptb/7951/589555.pdf, http://ri.gerdau.com/ptb/7556/Anexo%203%20-%20Laudo%20de%20Avaliao.pdf
[11] 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 >.
[12] 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. It is a common practice the adoption of United States Treasury Bond (T-Bond) adjusted to country specific risk (EMBI+). This parameter with a maturity of 10 years (USTB10) was obtained at Damodaran website, a commonly reference adopted in investment analysis <http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html>. A risk free rate with a maturity of 20 years (USTB20) was not available at this data source for it is not used so commonly due to it's reduced liquidity. Furthermore, Tool 27 recommends the adoption of the latest sovereign debt data available at the time of the investment decision. For this reason, the USTB10 of 2014 was selected (the previous year of the investment decision of the project activity - Auction date: 21/08/2015).
[13] https://saylordotorg.github.io/text_macroeconomics-theory-through-applications/s20-14-the-fisher-equation-nominal-an.html
[14] Available at < https://stats.oecd.org/# >. Consumer price indices; Country: USA; Time and Frequency: Annual for 2014.

For Beta establishment was consulted A. Damodaran reference available for Power Companies in Emergent countries in 2014.The average unlevered beta corresponds to 0.49[15]. This value was levered for the proposed project activity capital structure trough the formula[16]:

Beta unlevered = Beta levered / (1+ D/E x (1-T)), where:
D= Debt;
E= Equity;
T= Interest and taxes

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 Ventos do Piauí Wind Complex, the 7 WPPs that composed it are configured as different SPEs with a power of up to 30MW in order to achieve some tariff incentives granted by the Brazilian government. So, the individual revenues of the 7 WPPs are under forty-eight million Reais per year and for this reason the presumed profit regime (assumed profit) was adopted (Law no. 9,718/1998).
So,
Beta levered= 0.49 x (1+ 70%/30% x (1-0))
= 1.63

US Premium and Country ERP (for Brazil) are both available in the A. Damodaran reference[17]. Values to be applied: 5.75% and 2.85% respectively.

Therefore,
Re = 8.98% + 1.63 x (5.75% + 2.85%)
= 23.03%

So, **Re in real terms is equal to 23.03%** 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 debit (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

[15] Available at <http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html>. Year: 2014, Emergent Countries, Industry Group: Power. Average Beta results in 0.49.
[16]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
[17] Based on the Brazilian rating of Baa2 (as per Moody's Agency, the ultimate and more conservative available before the Investment Decision date, since is the higher credit rating achieved by the host country). Available at <http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem14.xls>.

In Brazil, the National Bank for Economic and Social Development, known as BNDES[18] (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 (tool 27), 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 interest rate terms (TJLP) of BNDES for the year of the investment decision of the project activity (2015).

The average value for TJLP for 2015 is equal to 5.75%[19]. It is expressed in nominal terms and was converted into real terms by using Fisher equation:
$\mathbf{(1 + \mathit{i}) = (1 + \mathit{r}) \times (1 + \pi)}$, where

r: Real Interest Rate;
i: Nominal Interest Rate
π: Inflation Rate

The inflation rate in Brazil for 2015 corresponds to 4.50% according to the Resolution 4,237/2013 provided by the Brazilian Central Bank[20]. So, TJLP in real terms for 2015 is equal to 1.20%.

Basic spread and **Credit Spread Risk** are also provided by BNDES[21]. For the energy auction that occurred in April 2015 (prior to the investment decision date), basic spread was equal to 1.2%. Credit spread risk, in its turn, was up 2.87%. For conservativeness, the average value was adopted: 1.44%.
Thereby, Rd is defined as:
Rd= Financing cost + Basic Spread + Credit Spread Risk
Rd= 1.20 + 1.2% + 1.44%
Rd= 3.83%

- **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 #9.718/1998 that establishes that corporate entities revenues under forty-eight million Reais per year can adopt presumed profit instead of real profit.

Although the cash flow has been made considering the Complex approach, the 7 WPPs are configured as different SPEs with a power of up to 30MW in order to achieve some tariff incentives granted by the Brazilian government. Thereby, the individual revenues of the 7 WPPs are under forty-eight million Reais per year and for this reason the presumed profit regime (assumed profit) was adopted (Law no. 9,718/1998). The sum of the costs and revenues of each WPP is equivalent to the costs and revenues of the complex considered in the proposed report.

[18] 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 >.
[19]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%
[20] http://www.bcb.gov.br/Pec/relinf/Normativos.asp
[21]BNDES parameters for energy auction of April, 2015. Available at < https://www.bndes.gov.br/wps/portal/site/home/financiamento/produto/leiloes-infraestrutura/leiloes-geracao-energia-abril-2015/!ut/p/z1/xVPLcpswFP2WLljKEggIdEdtN8QhTWrHtWHjESBAGSMRIUzz9xWOM-60MZ1OF2UlHV3p3vMAJnALE04OrCSKCU72eh8n7m7hRdPQt1F0ba1cFDx8NXG4XFve2oGbYwG68AUIJuP3v8EEJhlXjapgnPKctjvGW8VUlx0nMFAlamqggnHCM0ZqypVoDbRnvCItaKQoJan1quh4fjygbC9oCxgvJKGtkp3qJDnjJZUkIwJQTmXJCCCpZHtgIdMZJmkylsO4oK7v5h4G2PYJsHMXAY9mHiCWaWGcmsjG7on5CLVkXJjFn6TR2IvybnpX6rGIqgZGAm7f53fGR_jpB9nT83MSaMUFV_S7gtv_LPlmEP1nGdDnpaNleFziub3AaGWdCiL_dh7a9yi6v8FzFITTyLHnt-a1j08FI0rH2qmr8wveVIPBzLqKcPRoWTMbbg6M9nDNhax15ld_GYTwrcMlL033HzvoqJR7kb7-jwFPsaczIWlBJZWTTmq4UqppPxrIQH3fT46mTkpxmKRSI432qBFSDda2TNF3DdYlUuTdsLgUsd97V6LVGfq1JWzqde3hF5DEnvJvnpyy3s0-fQFJ-tJ_-AFiDe7e/dz/d5/L2dBISEvZ0FBIS9nQSEh/ > Last access: May 31th, 2019.

