Monitoring report form

(Version 05.1)

MONITORING REPORT		
Title of the project activity	Grid connected electricity generation from renewable source: Windfarm Complex Santa Vitória do Palmar and Chuí	
UNFCCC reference number of the project activity	8012	
Version number of the monitoring report	01	
Completion date of the monitoring report	26/05/2017	
Monitoring period number and duration of this monitoring period	First monitoring period: 01st January 15 to 15th April 2016	
Project participant(s)	Santa Vitória do Palmar Holding S.A. Chuí Holding S.A. WayCarbon Soluções Ambientais e Projetos de Carbono Ltda.	
Host Party	Federative Republic of Brazil	
Sectoral scope(s)	01 – Energy industry (renewable source)	
Selected methodology(ies)	ACM0002 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 12.2.0)	
Selected standardized baseline(s)	N/A	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	827,579 tCO2e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO2e	640,696

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The proposed project activity consists in the implementation and operation of the Windfarm Complex Santa Vitória do Palmar and Chuí, constituted by 16 new wind electricity generation facilities (Chuí I, Chuí II, Chuí IV, Chuí V, Minuano I, Minuano II, Verace I, Verace II, Verace III, Verace IV, Verace V, Verace VI, Verace VII, Verace VIII, Verace IX and Verace X[1]) (Table 1), located in Santa Vitória do Palmar and Chuí Municipalities, in the Rio Grande do Sul State, Brazil. The project activity will employ 201 horizontal-axis aerogenerators (129 aerogenerators model Gamesa G97 in Verace's facilities and 72 aerogenerators IMPSA IWP-100 in Chuí and Minuano's facilities), each with 2.0 MW (total nominal capacity: 402.0 MW). The physical implementation has not yet begun.

Table 1: Windfarm Complex Santa Vitória do Palmar and Chuí's facilities.

Facility	Aerogenerators' model	Aerogenerators' quantity	Installed capacity (MW)	Electricity generation (MWh/year)	Plant load factor	Net capacity (MW)
Chuí I	IMPSA IWP-100	12	24.0	107,952	51.3%	12.3
Chuí II		11	22.0	93,019	48.3%	10.6
Chuí IV		11	22.0	91,905	47.7%	10.5
Chuí V		15	30.0	131,661	50.1%	15.0
Minuano I		11	22.0	99,402	51.6%	11.3
Minuano II		12	24.0	102,821	48.9%	11.7
Verace I	Gamesa G97	10	20.0	77,643	44.3%	8.9
Verace II		10	20.0	75,691	43.2%	8.6
Verace III		13	26.0	100,809	44.3%	11.5
Verace IV		15	30.0	120,407	45.8%	13.7
Verace V		15	30.0	113,634	43.2%	13.0
Verace VI		9	18.0	69,280	43.9%	7.9
Verace VII		15	30.0	116,339	44.3%	13.3
Verace VIII		13	26.0	98,667	43.3%	11.3
Verace IX		15	30.0	115,727	44.0%	13.2
Verace X		14	28.0	110,787	45.2%	12.6
TOTAL		**201**	**402.0**	**1,625,744**	**46.2%**	**185.6[2]**

[1] There are several names representing the same facilities and companies that compound the project activity. In the results of the 12th Brazilian Auction of New Energy (*12º Leilão de Energia Nova - Leilão nº 02/2011*), the facilities were named as Chuí I, Chuí II, Chuí IV, Chuí V, Minuano I, Minuano II, Verace I, Verace II, Verace III, Verace IV, Verace V, Verace VI, Verace VII, Verace VIII, Verace IX and Verace X, as mentioned above in the PDD. Nevertheless, Chuí and Minuano facilities can be named as Chuí's facilities, as a set, since they are all located in Chuí Municipality; and the holding that owns these facilities is Chuí Holding S.A. Verace's facilities are owned by Santa Vitória do Palmar Holding S.A., since they are located in Santa Vitória do Palmar Municipality; additionally, Verace's facilities can be named also as Geribatu's facilities.

[2] It should be noted that the Windfarm Complex Santa Vitória do Palmar and Chuí's current configuration with 201 aerogenerators, 402.0 MW of installed capacity, plant net load factor of 46.2% and consequently net capacity of 185.6 MW (estimated electricity generation of 1,625,744 MWh/year) was utilized both in the investment analysis (section B.5 of this PDD) and in the *ex-ante* estimation of emissions reductions achieved by the proposed project activity (section B.6 of this PDD). This plant load factor of the project activity is determined by two electricity generation analysis:

1. The entrepreneurs contracted Inova Energy to analyze the estimated electricity generation in Verace's facilities, considering a total of 129 aerogenerators model Gamesa G90 2.0 MW, with a total installed capacity of 258.0 MW. The Inova Energy's wind report was made available to the entrepreneurs on 13/Apr/2011 (reference: Verace_InovaEnergy_20110413) and estimated a total net electricity generation of 998,984 MWh/year.

The project activity is projected to deliver an average of 1,625,744 MWh/year[3] of renewable electricity to the National Interconnected System (*Sistema Interligado Nacional* - SIN). In the baseline[4], electricity delivered to the grid by the project activity would have 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. Hence, the project activity will promote GHG emissions reductions by displacing fossil fuel-based electricity generation that would otherwise occur.

The project boundary includes CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. Project and leakage emissions are not expected.

A.2. Location of project activity

A.2.1. Host Party

Federative Republic of Brazil

A.2.2. Region/State/Province etc.

State: Rio Grande do Sul

A.2.3. City/Town/Community etc.

Municipalities: Santa Vitória do Palmar and Chuí

2. Similarly, the entrepreneurs contracted MegaJoule to analyze the estimated electricity generation in Chuí and Minuano's facilities, considering a total of 72 aerogenerators model IMPSA IPW-100 2.0 MW, with a total installed capacity of 144.0 MW. The MegaJoule's wind report was made available to the entrepreneurs on 16/Aug/2011 (reference: ChuiMinuano_MegaJoule_20110816) and estimated a total net electricity generation of 626,760 MWh/year.

Hence, in the investment decision date (i.e. the date of the 12th Brazilian Auction of New Energy), the entrepreneurs decided to implement Chuí and Minuano's facilities utilizing IMPSA's aerogenerators and Verace's facilities utilizing Gamesa's one. This is the current configuration of this windfarm.

[3] Considering the plant load factors defined in Inova Energy's study for Verace's facilities and in MegaJoule's study for Chuí and Minuano's facilities. A detailed description of the plant load factor of the project activity is presented in footnote 2 of this PDD.

