



Monitoring report form for CDM project activity
(Version 08.0)

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

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 PDD applicable to this monitoring report	Version 4		
Version number of this monitoring report	Version 06.0		
Completion date of this monitoring report	13/09/2021		
Monitoring period number	2		
Duration of this monitoring period	16/04/2016 – 31/12/2020		
Monitoring report number for this monitoring period	N/A		
Project participants	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		
Applied methodologies and standardized baselines	ACM0002 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 12.2.0)		
Sectoral scopes	01 – Energy Industry (Renewable Source)		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0 tCO ₂ e	2,477,517 tCO ₂ e	0 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	2,902,222 tCO ₂ e		

SECTION A. Description of project activity

A.1. General description of project activity

The project activity consists in the implementation and operation of the Windfarm Complex Santa Vitória do Palmar and Chuí, constituted by 16 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 X¹) (Table 1), located in Santa Vitória do Palmar and Chuí Municipalities, in the Rio Grande do Sul State, Brazil. The project activity employs 201 horizontal-axis aerogenerators (model Gamesa G97), each with 2.0 MW (total nominal capacity: 402.0 MW).

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

Facility	Aerogenerators' Model	Quantity of Aerogenerators	Installed Capacity(MW)	Electricity generation* (MWh/year)	Plant load factor	Net capacity (MW)
Chuí I	Gamesa G97	12	24.0	98,319	46.8%	11.2
Chuí II		11	22.0	87,089	45.2%	9.9
Chuí IV		11	22.0	86,620	44.9%	9.9
Chuí V		15	30.0	119,148	45.3%	13.6
Minuano I		11	22.0	82,999	43.1%	9.5
Minuano II		12	24.0	90,234	42.9%	10.3
Verace I		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

*Ex-ante estimations.

The project activity is projected to deliver an average of 1,563,393 MWh/year² of renewable electricity to the National Interconnected System (*Sistema Interligado Nacional*)

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 (12^o 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 Considering the plant load factors defined in Inova Energy's study for Verace's facilities and in EREDA'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.

- SIN). In the baseline³, 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 project boundary includes CO₂ 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

Federative Republic of Brazil;

State: Rio Grande do Sul

Municipalities: Santa Vitória do Palmar and Chuí

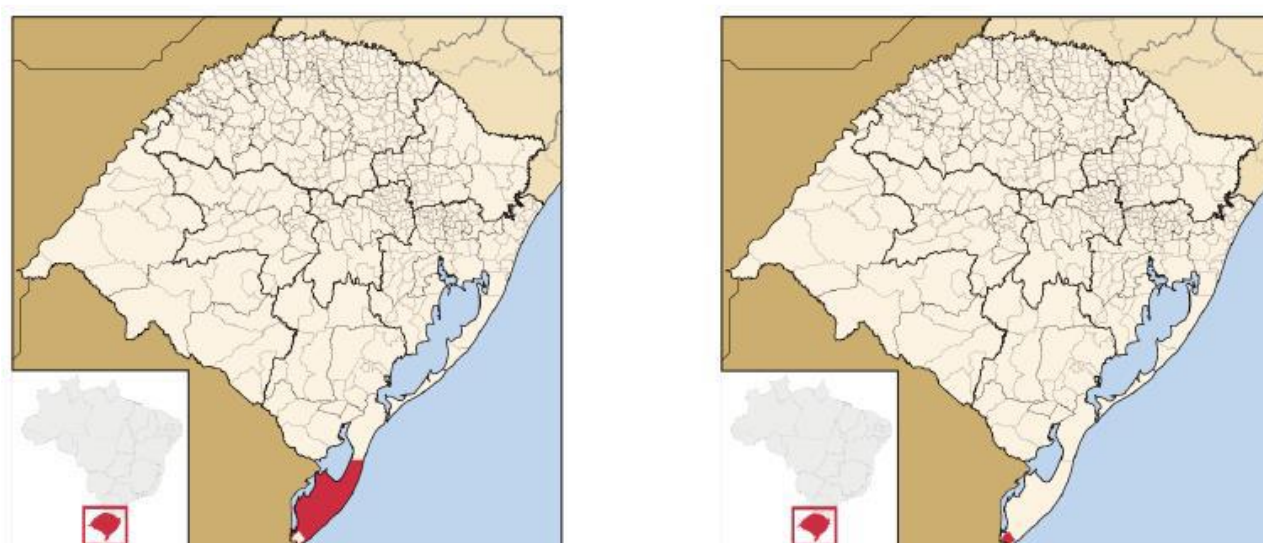


Figure 1. Geographic location of the project activity. Bottom-left panel in both figures: depicts the position of Rio Grande do Sul State in the Federative Republic of Brazil. Main left panel: depicts Santa Vitória do Palmar Municipality within Rio Grande do Sul State. Main right panel: depicts Chuí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