Considering all the parameters exposed, the WACC calculation corresponds to 9.59%, as can be demonstrated below:

WACC = Re x We + Rd x Wd x (1-Tc),
= 23.03% x 30% + 3.83% x 70% x (1-0)
= 9.59%

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. As recommended by *CDM project standard for programmes of activities*, version 01.0, paragraph "g", item "iv", the additionality for including instances in a grouped project is assessed by using the actual values, applicable at the time of this Monitoring Report elaboration.

All negotiations with main suppliers of the project (CAPEX and OPEX) considered all seven wind power plants together as a complex. Following this strategy, project owners could obtain synergy and scale. Consequently, the project could reach better (lower) prices for CAPEX and OPEX. For VCS additionality analysis, the financial analysis was carried out considering the complex. This is a conservative approach once it assumes lower costs and scale obtained.

The cash flow of Ventos do Piauí Complex 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).

General Features of the Investment Analysis and calculation of the Financial Indicator

- **Assessment Period:** The cash flow considers an economic plant lifetime of 20 years which is in line with the operational lifetime of the wind turbines. This agrees with the provisions of the CDM Methodological Tool Investment Analysis, version 09.0. item 6, which defines that the IRR calculation must preferably reflect the expected operational lifetime of the project activity.

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

- **Depreciation:** 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 [22]. 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 Ventos do Piauí Complex.

- **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 Tool 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.

[22] 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.

- **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 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°77, of 18 August 2004[23], 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 lower or equal to 30,000 kW.

This sectoral policy was established on 18 Aug 2004, 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".*

---

[23] ANEEL (2004). Normative Resolution n° 77, 18 August 2004. Available at: http://www.aneel.gov.br/cedoc/ren2004077.pdf. Last accessed: May 2019.

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 this taxes (CONVÊNIO ICMS 101/97)[24]. 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.

Assumptions used in the Cash Flow
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:

Table 8 - Financial Assumptions

Item	Description	Unit	Values
Installed Capacity	Installed Capacity, as evidenced by Operation License of each entrepreneurship.	MW	• **Complexo Ventos do Piauí: 205.8** • WPP Ventos de São Vicente 08: 29.4 • WPP Ventos de São Vicente 09: 29.4 • WPP Ventos de São Vicente 10: 29.4 • WPP Ventos de São Vicente 11: 29.4 • WPP Ventos de São Vicente 12: 29.4 • WPP Ventos de São Vicente 13: 29.4 • WPP Ventos de São Vicente 14: 29.4
Electricity generated for sale	It was considered the plant load factor of each plant supplied by independent report issued by engineering company AWS TruePower.	MWh/year	• **Ventos do Piauí Complex: 1,060,590** • WPP Ventos de São Vicente 08: 151,567 • WPP Ventos de São Vicente 09: 151,979 • WPP Ventos de São Vicente 10: 151,144 • WPP Ventos de São Vicente 11: 149,298 • WPP Ventos de São Vicente 12: 150,358 • WPP Ventos de São Vicente 13: 153,397 • WPP Ventos de São Vicente 14: 152,847

[24] CONVÊNIO ICMS 101/97. Available at <http://app1.sefaz.mt.gov.br/sistema/legislacao/legislacaotribut.nsf/07fa81bed2760c6b84256710004d3940/f219de0bc8dbf2ce832567940040cc22?OpenDocument>. Last accessed: June 2019.

Electricity Price	It was considered the electricity price contracted through ANEEL auctions.	R$/MWh	• WPP Ventos de São Vicente 08: 182,39 • WPP Ventos de São Vicente 09: 182,41 • WPP Ventos de São Vicente 10: 182,41 • WPP Ventos de São Vicente 11: 182,42 • WPP Ventos de São Vicente 12: 182,41 • WPP Ventos de São Vicente 13: 182,42 • WPP Ventos de São Vicente 14: 182,40

Investment and Operational Costs			
Item	**Description**	**Unit**	**Values**
Investment (CAPEX)	Budgeted according to contracts established with (I) Wind Turbine Generators Supplier (GAMESA); (II) Civil Works (Cortez Engenharia); (III) Electric Works (ABB); (IV) Owner Engineering (Concremat Engenharia); (V) Insurance (Swiss Re); (VI) Capacitors Banks Supply (Construtora Successo);	R$	**Ventos do Piauí Complex: 1,557,703,446.43** (I) Wind Turbine Generators Supplier: 1,339,201,365.51 (II) Civil Works: 101,911,652.28 (III) Electric Works: 107,275,798.03 (IV) Owner Engineering: 6,579,063.19 (V) Insurance: 290,192.48 (VI) Capacitors Banks Supply: 2,445,374.94
O&M Costs	Budgeted according to Full Service Agreement between each Wind Power Plant and Supplier (GAMESA). The cost is the same for each plant per year and this contract is expected to be renewed.	R$/year/ WTG	Year 01: 10,022,950.00 Year 02: 10,022,950.00 Year 03: 12,779,200.00 Year 04: 12,779,200.00 Year 05 and following years: 12,779,200.00
O&M Costs	Budgeted according to Full Service Agreement between each Wind Power Plant and Supplier (COTESA). The cost is the same for each plant per year and this contract is not expected to be renewed.	R$/year/ WTG	Year 02: 939,943.88 Year 03: 939,943.88 Year 04: 78,328.91
TUST	According to ANEEL Technical Note 2259. Technical E-Policy definitions was used for this item.	R$/KW installed. month	• WPP Ventos de São Vicente 08: 5.291 • WPP Ventos de São Vicente 09: 5.291 • WPP Ventos de São Vicente