[4] The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

A.2.4. Physical/Geographical location

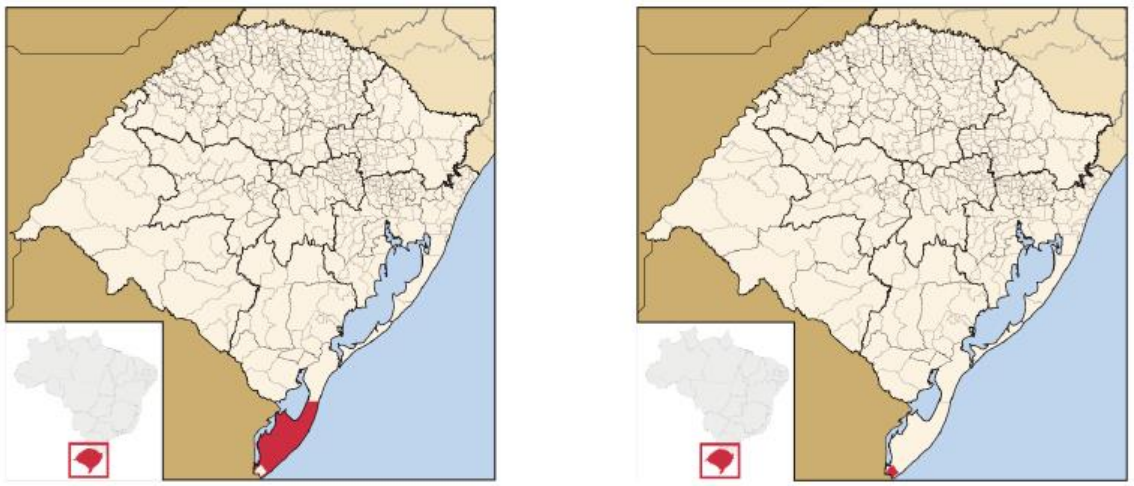


Figure 1. Geographic location of the project activity. Bottom-left panel in both figures: depicts the position of Rio Grande do SUl State in the Federetive Republic of Brazil. Main left panel: depicts Santa Vitória do Palmar Municipality within Rio Grande do Sul State. Main right panel: depicts Chuí Municipality within Rio Grande do Sul State.

The reference geographic coordinates of the project activity are depicted in Table 2.

Table 2: Project facilities' reference geographic coordinates.

Facility	Type (Datum SIRGAS2000, 22S)	Latitude	Longitude
Chuí I	UTM	6,272,978 m	278,124 m
	Degrees	- 33º39'35".8261	- 53º23'34".2523
Chuí II	UTM	6,272,638 m	277,423 m
	Degrees	- 33º39'46".3286	- 53º24'01".7541
Chuí IV	UTM	6,271,959 m	276,022 m
	Degrees	- 33º40'07".2966	- 53º24'56".7231
Chuí V	UTM	6,271,619 m	275,322 m
	Degrees	- 33º40'17".7945	- 53º25'24".1914
Minuano I	UTM	6,265,987 m	277,429 m
	Degrees	- 33º43'22".0991	- 53º24'07".5259
Minuano II	UTM	6,266,662 m	276,662 m
	Degrees	- 33º42'59".6211	- 53º24'36".6908
Verace I	UTM	6,291,509 m	289,019 m
	Degrees	- 33º29'42".5793	- 53º16'15".7864
Verace II	UTM	6,290,313 m	288,112 m
	Degrees	- 33º30'20".7380	- 53º16'51".9279
Verace III	UTM	6,288,498 m	288,350 m
	Degrees	- 33º31'19".7952	- 53º16'44".2549
Verace IV	UTM	6,285,283 m	293,316 m
	Degrees	- 33º33'07".6087	- 53º13'34".5595
Verace V	UTM	6,287,117 m	286,656 m
	Degrees	- 33º32'03".3882	- 53º17'51".0596
Verace VI	UTM	6,286,170 m	288,608 m
	Degrees	- 33º32'35".5107	- 53º16'36".2414
Verace VII	UTM	6,283,510 m	291,543 m
	Degrees	- 33º34'03".8931	- 53º14'44".7545
Verace VIII	UTM	6,285,104 m	285,803 m
	Degrees	- 33º33'08".0836	- 53º18'25".8421
Verace IX	UTM	6,282,745 m	286,505 m
	Degrees	- 33º34'25".1257	- 53º18'00".6700
Verace X	UTM	6,280,557 m	290,986 m

	Degrees	- 33º35’39”.3113	- 53º15’08”.8325

Sources:

- UTM: *Ficha de Dados EPE* (EPE's data sheet; EPE =*Empresa de Pesquisa Energética* = Brazilian Energetic Research Enterprise) (references: EPEDataSheet_Chui1; EPEDataSheet_Chui2; EPEDataSheet_Chui4; EPEDataSheet_Chui5; EPEDataSheet_Minuano1; EPEDataSheet_Minuano2; EPEDataSheet_Verace1; EPEDataSheet_Verace2; EPEDataSheet_Verace3; EPEDataSheet_Verace4; EPEDataSheet_Verace5; EPEDataSheet_Verace6; EPEDataSheet_Verace7; EPEDataSheet_Verace8; EPEDataSheet_Verace9; EPEDataSheet_Verace10).
- Degrees: conversion from UTM data by ProGrid Brazilian official program (program available at http://www.ibge.gov.br/home/geociencias/geodesia/param_transf/default_param_transf.shtm, accessed on 05/Dec/2011; conversion reference: ProGriD_0147_SIRGAS2000_Lat_Long_Chui1; ProGriD_0147_SIRGAS2000_Lat_Long_Chui2; ProGriD_0147_SIRGAS2000_Lat_Long_Chui4; ProGriD_0147_SIRGAS2000_Lat_Long_Chui5; ProGriD_0147_SIRGAS2000_Lat_Long_Minuano1; ProGriD_0147_SIRGAS2000_Lat_Long_Minuano2; ProGriD_0147_SIRGAS2000_Lat_Long_Verace01; ProGriD_0147_SIRGAS2000_Lat_Long_Verace02; ProGriD_0147_SIRGAS2000_Lat_Long_Verace03; ProGriD_0147_SIRGAS2000_Lat_Long_Verace04; ProGriD_0147_SIRGAS2000_Lat_Long_Verace05; ProGriD_0147_SIRGAS2000_Lat_Long_Verace06; ProGriD_0147_SIRGAS2000_Lat_Long_Verace07; ProGriD_0147_SIRGAS2000_Lat_Long_Verace08; ProGriD_0147_SIRGAS2000_Lat_Long_Verace09; ProGriD_0147_SIRGAS2000_Lat_Long_Verace10)

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Federative Republic of Brazil (host)	Santa Vitória do Palmar Holding S.A. Chuí Holding S.A. WayCarbon Soluções Ambientais e Projetos de Carbono Ltda.	No

A.4. Reference of applied methodology and standardized baseline

- ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 12.2.0.