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

³ The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

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	- 33°39'35".8261	- 53°23'34".2523
Chuí II	UTM	6,272,638 m	277,423 m
	Degrees	-33°39'46".3286	- 53°24'01".7541
Chuí IV	UTM	6,271,959 m	276,022 m
	Degrees	33°40'07".2966	- 53°24'56".7231
Chuí V	UTM	6,271,619 m	275,322 m
	Degrees	- 33°40'17".7945	- 53°25'24".1914
Minuano I	UTM	6,265,987 m	277,429 m
	Degrees	- 33°43'22".0991	- 53°24'07".5259
Minuano II	UTM	6,266,662 m	276,662 m
	Degrees	- 33°42'59".6211	- 53°24'36".6908
Verace I	UTM	6,291,509 m	289,019 m
	Degrees	- 33°29'42".5793	- 53°16'15".7864
Verace II	UTM	6,290,313 m	288,112 m
	Degrees	- 33°30'20".7380	- 53°16'51".9279
Verace III	UTM	6,288,498 m	288,350 m
	Degrees	- 33°31'19".7952	- 53°16'44".2549
Verace IV	UTM	6,285,283 m	293,316 m
	Degrees	- 33°33'07".6087	- 53°13'34".5595
Verace V	UTM	6,287,117 m	286,656 m
	Degrees	- 33°32'03".3882	53°17'51".0596
Verace VI	UTM	6,286,170 m	288,608 m
	Degrees	- 33°32'35".5107	- 53°16'36".2414
Verace VII	UTM	6,283,510 m	291,543 m
	Degrees	- 33°34'03".8931	53°14'44".7545
Verace VIII	UTM	6,285,104 m	285,803 m
	Degrees	- 33°33'08".0836	- 53°18'25".8421
Verace IX	UTM	6,282,745 m	286,505 m
	Degrees	- 33°34'25".1257	- 53°18'00".6700
Verace X	UTM	6,280,557 m	290,986 m
	Degrees	- 33°35'39".3113	- 53°15'08".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 participants

Parties involved	Project participants	Indicate if 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. References to applied methodologies and standardized baselines

- ACM0002: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, Version 12.2.0. Available at: <https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>
- “Tool to calculate the emission factor for an electricity system” TOOL07, Version 02.2.1. Available at: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view

A.5. Crediting period type and duration

Renewable, 01/01/2015 – 31/12/2021.

SECTION B. Implementation of project activity**B.1. Description of implemented 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 02/2011⁴*), the wind electricity generation of this project activity was contracted; nevertheless, the Power Purchase Agreement (PPA) established in the auction did not commit the entrepreneurs to the wind electricity generation facilities’ implementation, since it was still possible to sell the PPA to another part.

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

⁴ 12th Brazilian Auction of New Energy (*12º Leilão de Energia Nova - Leilão nº 02/2011*).

Starting Date of the project activity. The milestone is presented on Table 3 – Timeline for implementation of registered project activity.

Table 3. Timeline for implementation of registered project activity.