			10: 5.291 • WPP Ventos de São Vicente 11: 5.291 • WPP Ventos de São Vicente 12: 5.291 • WPP Ventos de São Vicente 13: 5.291 • WPP Ventos de São Vicente 14: 5.291
ANEEL Supervision Taxes	Budgeted according to the following Decrees: 4,402 and 44. It is calculated over 0.5% of the installed capacity.	R$/year	• 2017: 118,054.69 • 2018: 527,193.73 • 2019 and following years: 632,439.85
ANEEL Associative contribution	Annual budgeted calculated for each plant that composes the grid. It is provided by ANEEL.	R$/year	• 2017: 3,786.49 • 2018: 64,478.38 • 2019 and following years: 45,624.50
Land Lease	Budgeted according to land lease agreements (1.5% of the project gross revenue).	R$/year	2,901,901,34
Insurance	O&M insurance. Evidenced by Insurance Policy 03,51,1,002009 and 51,961,000,444.	R$/year	**Ventos do Piauí Complex: 844,796.02** • General indemnity insurance (XL Seguros Brasil S.A.): 152,994.13 • Operational risks insurance (Swiss Re Corporate Solutions Brasil Seguros S.A.): 685,149.97
Contingencies	Internal Assumptions: 0.1% Over Capex total	%	1,557,703.45

Taxes			
Item	**Description**	**Unit**	**Values**
PIS/COFINS	Budgeted as applicable Brazilian	%	3.65 (Over Gross Revenue)

	Law 10,637, Law 10,833 and Normative Instruction 247.		
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 9 - Project Indicators X Benchmark

Project IRR	Benchmark (WACC)
6.40%	**9.59%**

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 contribute to increase economic and financial attractiveness of the project aiming to confirm how solid the analysis of sub-steps 2b and 2c are. Table below presents how changes in the main parameters affect project IRR.

Table 10– Sensitivity Analysis

	Variation	IRR	To IRR= Benchmark
Revenues increase	10%	7.89%	22.54%
CAPEX reduction	10%	7.73%	-22.48%
O&M costs decrease	10%	6.70%	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.

Electricity of the project's plants were already sold in the Auction promoted by CCEE and the price is already established according auction results. The power purchase agreements are valid for the entire assessment period (20 years). Therefore, no variation on price is expected.

With regards to the volume of energy generated, the project is subject to significant variations and uncertainties. The quantity of electricity sold is very close to plant load factors of the plants. To reach the benchmarking would be necessary an increase of 22.54% of the electricity generated. It is noticed that the scenario of revenue generation over 10% predicted in the sensitivity analysis is not likely to happen.

<u>CAPEX</u>

CAPEX represents the most important investment of the enterprise. At the time of this VCS Monitoring Report, CAPEX was already contracted, and the plants already built. Thus, CAPEX reduction scenario is very unlikely. To reach the benchmark, it would be necessary a reduction of 22.48% in the CAPEX, an impossible scenario.

<u>O&M Costs</u>

The result of the sensitivity analysis shows that an 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%. Therefore, the variation range between 0 and 10% cover more than the probable scenarios.

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.

Step 4. Common practice analysis
Sub-step 4a. Analyze other activities similar to the proposed project activity:

The common practice analysis follows the step-wise approach suggested by CDM tool 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 Ventos do Piauí Complex is 205.8 MW. Therefore, the capacity range applicable is from 102.9 MW to 308.7 MW.

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

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

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

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

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

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

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

Outcome:

To develop this step, the following procedure was applied:

1. All operational plants connected to the Grid. Source were identified at ANEEL database[25]
2. Selection of renewable plants (applying the same measure).
3. After that, only renewable plants that begun to operate before 02/08/2017 (Start date of the Project Activity) were selected.
4. Only plants with the capacity output calculated on STEP 1 were selected (102.9 MW to 308.7 MW)
5. For Wind Power Plants, it was used database supplied by ABEEÓLICA. Through this database, it could be identified Wind Power Plants Complexes. Theses complexes groups several plants under the same umbrella. So, they could be compared to the Ventos de São Vicente Wind Power Plant Complex. At ANEEL database, plants of each complex were presented individually.

   The outcome is presented at the table below:

Table 11 – Outcome Step 2

Number	Energy Source	Plant	Operational Starting Date	Installed Capacity (MW)
1	Biomass	Klabin	01/01/1961	113.25
2	Biomass	CMPC (Antiga Aracruz Unidade Guaíba)	01/12/1971	250.99
3	Biomass	Suzano Mucuri (Antiga Bahia Sul)	01/03/1992	214.08
4	Biomass	Aracruz	01/05/2002	210.40
5	Biomass	Veracel	02/01/2006	126.60