- "Tool to calculate the emission factor for an electricity system". Latest approved version at the time of conclusion of this monitoring report: 05.5;

A.5. Crediting period of project activity

01 Jan 15 – 31 Dec 21 (Renewable)

A.6. Contact information of responsible persons/entities

Responsible entity:

WayCarbon Soluções Ambientais LTDA (**project participant**)
R. Professor José Vieira de Mendonça, 770, Sl.210, Engenho Nogueira, 31310-260
Tel/Fax: +55 (31) 3401-1074

Responsible persons:

- Breno Rates Azevedo – brates@waycarbon.com
- Isabela de Almeida Aroeira - iaroeira@waycarbon.com

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

Start date of the project activity: 09/08/2012

The Project Starting Date only occurred after project registration. During the 12th Brazilian Auction of New Energy (*12º Leilão de Energia Nova - Leilão nº 02/2011*[5]), the wind electricity generation of this project activity has been contracted; nevertheless, the Power Purchase Agreement (PPA) established in the auction do not necessarily commit the entrepreneurs to the wind electricity generation facilities' implementation, since it is possible to sell the PPA to other part yet. Besides not representing a major financial commitment, the land lease agreements do not necessarily bind the entrepreneurs to the implementation of the project activity either, as each one of them will only come into force when the respective windfarm starts operation as a whole. During the auction, the entrepreneurs negotiated the costs of the Windfarm Complex implementation and finally dealt the final costs with the equipment suppliers and with the company responsible for implementing the facilities. However, these deals have not been officialised yet (i.e. there is no official contracts that commit the entrepreneurs to the equipment suppliers and to the companies responsible for implementing the facilities). The project developers and the involved parts are drawing up the respective Memorandum of Understandings and contracts; these documents will formalize the financial and technical conditions of the deal made between entrepreneurs and IMPSA, Gamesa and Schahin, related to the implementation of the project activity. The signature of the first of these documents, which formalizes financial penalties if entrepreneurs do not follow them, defines the Starting Date of the project activity.

As of August 9, 2012, the entrepreneurs signed the first turn-key contract including Gamesa and Schahin for the implementation of GERIBATU I-X. This date defines the Starting Date of the project activity.

The project activity was projected to deliver an average of 1,625,744 MWh/year[6] of renewable electricity to the National Interconnected System (*Sistema Interligado Nacional* - SIN). In the baseline[7], electricity delivered to the grid by the project activity would have 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. Hence, the project activity promotes GHG emissions reductions by displacing fossil fuel-based electricity generation that would otherwise occur.

The overview of the IMPSA and Gamesa aerogenerator's technical characteristics is provided in Table 3 and Table 4, respectively.

Table 3: IMPSA IWP-100's technical overview[9].

Operational data	
Rated power	2.0 MW
Cut-in wind speed	4 m/s
Cut-out wind speed	22 m/s

[5] 12th Brazilian Auction of New Energy (12º *Leilão de Energia Nova - Leilão nº 02/*2011). Available at http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=38820a6c2930f210VgnVCM1000005e01010aRCRD. Accessed on 07/Dec/2011. Reference: 12thNewEnergyAuction_Results

[6] Considering the plant load factors defined in Inova Energy's study for Verace's facilities and in MegaJoule's study for Chuí and Minuano's facilities. A detailed description of the plant load factor of the project activity is presented in footnote 2 of this Monitoring Report.

[7] The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

Rated wind speed	13 m/s
Wind class - IEC[8]	Average speed = 8.5 m/s Reference speed = 37.5 m/s
Rotor	
Diameter	100 m
Swept area	7,854 m^2
Rotor speed range	5 - 15 rpm
Speed regulation	Pitch control
Generator	
Type	Direct-drive permanent magnet (DDPM)
Voltage	750 V
Frequency	60 Hz
Brake system	
Type	Independent systems with blade pitching mechanism

Table 4: Gamesa G97's technical overview[10, 11].

Operational data	
Rated power	2.0 MW
Wind class - IEC[12]	IIA / IIIA
Rotor	
Diameter	97 m
Swept area	7,390 m^2
Rotor speed range	9.6 – 17.8 rpm
Speed regulation	Variable pitch and speed technology
Generator	
Type	Doubly-fed machine
Voltage	690 V
Frequency	60 Hz
Brake system	
Type	Joint action of primary aerodynamic brakes and emergency brake with an hydraulic control system

The project started delivering energy to the National Interconnected System on February 2015.

Facility	Operation start
Geribatu I	Feb/2015
Geribatu II	Feb/2015
Geribatu III	Feb/2015
Geribatu IV	Feb/2015