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

6	Biomass	Fibria - MS (Antiga VCP - MS)	07/04/2009	175.10
7	Biomass	Usina Bonfim	12/06/2010	111.00
8	Biomass	Cocal II	07/01/2010	131.30
9	Biomass	Caarapó	14/05/2010	114.00
10	Biomass	Barra Bioenergia	15/07/2010	136.00
11	Biomass	Conquista do Pontal	22/07/2010	110.00
12	Biomass	Caçú I	29/07/2010	130.00
13	Biomass	Santa Luzia I	02/12/2010	130.00
14	Biomass	Eldorado	04/06/2011	140.00
15	Biomass	Porto das Águas	18/11/2011	160.00
16	Biomass	Jataí	28/02/2013	105.00
17	Biomass	Eldorado Brasil	12/09/2013	226.00
18	Biomass	Suzano Maranhão	04/04/2014	254.84
19	Hydro Power Plant	Bariri (Álvaro de Souza Lima)	26/12/1969	143.10
20	Hydro Power Plant	Barra Bonita	20/05/1963	140.76
21	Hydro Power Plant	Risoleta Neves (Antiga Candonga)	07/09/2004	140.00
22	Hydro Power Plant	Castro Alves	04/03/2008	130.00
23	Hydro Power Plant	Euclides da Cunha	07/12/1960	108.80
24	Hydro Power Plant	Fontes Nova	01/01/1940	131.99
25	Hydro Power Plant	Guaporé	08/04/2003	120.00
26	Hydro Power Plant	Guilman Amorim	02/11/1997	140.00
27	Hydro Power Plant	Ibitinga	20/04/1969	131.49
28	Hydro Power Plant	Jauru	06/06/2003	121.50
29	Hydro Power Plant	Passo Real	01/01/1973	158.00
30	Hydro Power Plant	Ponte de Pedra	19/07/2005	176.10
31	Hydro Power Plant	Quebra Queixo	31/12/2003	120.00
32	Hydro Power Plant	Queimado	16/06/2004	105.00
33	Hydro Power Plant	Dona Francisca	05/02/2001	125.00
34	Hydro Power Plant	Porto Estrela	04/09/2001	112.00
35	Hydro Power Plant	Itiquira (Casas de Forças I e II)	06/11/2002	157.37
36	Hydro Power Plant	Corumbá IV	01/04/2006	127.00
37	Hydro Power Plant	Monte Claro	29/12/2004	130.00
38	Hydro Power Plant	Fundão	23/06/2006	120.17
39	Hydro Power Plant	Santa Clara	31/07/2005	120.17
40	Hydro Power Plant	Pedra do Cavalo	16/12/2004	160.00
41	Hydro Power Plant	Salto	25/05/2010	116.00
42	Hydro Power Plant	Baguari	09/09/2009	140.00
43	Hydro Power Plant	Amador Aguiar I (Antiga Capim Branco I)	21/02/2006	240.00
44	Hydro Power Plant	Amador Aguiar II (Antiga Capim Branco II)	09/03/2007	210.00
45	Hydro Power Plant	São Salvador	06/08/2009	243.20
46	Hydro Power Plant	Salto Pilão	11/12/2009	191.89

47	Hydro Power Plant	Serra do Facão	13/07/2010	212.58
48	Hydro Power Plant	Dardanelos	09/08/2011	261.00
49	Hydro Power Plant	Garibaldi	24/09/2013	191.90
50	Hydro Power Plant	Ferreira Gomes	04/11/2014	252.00
51	Hydro Power Plant	Cachoeira Caldeirão	05/05/2016	219.00
52	Hydropower Plant	Ilha dos Pombos	01/01/1924	187.17
53	Hydropower Plant	Jacuí	01/01/1962	180.00
54	Hydropower Plant	Paulo Afonso I	30/12/1964	180.00
55	Hydropower Plant	Funil	20/03/1970	216.00
56	Hydropower Plant	Boa Esperança (Antiga Castelo Branco)	02/10/1970	237.30
57	Hydropower Plant	Governador Pedro Viriato Parigot de Souza (Capivari/Cachoeira)	03/09/1971	260.00
58	Hydropower Plant	Passo Fundo	30/03/1973	226.00
59	Hydropower Plant	Mascarenhas	21/09/1973	198.00
60	Hydropower Plant	Promissão (Mário Lopes Leão)	28/07/1975	264.00
61	Hydropower Plant	Balbina	20/02/1989	249.75
62	Hydropower Plant	Samuel	17/07/1989	216.75
63	Hydropower Plant	Igarapava	31/12/1998	210.00
64	Hydropower Plant	Manso	29/11/2000	210.00
65	Hydropower Plant	Funil	30/12/2002	180.00
66	Wind Power Plant	União dos Ventos	01/04/2014	234.70
67	Wind Power Plant	Alto Sertão I	01/07/2014	294.40
68	Wind Power Plant	Asa Branca	01/12/2014	241.00
69	Wind Power Plant	Morrinhos	01/11/2015	180.00
70	Wind Power Plant	Ventos de Santa Brígida	01/12/2015	181.90
71	Wind Power Plant	Calango	01/01/2016	180.00
72	Wind Power Plant	Itarema	01/01/2016	207.00
73	Wind Power Plant	Ventos de São Clemente	01/05/2016	216.09
74	Wind Power Plant	Ventos de Santo Augusto	24/03/2017	200.80
75	Wind Power Plant	Atlântica	22/03/2014	124.8
76	Wind Power Plant	Baixa do Feijão	21/05/2016	120
77	Wind Power Plant	Bloco Sul	27/08/2016	126
78	Wind Power Plant	Caldeirão I	19/07/2017	118.8
79	Wind Power Plant	Campo dos Ventos	23/06/2016	105.6
80	Wind Power Plant	Corredor do Senandes	11/04/2015	108
81	Wind Power Plant	Echo 2	02/03/2016	128
82	Wind Power Plant	Faisa	30/10/2014	136.5
83	Wind Power Plant	Riachão	27/06/2015	145.8
84	Wind Power Plant	São Miguel do Gostoso	20/06/2017	108
85	Wind Power Plant	Tianguá	07/10/2016	130.13

- 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: Eighteen (18) plants were identified as CDM Project (Biomass Power Plant Usina Bonfim, Hydro Power Plants Castro Alves, Monte Claro, Fundão, Santa Clara, Pedra do Cavalo, Baguari and Ferreira Gomes, and Wind Power Plants União dos Ventos, Alto Sertão I, Asa Branca, Calango, Atlântica, Caldeirão I, Campo dos Ventos, Corredor dos Senandes, Echo 2 and Faisa).

Therefore Nall = 67.

- 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 (40) plants are hydro power plants and Seventeen (17) are thermoelectrics (Biomass). Therefore N_{diff} = 57.

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 – 57/67 = 0.149

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 = 0.149 and N_{all}-N_{diff} = 10, 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 ESTIMATED 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:

Equation 01

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

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 CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (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 CDM 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 CDM 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 (EFgrid,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 ($EF_{grid,OM-DD,y}$) 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.

Step 5: Calculate the build margin emission factor

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

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

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin 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, PEy = 0. This is applied to grid-connected wind power plants as the enterprises of VTRM Renewable Energy 2.

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 Estimated Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ **Equation 06**

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:

Equation 01

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

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 CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO_2/MWh)

As **VTRM Renewable Energy 2** just comprises greenfield wind power plants, then:

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

Equation 02

At this document, project proponents are also requesting verification of the period 02/08/2017 to 28/02/2019. Therefore, for this period the real electricity supplied to grid was used in the emission reduction estimation.

For the period 01/03/2019 to 01/08/2027, EGfacility,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 EGfacility for this period.

Table 12 - 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 Vicente 08	29.4	58.85	151,567
Ventos de São Vicente 09	29.4	59.01	151,979
Ventos de São Vicente 10	29.4	58.69	151,144

WPPs	Installed Capacity (MW) (A)	Plant Load Factor (%) (B)	EGfacility,y Estimation C = A x B x 8,760 (MWh)
Ventos de São Vicente 11	29.4	57.97	149,298
Ventos de São Vicente 12	29.4	58.38	150,358
Ventos de São Vicente 13	29.4	59.56	153,397
Ventos de São Vicente 14	29.4	59.35	152,847
		Total	1,060,590

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 3

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.

As VTRM Renewable Energy 2 uses Dispatch data analysis OM method for operating margin emission factor, EFgrid,OM,y is calculated ex post.

For emission reduction estimation of the period 02/08/2017 to 31/12/2017 (dd/mm/yyyy), EFgrid,OM,y and EFgrid,BM,y for 2017 were used.

For ex-ante emission reductions estimations from 01/01/2018 to 01/08/2027 (dd/mm/yyyy), EFgrid,OM,y and EFgrid,BM,y for 2018 were used. This is the latest information available.

For both years, these parameters were calculated by Brazilian DNA[26].

The values are:

The values are:

EFgrid,OM,2017 = 0.5882 tCO2e/MWh

EFgrid,BM,2017= 0.0028 tCO2e/MWh

EFgrid,OM,2018 = 0.5390 tCO2e/MWh

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

EFgrid,BM,2018= 0.137 tCO2e/MWh

Applying these values to Equation 03,

$EF_{grid,CM}$,2017 = 0.75 X 0.5882 + 0.25 X 0.0028 = **0.4418 tCO2/MWh**

$EF_{grid,CM}$,2018 = 0.75 X 0.5390 + 0.25 X 0.137 = **0.4385 tCO2/MWh**.

Applying $EG_{PJ,2017}$ = 172,015 MWh (real electricity generation supplied to the grid between 02/08/2017 to 31/12/2017) to equation 02, BE_{2017} = 172,015 MWh X 0.4418 tCO2e/MWh = **75,999 tCO2e (in 2017)**

Applying $E_{GPJ,2018}$ = 835,537 MWh (real electricity generation supplied to the grid between 01/01/2018 to 31/12/2018) to equation 02, BE_{2018} = 835,537 MWh X 0.4385 tCO2e/MWh = **366,408 tCO2e (in 2018)**

Applying $E_{GPJ,2019}$ (until 28/02/2019) = 91,346 MWh (real electricity generation supplied to the grid between 01/01/2019 to 28/02/2019) to equation 02, BE_{2018} = 91,346 MWh X 0.4385 tCO2e/MWh = **40,058 tCO2e (in 2019)**

Applying estimation of annual E_{GPJy} to equation 02, BE_y = 1,060,590 MWh X 0.4385 tCO2e/MWh = 465,101 tCO2e/year.

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 13- 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)
2017	75,999	0	0	75,999
2018	366,408	0	0	366,408
2019	429,979	0	0	429,979
2020	465,101	0	0	465,101
2021	465,101	0	0	465,101
2022	465,101	0	0	465,101
2023	465,101	0	0	465,101
2024	465,101	0	0	465,101
2025	465,101	0	0	465,101
2026	465,101	0	0	465,101
2027	271,415	0	0	271,415
Total	**4,399,508**	**0**	**0**	**4,399,508**

4 MONITORING

4.1 Data and Parameters Available at Validation

Table 14 - Data and Parameters Available at Validation

Data / Parameter	The percentage share of total installed capacity of the specific technology
Data unit	%
Description	The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country
Source of data	ANEEL
Value applied	8.1%
Justification of choice of data or description of measurement methods and procedures applied	Data provided by ANEEL[27]
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	The total installed capacity of the technology
Data unit	kW
Description	The total installed capacity of the technology in the host country
Source of data	ANEEL
Value applied	14,390,293
Justification of choice of data or description of measurement methods and procedures applied	Data provided by ANEEL[27]
Purpose of Data	Calculation of baseline emissions
Comments	-

[27] ANEEL Management Information Report, December/2018. Available at: http://www.aneel.gov.br/documents/656877/14854008/Boletim+de+Informa%C3%A7%C3%B5es+Gerenciais+-+4%C2%BA+trimestre+de+2018/36e91555-141a-637d-97b1-9f6946cc61b3. Acessed on May/2019.