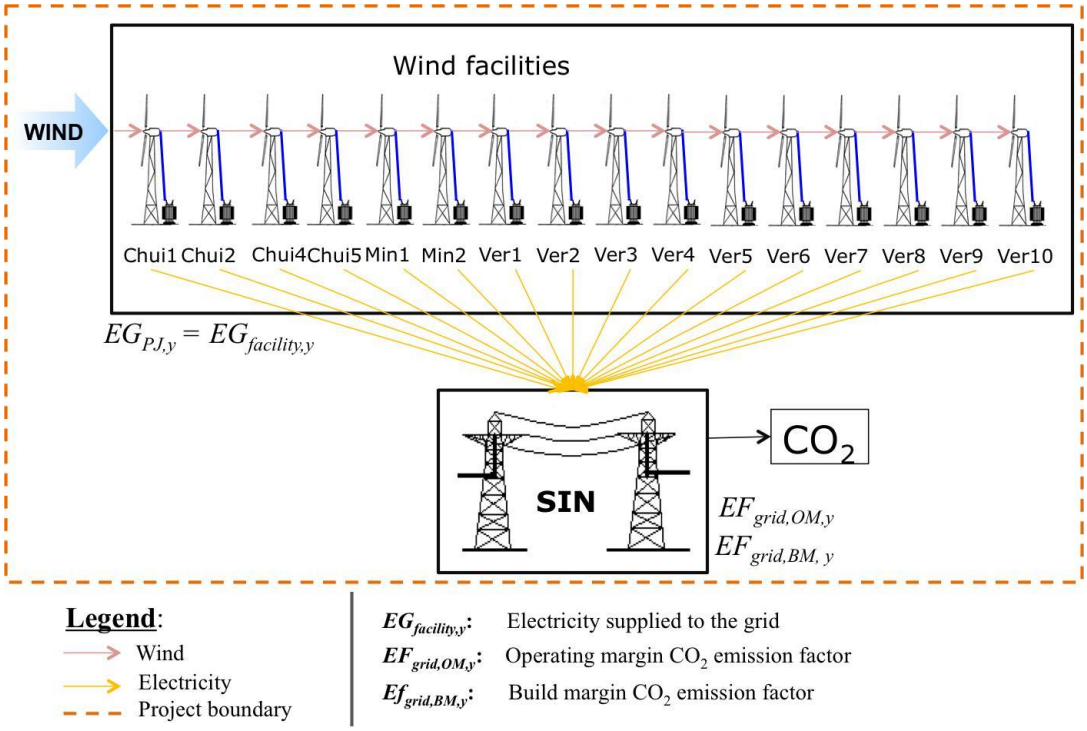
[8] International Electrotechnical Commission (IEC) is the world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

Geribatu VI	Feb/2015
Geribatu VII	Feb/2015
Geribatu VIII	Feb/2015
Geribatu IX	Feb/2015
Geribatu X	Feb/2015
Chui I	May/2015
Chui II	May/2015
Chui IV	May/2015
Chui V	Apr/2015
Minuano I	Apr/2015
Minuano II	Apr/2015

It is noteworthy that the entrepreneurship is in accordance with all the determinations established by the Brazilian, State and Municipal Environmental Law. Moreover, possible interference with environment will be also minimized through the adoption of mitigation and environmental control measures[9].

The information provided above demonstrates that the project activity employs environmentally safe and sound technology.

A flow diagram of the project boundary, physically delineating the project activity, representing emissions sources and gases included in the project boundary and the monitoring variables, is depicted in **Figure 2**.



[9] Chuí, Minuano and Verace's Simplified Environmental Report (*Relatório Ambiental Simplificado* – RAS) (references: Chui_RAS; Minuano_RAS; Verace_RAS).

Figure 2: Project boundary. Monitored variables are depicted. Baseline emissions consist of CO_2 emissions from fossil fuel combustion for the electricity generation by the plants connected to SIN, as reflected in its combined margin.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

Not applicable.

B.2.2. Corrections

Not applicable.

B.2.3. Changes to start date of crediting period

The crediting period of the PDD was changed from 01 Jan 14 – 31 Dec 20 (first version) to 01 Jan 2015 – 31 Dec 21, reflected on UNFCCC project view page.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

Not applicable.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

Not applicable.

B.2.6. Changes to project design of registered project activity

Not applicable.

B.2.7. Types of changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

Description of the monitoring plan:

1. **General Considerations**

Description of the monitoring plan:

1. **General Considerations**

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions achieved by the project activity during the whole crediting period. The entrepreneurs (that are the project developer and operator) will be responsible for the implementation of the monitoring plan, which is based in monitoring the net electricity dispatched to the grid and the emission factor of the electricity grid.

2. Data and Parameters monitored

Net electricity dispatched to the grid – $EG_{facility,y}$

Monitoring consists of metering, compiling and archiving the data that refers to the net electricity generated by the project activity and delivered to the Brazilian national grid (SIN). The net electricity dispatched to the grid ($EG_{facility,y} = EG_{PJ,y}$) will be monitored in the meters localized in the interconnection point with the Brazilian national grid (SIN); 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 (Figure 3). This data will be crosschecked with the data provided by the Brazilian Electric Energy Commercialization Chamber (*CCEE – Câmara de Comercialização de Energia Elétrica*). This data is a third party and reliable information, since CCEE is the official Brazilian agency responsible for the activities and operations of the national electricity market. Project operator will monitor this parameter continuously and data will be consolidated hourly and monthly. Monthly values will be used for crosschecking electricity dispatched in the interconnection point with the Brazilian national grid and the data provided by CCEE. Records pertaining to the meters used in the project activity (type, model and calibration reports) will be kept accordingly.

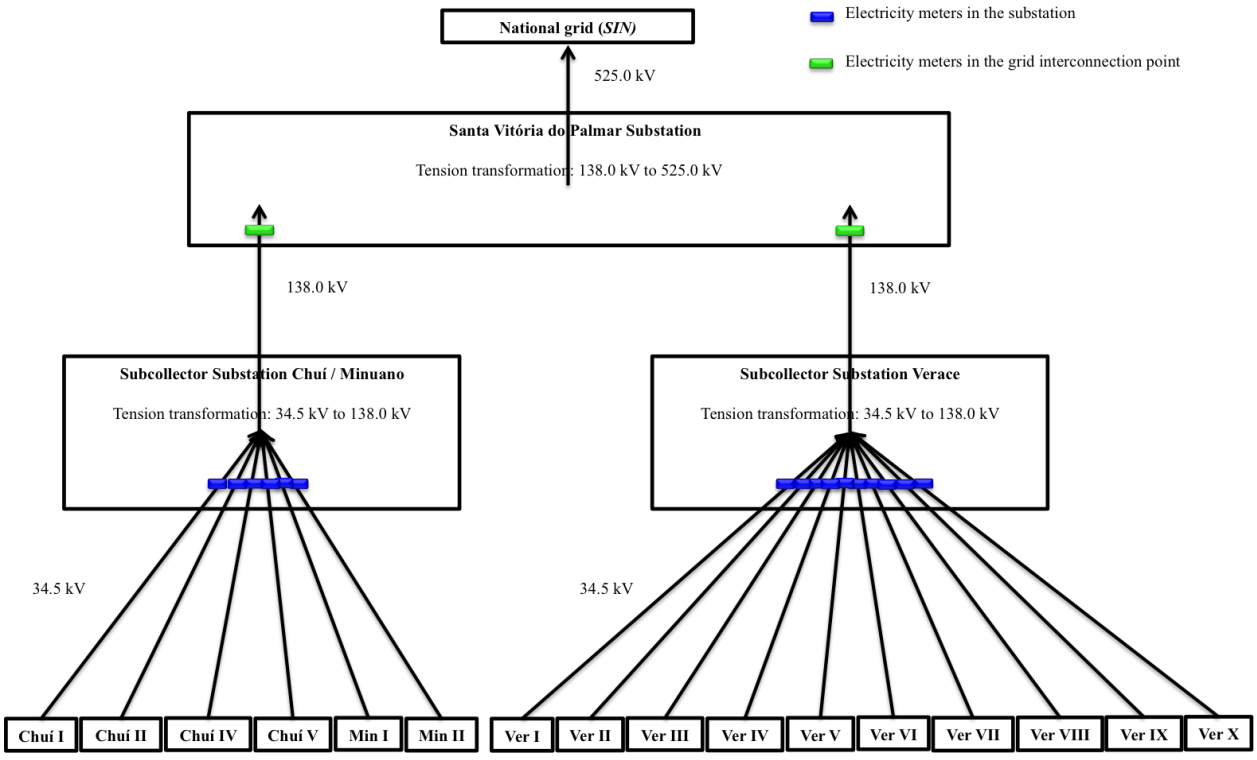


Figure 3: Simplified wiring diagram indicating the delivery point, location of the meters and tension transformation. Electricity meters in the interconnection point will be utilized in the emission reduction calculations; meters localized in the substation will be utilized for crosschecking.

The National Operator of the Electric System (*Operador Nacional do Sistema Elétrico - ONS*) regulates, by means of its Grid Procedures [10] (*Procedimentos de Rede*), *inter alia*, the measurements of electricity production for invoicing (12th module). For information related to this module, it is necessary to maintain the Measurement for Invoicing System (*Sistema de Medição para Faturamento – SMF*) according to the standard specified in the document Technical Specifications of Measurement for Invoicing (*Especificação Técnica das Medições para Faturamento*) to assure not only the control of energy accounting process by CCEE, but also the determination of demands by ONS[11].

Generally, SMF is a system composed of the main and backup measurers, by the potential and current transformers, the channels of communication between energy agent/project participant and CCEE, and the system for data collection and measurement for invoicing[12].

According to the ONS Grid Procedures – Submodule 12.1, the SMF should be installed in the connection of the plants with the energy grid to measure the net generation of these plants, which will be used for accounting and settlement of electricity in the CCEE.

Data stored on the meters is collected by the System of Energy Data Collection (*Sistema de Coleta de Dados de Energia – SCDE*) of CCEE, remotely and automatically through direct access to the meters of the project participant. These collected data are processed in SCDE for electricity accounting by CCEE and are available to all energy market participants to control their respective incomes[12].

The energy meters shall be: multi-phase, 3 elements, 4 wire (for 4 wire systems), of system rated frequency, rated current according to the secondary of current transformer, nominal voltage according to the secondary of potential transformer. The meters shall have independence of elements and sequence of phases, ensuring the same performance in monophasic and three-phasic testing[12].

The measurement systems are designed and implemented in accordance with the standards of the Brazilian Association of Technical Standards (*Associação Brasileira de Normas Técnicas – ABNT*) or International Electrotechnical Commission - IEC, ensuring the quality of the system. In addition, the meters will have certificate of conformity of design approved and issued by the National Institute of Metrology Standardization and Industrial Quality (*Instituto Nacional de Metrologia, Normalização e Qualidade Industrial – INMETRO*)[12].

Regarding the class of accuracy of energy meters, they will meet all relevant metrological requirements prescribed in Metrological Technical Regulation (*Regulamento Técnico Metrológico – RMT*) for Class 0.2 of energy meters, approved by INMETRO. Class 0.2 of energy meter, also identified as index D energy meters admits error in measurements of up to ±0.2%[12].

The energy meters possess mass memory capable of storing the data of active, reactive and demand energy in a bidirectional manner, voltages and currents at intervals of integration

[10] National Operator of the Electric System (*Operador Nacional do Sistema Elétrico* - ONS). Grid Procedures (*Procedimentos de Rede*). www.ons.org.br/procedimentos/index.aspx. Accessed in 14/07/2010.

[11] National Operator of the Electric System (*Operador Nacional do Sistema Elétrico* - ONS). Grid Procedures (*Procedimentos de Rede*). Module 12 – Submodule 12.1 (*Módulo 12 - Submódulo 12.1*). www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.1_Rev_1.1.pdf.

[12] National Operator of the Electric System (*Operador Nacional do Sistema Elétrico* - ONS). Grid Procedures (*Procedimentos de Rede*). Module 12 – Submodule 12.2 (*Módulo 12 - Submódulo 12.2*). www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.2_Rev_1.1.pdf.

programmable from 5 to 60 minutes during the minimum period of 32 days. These meters will also be equipped with a system of preservation and salvage of records in case of power loss, storing data in non-volatile memory for at least 100 hours. In addition, they possess at least two independent communication ports with concurrent access or that allow the prioritization of one of them. One will be for the exclusive use of the CCEE and the other for access of agents involved in the measurement point. The CCEE communication port will be coupled to a stable and good performance internet channel, which will be established under a VPN tunnel (Virtual Private Network) between the meter and the CCEE. The meters will be able to manage concurrent access to its communications ports in order to allow full time access to mass memory records of meters via CCEE communication port[12].

Besides electricity measurements are performed by the project owners, all the electricity dispatched to the grid by the project activity will be monitored online by CCEE. This entity is responsible for the monthly readings and keeping the records of the energy generated. If any problem happens at the local meter level, the reading lecture corresponding to the amount of energy during the time of the problem will not be lost due to online reading performed by CCEE. As mentioned before, in order to assure the quality of data used in the emission reductions calculation, the project proponents will provide access to the DOE of the records of CCEE databank, because the data from this entity will serve to crosscheck the electricity dispatched to the grid.

Backup meters are equal or equivalent to the main meters, installed on the same panel, with the same information for current and voltage and under the same technical standards.

In order to ensure the effectiveness operation of SMF, preventive maintenance must be carried out and, where necessary, also corrective maintenance. Inspections are also conducted in order to verify the correct operation of meters[12].

The frequency for preventive maintenance of the SMF is a maximum of two years. This schedule may be changed based on the historical occurrence observed in all plants, considering the schedule of stops. The meter that after calibration displays errors outside the range specified by the standard must be replaced[13].

The calibration of meters shall be conducted by a qualified organization that must comply with national standards and industrial regulations to ensure the accuracy. After calibration, the meters must be sealed to assure the safety and the calibration certificates must be archived with the other monitoring records. The deadline for meter's calibration follows, therefore, the "Grid Procedures" from the ONS Module 12, Sub-module 12.3. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE, etc).