4.2 Data and Parameters Monitored

Table 15 – Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
Source of data	Meters at substation Curral Novo do Piauí 2 (CNP2)
Description of measurement methods and procedures to be applied	Electricity Meters
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied	1,060,590 MWh (for a complete year)
Monitoring equipment	At the substation CNP2, there are two meters (one principal and one rear) that register net electricity supplied to the grid by all initial project instances. New project instances will have at least two meters to register net electricity supplied to the grid. Class, precision and calibration procedures of the meters shall follow ONS and National Authorities Guidelines and Procedures.
QA/QC procedures to be applied	The uncertainty level for these data is low. The electricity supplied to the grid is monitored by the project participants directly from the meters. Votorantim Energia Generation Operating Center (*Centro de Operação da Geração da Votorantim Energia – COG*, in Portuguese) supports measurement data collection. Commercial team cross-checks monthly data collected from the meters managed by COG (available at a web platform) and data provided by CCEE's Website (Electric Power Commercialization Chamber). Meters are calibrated according to National Operator of the System (ONS) Procedures.
Purpose of data	Calculation of baseline emissions
Calculation method	Two specific meters are located in the Substation CNP2 that registers net electricity generated by all plants to the Grid. No calculation is necessary.

Comments	CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

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 EFgrid, 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 VTRM Renewable Energy 2 uses Dispatch data analysis OM method for operating margin emission factor, EFgrid,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 emission reduction estimation of the period 02/08/2017 to 31/12/2017 (dd/mm/yyyy), EFgrid,OM,y and EFgrid,BM,y for 2017 were used. For ex-ante emission reductions estimations from 01/01/2018 to 01/08/2027 (dd/mm/yyyy), EFgrid,OM,y and EFgrid,BM,y for 2018 were used. This is the latest information available. For both years, these parameters were calculated by Brazilian DNA.
Frequency of monitoring/recording	Annually
Value applied	0.4418 tCO2e/MWh for 2017. 0.4385 tCO2e/MWh from 2018 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 ($EF_{Grid,CM,y}$)

New project instances should present their monitoring reports when requesting inclusion in this Grouped Project. Monitoring Report should follow Monitoring Methodology of consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 19.0, and Brazilian Electricity Standards.

Monitoring of EGfacility,y

Operation and Maintenance (O&M) team is responsible for the operation and maintenance activities of the plants that compose Ventos do Piauí Complex. Votorantim Energia Generation Operating Center (*Centro de Operação da Geração da Votorantim Energia – COG*, in Portuguese) is responsible for measurement activities. It collects and storages all measurement data. Data is collected in real time and is available at web platform.

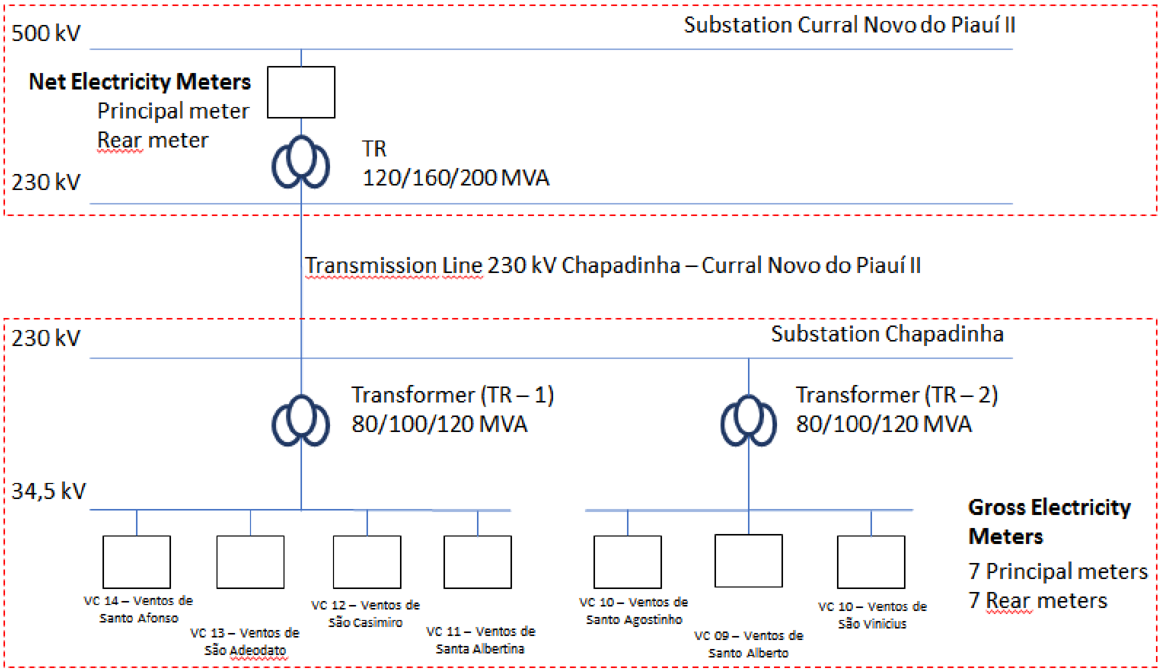
Commercial team is responsible for monitoring and analysing $EG_{facility,y.}$ information. It monitors data provided by COG and cross-checks it with information provided by Chamber of Electricity Commercialization (CCEE).

Each plant has two measurement instruments (meters) located in the plant. One is the principal meter and the second is a rear. These meters register gross electricity generated by each plant. Substation CHAPADINHA (34.5 to 230kV), which the WPPs included in this project activity are connected to, has individual measuring equipment for each facility connected. This substation can also include energy generated by facilities outside the boundary project.

At substation Curral Novo do Piauí II (CNP2), there are two meters (one principal and one rear) that register net electricity supplied to the grid ($EG_{facility,y}$) by all 7 plants that compose the initial project instance. These meters can 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 electrical substation for each facility.

ONS Grid Procedures (Sub-module 12.3) defines the calibration frequency and other maintenance procedures. All meters of the plants are calibrated according to Brazilian Standards.

Diagram below shows the measurement scheme of the initial project instance:



It is important to say 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. Periodically, the Information Technology Area accomplishes an insurance backup for all plant data through backup tape.

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

As it will be discussed in item 5.2, 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 Environmental Impact Assessment (EIA) and monitoring programs were designed to mitigate these impacts. The Environmental Basic Program gives details of actions taken to mitigate socio-economic impacts.