All the meters installed will be tested and calibrated in accordance with regulations provided by CCEE. Moreover if any errors are detected in the measuring device, it will be immediately replaced by the backup meter, which will be previously calibrated. The damaged measuring device will be repaired, recalibrated and will return to the monitoring system.

In the case of any changes occurred in the ONS Grid Procedures and related documents, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE, etc) in the net electricity dispatched to the grid ($EG_{facility,y}$) monitoring. The monitoring procedure described above reflects what is demanded today by ONS. In case of changes of these requirements, the new procedures will supersede what is described here.

[13] National Operator of the Electric System (*Operador Nacional do Sistema Elétrico* - ONS). Grid Procedures (*Procedimentos de Rede*). Module 12 – Submodule 12.3 (*Módulo 12 - Submódulo 12.3*). http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.3_Rev_1.1.pdf.

Emission Factor – $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ and $EF_{grid,CM,y}$

The monitoring plan also includes parameters such as the operating margin CO_2 emission factor for power units in the top of the dispatch order ($EF_{grid,OM,y}$), the build margin CO_2 emission factor ($EF_{grid,BM,y}$) of SIN and the combined margin CO_2 emission factor ($EF_{grid,CM,y}$). These parameters will be obtained from the Brazilian Interministerial Commission for Climate Change (Brazilian DNA), which calculates and publishes $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ according to the most recent version of the "Tool to calculate the emission factor for an electricity system". These published parameters will be used for the calculation of the yearly combined margin ($EF_{grid,CM,y}$) and, ultimately, for the calculation of the emission reductions achieved by the project activity. In case the DNA ceases to publicize $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ and/or $EF_{grid,CM,y}$, project proponents may choose to use its own or third-party calculated Emission Factors, which follow the "Tool to calculate the emission factor for an electricity system."

All data collected as part of monitoring will be archived and kept at least for 2 years after the end of the crediting period or 2 years after the last issuance of CER for this project activity, whichever occurs later.

3. Monitoring Structure

The operational and management structure that the project operator will implement in order to monitor emission reductions achieved by the project activity is as given in the flowchart in Figure 4.

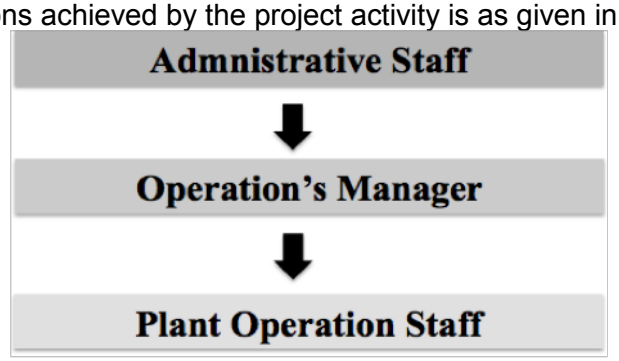


Figure 4: Operational and management structure that the project operator will implement in order to monitor emission reductions achieved by the project activity.

The roles and responsibilities within the structure outlined in Figure 4 are described in detail in the paragraphs below.

Administrative Staff: Responsible for go along with the auditor during the verification visit and provide all necessary documents related to the records of the net electricity supply to the grid. If applicable, at the time of verification by DOE, the Administrative Staff will provide access to the records of CCEE databank in order to demonstrate that electricity generation data is consistent and accurate. The Administrative Staff will forward all electronic media-based information to the CDM Consultancy Company at a minimum bimonthly frequency.

Operation's Manager: Responsible for the record keeping and indexing of the data pertaining to the net electricity supply to the grid. Its attributions also include ensuring that the monitored data pertaining to the net electricity generation is continuously sent (online) to the Electric Energy Commercialization Chamber (*CCEE – Câmara de Comercialização de Energia Elétrica*).

Plant Operation Staff: Responsible for the general supervision of the plant operation and for the supervision of the metering. Its attributions also include ensuring that meters included in the

present monitoring plan are calibrated and undergo maintenance as per the applicable regulations and manufactures' recommendations. Any meter calibration procedures will be reported to the Administrative Staff.

Training procedures

In order to ensure accuracy of the monitored data and to guarantee the quality of the monitoring plan, the Administrative Staff will receive training on monitoring methodologies, procedures and archiving by WayCarbon Soluções Ambientais e Projetos de Carbono Ltda. Then, the CDM Manager will train the project staff in respect to the CDM monitoring. The training course covers initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving.

4. Compilation of Monitoring Reports

As previously mentioned, monitored data will be forwarded to the CDM Consultancy Company (WayCarbon Soluções Ambientais e Projetos de Carbono Ltda.) at a minimum bimonthly basis. Besides being responsible for collecting the information pertaining to the calculation of the grid emission factor ($EF_{grid,OM,y}$ and $EF_{grid,BM,y}$), the CDM Consultancy Company will compile monitoring reports and will be responsible for the calculation of the emission reductions achieved by the project activity.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter	w_{OM}
Unit	Fraction
Description	Weighting of operating margin emissions factor
Source of data	"Tool do calculate the emission factor for an electricity system", Version 02.2.1
Value(s) applied	75%
Choice of data or Measurement methods and procedures	Default value for wind power plants.
Purpose of data	Calculation of baseline emissions
Additional comment	This value will be applied in the subsequent crediting periods.

Data / Parameter	w_{BM}
Unit	Fraction
Description	Weighting of build margin emissions factor
Source of data	"Tool do calculate the emission factor for an electricity system", Version 02.2.1
Value(s) applied	25%
Choice of data or Measurement methods and procedures	Default value for wind power plants.
Purpose of data	Calculation of baseline emissions
Additional comment	This value will be applied in the subsequent crediting periods.

D.2. Data and parameters monitored

Data/parameter:	$EG_{facility,y} = EG_{PJ,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant to the grid in year y
Measured/calculated/default	Measured and calculated
Source of data	Project activity site.
Value(s) of monitored parameter	2015: 984,432 MWh till 15th of April 2016: 325,079 MWh

Monitoring equipment

Type: Electricity Meter ION 8600.

Facility	Meter code	Meter serial#	Meter type	Last calib. Date	Calib. certify. #
Chui I	RSCHU-CH01-01P	MW1310A364-01	Main	29/09/2015	16/2015
Chui I	RSCHU-CH01-01R	MW1309A508-01	Backup	01/10/2015	17/2015
Chui II	RSCHU-CH02-02P	MW1310A504-01	Main	30/09/2015	18/2015
Chui II	RSCHU-CH02-02R	MW1309A723-01	Backup	30/09/2015	19/2015
Chui IV	RSCHU-CH04-03P	MW1308A359-01	Main	30/09/2015	22/2015
Chui IV	RSCHU-CH04-03R	MW1309A281-01	Backup	02/10/2015	23/2015
Chui V	RSCHU-CH05-04P	MW1309A564-01	Main	02/10/2015	24/2015
Chui V	RSCHU-CH05-04R	MW1310A182-01	Backup	03/10/2015	25/2015
Chui VI (Min. I)	RSCHU-MN01-05P	MW1310A568-01	Main	02/10/2015	26/2015
Chui VI (Min. I)	RSCHU-MN01-05R	MW1309A056-01	Backup	04/10/2015	27/2015
Chui VII (Min. II)	RSCHU-MN02-06P	MW1310A344-01	Main	03/10/2015	28/2015
Chui VII (Min. II)	RSCHU-MN02-06R	MW1310A402-01	Backup	03/10/2015	29/2015
SPA LT Chui	RSSPA2CECH-05P	MW1310A340-01	Main	05/10/2015	34/2015
SPA LT Chui	RSSPA2CECH-05P	MW1310A508-01	Backup	07/10/2015	35/2015
Geributu I	RSCBGTEVRC101P	MW1310A191-01	Main	11/11/2015	40/2015
Geributu I	RSCBGTEVRC101R	MW1310A184-01	Backup	12/11/2015	41/2015
Geributu II	RSCBGTEVRC202P	MW1310A572-01	Main	11/11/2015	42/2015
Geributu II	RSCBGTEVRC202R	MW1309A372-01	Backup	12/11/2015	43/2015
Geributu III	RSCBGTEVRC303P	MW1310A398-01	Main	11/11/2015	44/2015
Geributu III	RSCBGTEVRC303R	MW1310A526-01	Backup	12/11/2015	45/2015
Geributu IV	RSCBGTEVRC404P	MW1310A401-01	Main	12/11/2015	46/2015
Geributu IV	RSCBGTEVRC404R	MW1309A552-01	Backup	13/11/2015	47/2015
Geributu v	RSCBGTEVRC505P	MW1309A457-01	Main	13/11/2015	48/2015
Geributu V	RSCBGTEVRC505R	MW1309A332-01	Backup	14/11/2015	49/2015
Geributu VI	RSCBGTEVRC606P	MW1310A390-01	Main	13/11/2015	50/2015
Geributu VI	RSCBGTEVRC606R	MW1310A181-01	Backup	15/11/2015	51/2015
Geributu VII	RSCBGTEVRC707P	MW1309A418-01	Main	14/11/2015	52/2015
Geributu VII	RSCBGTEVRC707R	MW1309A290-01	Backup	15/11/2015	53/2015
Geributu VIII	RSCBGTEVRC808P	MW1309A327-01	Main	14/11/2015	54/2015
Geributu VIII	RSCBGTEVRC808R	MW1309A422-01	Backup	15/11/2015	55/2015
Geributu IX	RSCBGTEVRC909P	MW1310A026-01	Main	16/11/2015	56/2015
Geributu IX	RSCBGTEVRC909R	MW1310A174-01	Backup	17/11/2015	57/2015
Geributu X	RSCBGTEVR1010P	MW1310A396-01	Main	16/11/2015	58/2015
Geributu X	RSCBGTEVR1010R	MW1310A333-01	Backup	18/11/2015	59/2015
SPA LT Ger	RSSPA2CEGBT03P	MW1309A452-01	Main	05/10/2015	32/2015
SPA LT Ger	RSSPA2CEGBT03R	MW1310A186-01	Backup	05/10/2015	33/2015
SPA TF3 525 kV	RSSPA2EGBCM04P	MW1309A114-01	Main	05/10/2015	30/2015
SPA TF3 525 kV	RSSPA2EGBCM04R	MW1309A444-01	Backup	06/10/2015	31/2015

Measuring/reading/recording frequency:	Data is monitored continuously with hourly recording. Data will be archived electronically until two years after finishing the crediting period.
Calculation method (if applicable):	This parameter will be continuously analyzed and monitored. Values will be aggregated monthly and yearly. Corresponds to the total net electricity generation by the 16 facilities of the project activity. This parameter will be monitored in meters localized in the interconnection point with the Brazilian national grid (SIN); 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 (Figure 3).
QA/QC procedures:	The monthly amount of electricity generated by each project plant, metered at the subcollector substation, is crosschecked with the amount of electricity accounted / invoiced by the Brazilian Electric Energy Commercialization Chamber (*CCEE – Câmara de Comercialização de Energia Elétrica*). This data is a third party and reliable information, since CCEE is the official Brazilian agency responsible for the activities and operations of the national electricity market.
Purpose of data:	Calculation of baseline emissions
Additional comments:	"SPA LT Ger" and "SPA LT Chui" monitor the electricity generation of all facility of Geribatu/Verace and Chui/Minuano, recpectively. The results of these meters are used for cross-check only. They are not used for the calculation of emission reductions.

Data/parameter:	$EF_{grid, CM, y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor in year y
Measured/calculated/default	Calculated
Source of data	Ministry of Science and Technology of Brazil
Value(s) of monitored parameter	2015: 0.4787 tCO_2/MWh till 15th of April 2016: 0.5214 tCO_2/MWh
Monitoring equipment	No monitoring equipment is involved
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	Calculation consists of weighed average of the yearly emission factor of the operating margin (OM) and the build margin (BM). Weighting factors are those provided in section D1 (w_{OM} and w_{BM}).
QA/QC procedures:	As per the most recent version of the "Tool to calculate the emission factor for an electricity system".
Purpose of data:	Calculation of baseline emissions
Additional comments:	-

Data/parameter:	$EF_{grid, OM, y}$
Unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor in year y
Measured/calculated/default	Calculated
Source of data	Brazilian Interministerial Commission on Global Climate Change
Value(s) of monitored parameter	2015: 0.5531 tCO_2/MWh till 15th of April 2016: 0.6101 tCO_2/MWh
Monitoring equipment	No monitoring equipment is involved
Measuring/reading/recording frequency:	Hourly emission factors of the operating margin are averaged annually, weighted by the hourly amount of electricity fed into the grid by the project activity.