At this section, project proponents present just the negative environmental and social impacts identified at the Environmental Impact Assessment and actions planned to mitigate them. It is worthwhile to highlight that main impacts of the project were identified as positive impacts but are not mentioned in this section.

The negative impacts identified for all plants included in the initial instance are:

- Change in the air quality caused by vehicle circulation, earth moving and operation of the machines;
- Noise generation related to civil works, earthworks, suppression of vegetation and other processes, during both implementation and operation phases, changing local acoustic conditions;
- Alteration of the surface layer of the soil caused by the removal of vegetation, with direct soil exposure to sunlight and rain, and the rotation of the material with earthmoving and excavation services;
- Geomorphological change with the regularization of the area;
- Intensification of erosive processes by soil waterproofing and increased of surface runoff;
- Alteration in the recharge of the aquifer by the increase of the surface runoff caused by the suppression of the vegetation;
- Change in surface water flow due to decreased drainage flow;
- Pressure on water resources;
- Vegetation suppression will directly result in damage to the vegetation cover and the reduction of local biodiversity;
- The deforestation action will result in alteration of the landscape by loss of biotic potential;
- Temporary disturbance of fauna caused by noise emission;
- Intervention in permanent preservation areas;
- Risks with accidents with birds and bats during operational phase;
- Tension over population related to job creation;
- Increased risk of accidents due to higher vehicle traffic in the region;
- Higher heavy equipment circulation might lead to the degradation of roadways, especially during the rainy season, which can increase the risk of accidents;
- Risk of incidents with people during construction activities;
- Impacts on archeological heritage caused by earth moving;
- Decrease of jobs after construction phase;
- Impacts on the original landscape.

To mitigate these impacts, several actions were planned in the Environmental Basic Project (PBA). The main actions are presented as follows:

- Environmental Plan for Construction;
- Noise Monitoring Program;

- Control and Deforestation Program;
- Degraded Areas Recovery Program;
- Program for the Protection of Permanent Preservation Areas;
- Rational Deforestation Program;
- Wildlife Monitoring Program;
- Environmental Education Program;
- Wildlife Protection and Management Program;
- Social Communication Program;
- Civil Works Signaling Program;
- Worker Protection and Workplace Safety Program;
- Archaeological Heritage Management Plan;
- Program for Paleontological Identification, Monitoring and Rescue;
- Environmental Program for Construction;
- Program for Technical Training and Use of Manpower.

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. The Brazilian licensing process presents as an important characteristic the social participation in decision making through Public Meetings as part of the process.

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 (Brazilian Institute of Environment and Renewable Natural Resources), as part of SISNAMA – Sistema Nacional de Meio Ambiente (National Environmental System).

Secretary of Environment and Water Resources of Piauí State Piauí (SEMAR) is responsible for environmental licensing of the wind power plants comprised in the initial instance. At the time of this Monitoring Report elaboration, all plants have licenses operation issued. The number and validity of each License Operation 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 (PL) 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, since it is this document that authorizes its 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 verified 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), among others.

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.

At the time of this Project Description elaboration, all plants have licenses operation issued. The number and validity of each License Operation was presented on section 1.11.

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 Environmental Impact Assessment.

- Generation of positive expectations in the communities surrounding AID, as many may envision some business and / or employment opportunity because of the project;
- Direct and Indirect jobs generation, including local workers during construction;
- Through the payment of salaries to workers, the collection of taxes, the acquisition of goods and services from local suppliers, which should be prioritized by the entrepreneur, there will be an increase in working capital;
- Increase in taxes collection;
- Renewable Energy Supply to National Interconnected System;
- Increase of land value
- Payment of lease / energy production to land owners.

5.3 Local Stakeholder Consultation

The public audience is one of the phases of the environmental impact assessment and one of the main channels of community participation at a local level before project construction. This procedure consists on presenting to the interested parties the environmental assessment report, clarifying doubts and collecting criticisms and suggestions on the entrepreneurship and the areas to be affected. The place where public audiences happen must be easily accessed by the interested parties.

During the licensing process of the wind plants comprised in the new instance, Environmental Impact Assessments of the projects were submitted to public audience. The public audience notice was published in a regional large circulation newspaper, radios and banners. Date, hour and place of the event were presented in advance.

Public audiences for the seven WPPs were held in the 3 cities identified as directly or indirectly affected by the project activity[28]:

- Curral Novo do Piauí/PI: January 19th, 2016
- Betânia do Piauí/PI: January 20th, 2016
- Paulistana/PI: January 21th, 2016

[28] Attendance list of the public audiences were submitted to VVB.

Questions raised during public audience were answered by entrepreneur team and they are dully registered by the environmental entity responsible for the licensing process (SEMAR - Secretary of Environment and Water Resources of Piauí State). These questions did not any cause any change in the project.

5.4 Public Comments

-

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Table 16 – Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
Value applied:	$EG_{facility,2017}$ = 172,015 MWh $EG_{facility,2018}$ = 835,537 MWh $EG_{facility,2019}$ = 91,346 MWh Values of Egfacility per month are presented below: **2017** August/2017: 10,054.94 MWh September/2017: 33,535.50 MWh October/2017: 48,081.07 MWh November/2017: 38,002.40 MWh December/2017: 42,340.61 MWh **2018** January/2018: 48,694.89 MWh February/2018: 28,277.94 MWh March/2018: 27,478.95 MWh April/2018: 60,735.72 MWh May/2018: 87,426.56 MWh June/2018: 93,434.13 MWh July/2018: 106,404.12 MWh

	August/2018: 99,041.76 MWh September/2018: 95,497.06 MWh October/2018: 64,053.72 MWh November/2018: 73,022.69 MWh December/2018: 51,468.98 MWh **2019** January/2019: 65,374.29 MWh February/2019: 25,971.73 MWh
Comments	The uncertainty level for these data is low. The electricity supplied to the grid is monitored by project participants directly from the meters. Votorantim Energia Generation Operating Center (*Centro de Operação da Geração da Votorantim Energia – COG*, in Portuguese) supports measurement data collection. Commercial team cross-checks monthly data collected from the meters managed by COG (available at a web platform) and data provided by CCEE's Website (Electric Power Commercialization Chamber). Information about theses meters are presented in Appendix 1. Meters are calibrated according to National Operator of the System (ONS) procedures. During monitoring, from Aug/2017 to Feb/2019, values of EGfacility collected directly from meters by *COG* presented significantly differences (higher than 3%) from data provided by CCEE. For these months, conservatively, the lowest values were used.