Calculation method (if applicable):	As per the most recent version of the "Tool to calculate the emission factor for an electricity system". This parameter is calculated as per the dispatch data analysis method. This means that the emission factor of the operating margin is calculated hourly and averaged yearly, weighted by the hourly amount of electricity fed into the grid by the project activity.
QA/QC procedures:	As per the most recent version of the "Tool to calculate the emission factor for an electricity system".
Purpose of data:	Calculation of $EF_{grid, CM, y}$.
Additional comments:	-

Data/parameter:	$EF_{grid, BM, y}$
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor in year y
Measured/calculated/default	Calculated
Source of data	Ministry of Science and Technology of Brazil
Value(s) of monitored parameter	2015: 0.2553 tCO_2/MWh 2016: 0.2553 tCO_2/MWh
Monitoring equipment	No monitoring equipment is involved
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	As per the most recent version of the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures:	As per the most recent version of the "Tool to calculate the emission factor for an electricity system".
Purpose of data:	Calculation of $EF_{grid, CM, y}$.
Additional comments:	By the time of completion of the monitoring report, the 2016 value was not yet available in the website of the Brazilian Ministry of Science and Technology.

D.3. Implementation of sampling plan

Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

Baseline emissions were calculated as follows:

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

Where:

BE_y: Baseline emissions in year y (tCO_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).

Calculation of $EF_{grid,CM,y}$

The project plants serve Brazilian Interconnected System (SIN). The Brazilian DNA has published the delineation of SIN to be adopted for the purposes of CDM projects. As per Resolution nº 8 of the Brazilian DNA, the electric grid considered in this project activity is considered as a single system consisted by the sub-markets of SIN as the definition of the electric system of the project. Off-grid plants will not be included in the calculation of $EF_{grid,CM,y}$.

$EF_{grid,CM,y}$ is calculated using the latest version of the "Tool to calculate the emission factor for an electricity system". The following formulae apply:

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

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year y (tCO_2/MWh);

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

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

w_{OM} = Weighting of operating margin emissions factor (75%);

w_{BM} = Weighting of build margin emissions factor (25%).

$EF_{grid,OM,y}$ was calculated as per the **Dispatch Data Analysis OM** calculated as per the most recent version of the "Tool to calculate the emission factor for an electricity system", according to the following formula:

$EF_{grid,OM\text{-}DD,y} = (\Sigma_h EG_{PJ,h} * FE_{EL,DD,h}) / EG_{PJ,y}$

Where

$EF_{grid,OM\text{-}DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (t CO_2/MWh)

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y (MWh)

$FE_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh)

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh)

h = Hours in year y in which the project activity is displacing grid electricit

y = Year in which the project activity is displacing grid electricity

The parameters $FE_{EL,DD,h}$ and $EF_{grid,BM,y}$ are calculated and published by the Brazilian Ministry of Science and Technology, according to the most recent version of the "Tool to calculate the emission factor for an electricity system".

E.2. Calculation of project emissions or actual net GHG removals by sinks

As per ACM0002/Version 12.2.0, since the project activity is neither a geothermal, solar nor a hydropower plant, $PE_y = 0$.

E.3. Calculation of leakage

According to ACM0002, version 12.2.0, "no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.".

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	640,696	0	0	0	640,696	640,696

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	827,579	640,696

E.6. Remarks on difference from estimated value in registered PDD

The value of the emission reductions (640,696 tCO2) achieved during the monitoring period (01st Jan/2015 to 15th Apr/2016) was 22.6% lower that the value estimated in the ex ante calculation of the registered PDD.

Such difference may be explained by the fact that, the present project claims zero credits for the period of 01 January 2015 to 01 February 2015, as the wind complex started operation on 01 February and the facilities CHUI I, CHUI II, CHUI IV, CHUI V, CHUI VI and CHUI VII only began operating between April/2015 and May/2015.

Contrastingly, in the registered PDD, for the purpose of ex-ante estimations of emission reduction, the average value of the emission factor of the combined margin in the three previous years was used (0.3941 tCO2/MWh). However, the ex-post monitored values of this parameter were 21% and 32%, respectively, for the years 2015 and 2016. Such increase was caused by the higher participation of the fossil fuel-fired resources in the Brazilian electric matrix, and it compensated the lower then anticipated electricity generation by the project activity during the monitoring period.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	WayCarbon Soluções Ambientais e Projetos de Carbono LTDA.
Street/P.O. Box	Rua Professor José Vieira de Mendonça, 770. Bairro Engenho Nogueira.
Building	Edifício Institucional do BHTEC, Sala 210
City	Belo Horizonte
State/region	Minas Gerais
Postcode	30310-260
Country	Brazil
Telephone	+55 31 3041-1075
Fax	+55 31 3041-1075
E-mail	brates@waycarbon.com
Website	www.waycarbon.com
Contact person	Breno Rates Azevedo
Title	Managing Partner
Salutation	Mr.
Last name	Azevedo
Middle name	Rates
First name	Breno
Department	-
Mobile	+55 31 99207-9005
Direct fax	+55 31 3041-1075
Direct tel.	+55 31 3041-1075
Personal e-mail	brenorates@gmail.com

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Santa Vitória do Palmar Holding S.A.
Street/P.O. Box	Rua Deputado Antônio Edu Vieira, 999, Pantanal.
Building	-
City	Florianópolis
State/region	Santa Catarina
Postcode	88040-901
Country	Brazil
Telephone	+55 48 3231-7000
Fax	+55 48 3234-4040
E-mail	jose.vieira@eletrosul.gov.br
Website	-
Contact person	José Renato Vieira
Title	-
Salutation	Mr.
Last name	Vieira
Middle name	-
First name	José Renato
Department	-
Mobile	-
Direct fax	+55 48 3234-4040
Direct tel.	+55 48 3231-7000
Personal e-mail	-

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Chuí Holding S.A.
Street/P.O. Box	Rua Deputado Antônio Edu Vieira, 999, Pantanal.
Building	-
City	Florianópolis
State/region	Santa Catarina
Postcode	88040-901
Country	Brazil
Telephone	+55 48 3231-7000
Fax	+55 48 3234-4040
E-mail	jose.vieira@eletrosul.gov.br
Website	-
Contact person	José Renato Vieira
Title	-
Salutation	Mr.
Last name	Vieira
Middle name	-
First name	José Renato
Department	-
Mobile	-
Direct fax	+55 48 3234-4040
Direct tel.	+55 48 3231-7000
Personal e-mail	-