Data / Parameter	$EF_{Grid,CM,y}$
Data unit	tCO2e/MWh
Description	Combined margin emission factor for the grid in year y
Value applied:	0.4418 tCO2e/MWh for 2017. 0.4385 tCO2e/MWh from 2018 to 2019
Comments	Calculated as per the "Tool to calculate the emission factor for an electricity system". For this project, WOM = 0.75 and WBM = 0.25 is used.

	As VTRM Renewable Energy 2 uses Dispatch data analysis OM method for operating margin emission factor, $EF_{grid,OM,y}$ and $EF_{Grid,BM,}$y calculated and published by Brazilian DNA. For $EF_{Grid,CM,y\ calculation,}$ the following values were used: **<u>2017</u>** **EFgrid,OM,2017 = 0.5882 tCO2e/MWh;** **and EFgrid,BM,2017= 0.0028 tCO2e/MWh;** **<u>2018</u>** **EFgrid,OM,2018 = 0.5390 tCO2e/MWh**, **EFgrid,BM,2018 = 0.137 tCO2e/MWh**; For the period from 01/01/2019 to 28/02/2019, data of 2018 was also used, once these are the latest data available. All values were supplied by Brazilian DNA and are published at the Ministry of Science, Technology, Innovation and Communication website.

6.2 Baseline Emissions

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

Equation 01

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

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 CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh)

As **VTRM Renewable Energy 2** just comprises greenfield wind power plants, 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 CDM 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)

Considering that:

- $EG_{facility,2017}$ = *172,015 MWh*
- $EG_{facility,2018}$ = *835,537 MWh*
- $EG_{facility,2019}$ = *91,346 MWh*
- $EF_{grid,CM,2017}$ = *0.4418 tCO2e*
- $EF_{grid,CM,2018}$ = *0.4385 tCO2e*
- $EF_{grid,CM,2018}$ = $EF_{grid,CM,2019}$ = *0.4385 tCO2e*

Applying $EG_{PJ,2017}$ (from August) = 172,015 MWh to equation 02, BE_{2017} = 172,015 MWh X 0.4418 tCO2e/MWh = 75,999 tCO2e (in 2017)

Applying $E_{GPJ,2018}$ = 835,537 MWh to equation 02, BE_{2018} = 835,537 MWh X 0.4385 tCO2e/MWh = 366,408 tCO2e (in 2018)

Applying $E_{GPJ,2019}$ (until 28/02/2019) = 91,346 MWh to equation 02, BE_{2019} = 91,346 MWh X 0.4385 tCO2e/MWh = 40,058 tCO2e (in 2019)

Total BE2017-2019 = $BE_{2017} + BE_{2018} + BE_{2019}$ = 75,999 tCO2e + 366,408 tCO2e + 40,058 tCO2e = **482,465.00 tCO2e**

6.3 Project Emissions

There are no project emissions for this type of project activity according to ACM0002 – Grid-connected electricity generation from renewable sources, version 19.0. Therefore, PEy = 0.

6.4 Leakage

There is no leakage according to ACM0002 – Grid-connected electricity generation from renewable sources, version 19.0.

6.5 Net GHG Emission Reductions and Removals

Table 17 – GHG Emission Reduction

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2017	75,999	0	0	75,999
Year 2018	366,408	0	0	366,408
Year 2019	40,058	0	0	40,058
Total	**482,465**	0	0	**482,465**

APPENDIX 1: ENERGY METERS CALIBRATION DETAILS

The current meter details for WPPs **Ventos de São Vicente 08** is as follows:

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC0801P	MW-1608A687-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC0801R	MW-1608A441-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

For **Ventos de São Vicente 09**:

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC0902P	MW-1608A806-02	Schneider Electric	ION 8650	D	28/09/2016	Approved	28/09/2021
PICVPIVIC0902R	MW-1608A557-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

For **Ventos de São Vicente 10**:

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC1003P	MW-1608A538-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC1003R	MW-1608A500-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

For **Ventos de São Vicente 11**:

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC1104P	MW-1608A527-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC1104R	MW-1608A439-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

For **Ventos de São Vicente 12:**

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC1205P	MW-1608A560-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC1205R	MW-1608A805-02	Schneider Electric	ION 8650	D	28/09/2016	Approved	28/09/2021

For **Ventos de São Vicente 13**:

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC1306P	MW-1608A225-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC1306R	MW-1608A261-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

For **Ventos de São Vicente 14:**

Metering Points	Meter Details					Test Result	Due Date of Calibration
	Serial nº	Make	Type	Accuracy Class	Date of Calibration		
PICVPIVIC1407P	MW-1608A254-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021
PICVPIVIC1407R	MW-1608A558-02	Schneider Electric	ION 8650	D	21/09/2016	Approved	21/09/2021

APPENDIX 2: TECHNICAL SPECIFICATION

	Model	Rated Power (MW)	Hub height (m)	Rotor diameter (m)	Supplier
Ventos de São Vicente 08 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 09 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 10 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 11 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 12 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 13 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T
Ventos de São Vicente 14 WPP	G114 2.1	2.1	80	114.0	Gamesa I&T

Source: AE_CVER_VOTORANTIM_BRAZIL_CHAPADINHA.