Date	Object	Related part	Document reference	Observation
09/08/2012	Turn-key contracts signature for VERACE I-X implementation	GAMESA, Schahin	Contrato EPC - Geribatu X - EOL ST GB X 085 2012 // Contrato EPC - Geribatu VIII - EOL ST GB VIII 083 2012 // Contrato EPC - Geribatu VII - EOL ST GB VII 082 2012 // Contrato EPC - Geribatu VI - EOL ST GB VI 081 2012 // Contrato EPC - Geribatu V - EOL ST GB V 080 2012 // Contrato EPC - Geribatu IX - EOL ST GB IX 084 2012 // Contrato EPC - Geribatu IV - EOL ST GB IV 079 2012 // Contrato EPC - Geribatu III - EOL ST GB III 078 2012 // Contrato EPC - Geribatu II - EOL ST GB II 077 2012 // Contrato EPC - Geribatu I - EOL ST GB I 076 2012	Entrepreneurs contracted Gamesa and Schahin for project implementation.
23/11/2012	Turn-key contracts signature for CHUI I,II,IV, V and Minuano I, II implementation	IMPESA, SCHAHIN	EOL CH CHVII 108 2012 CONSÓRCIO EPC // EOL CH CHV 144 2012 - CONSÓRCIO EPC // EOL CH CH VI 145 2012 - CONSÓRCIO EPC // EOL CH CH IV 143 2012 - CONSÓRCIO EPC // EOL CH CH II 142 2012 - CONSÓRCIO EPC // EOL CH CH I 141 2012 - CONSÓRCIO EPC	Entrepreneurs contracted IMPESA and Schahin for project implementation.
24/09/2013	Dissolution of turn-key contracts CHUI-IMPESA	IMPESA	‘Termo de Acordo - IMPESA’ dated 7/02/2014 but entered into force in 24/09/2013	As IMPESA could not deliver the contracted aerogenerators, the contract was terminated
21/10/2013	Turn-key contracts signature for CHUI IV, V and MINUANO I, II implementation	GAMESA, SCHAHIN	EOL CH CH VII 253 2013-253A1 EPC CHUI // EOL CH CH VI 252 2013-252A1 EPC CHUI // EOL CH CH V 251 2013-251A1 EPC CHUI // EOL CH CH IV 250 2013-250A1 EPC CHUI	After the IMPESA contract termination, a turn-key contract including GAMESA and SCHAHIN for the implementation was signed
03/02/2014	SCHAHIN cession of rights to PAVSOLO concerning turn-key contracts CHUI IV, V and MINUANO I, II	SCHAHIN, PAVSOLO, GAMESA	Aditivo aos EOLs 250 251 252 253	A complimentary agreement was signed to formalize SCHAHIN’s cession of rights to PAVSOLO concerning the turn-key contracts for CHUI IV-V and MINUANO I, II
12/02/2014	Turn-key contracts signature for CHUI I and II implementation	GAMESA	EOL CH CH I 316 2014 EPC CHUI // EOL CH CH II 317 2014 EPC CHUI	After the IMPESA contract termination, a turn-key contract including GAMESA for the implementation was signed
21/09/2013	Turn-key contract signature for VERACE I-X implementation	SCHAHIN, PAVSOLO	SP 509 2013 EPC PAVSOLO	Implementation contract between the entrepreneurs and the companies SCHAHIN and PAVSOLO

Date	Object	Related part	Document reference	Observation
30/04/2014	Complementary agreement for construction works acceleration VERACE I-X	GAMESA	Acordo Complementar aos EOL's 076 077 078 079 080 081 082 083 084 085 - GAMESA	A complimentary agreement only to alter contract dates and targets
04/10/2014	Amendment to complementary agreement for construction works acceleration VERACE I-X	GAMESA	A1AC ST EOL's 076, 077, 078, 079, 080, 081, 082, 083, 084 e 085	Na amendment to the complimentary agreement for construction works was signed
19/09/2015	Turn-key contract termination (VERACE I-X)	GAMESA	TERMO DE ENCERRAMENTO CONT EPC GERIBATU	The turn-key contract for VERACE facilities was terminated. The contract termination is a legal tool to resolve disputes related to extraordinary costs.
19/09/2015	Turn-key contract termination (CHUI I,II,IV, V; MINUANO I and II)	GAMESA	TERMO DE ENCERRAMENTO CONT EPC CHUI	The turn-key contract for CHUI and MINUANO facilities was terminated. The contract termination is a legal tool to resolve disputes related to extraordinary costs.

The first registered PDD (Version 03, dated 22 June 2012) considers the same Windfarm Complex configuration in force as that of the investment decision date (i.e. the date of the 12th Brazilian Auction of New Energy). IMPSA would be the aerogenerator supplier to Chuí's and Minuano's plants, whereas GAMESA would be the aerogenerator supplier to Verace's plants.

As presented in Table 3 – Timeline for implementation of registered project activity, on 24/09/2013 the entrepreneurs ceased the contract with IMPSA. The reasons for the contract caseation encompass the fact that this supplier would not be able to deliver the aerogenerators. At the time of project implementation, IMPSA was also responsible for supplying aerogenerators for several other wind power plants under construction in Brazil. Many were the cases of delivery default, thus causing a profound and negative impact in the Brazilian electricity sector. IMPSA soon went bankrupt leaving a default as high as 1580 MW wind power capacity in the country (reference: Caso Impsa_Energia Inteligente; Falencia IMPSA).

In light of these facts, the project developer was forced to change the aerogenerator supplier of Chuí and Minuano facilities after the project implementation had commenced. Gamesa was the new supplier of choice, since it was successfully delivering the aerogenerators for the other facilities of the project activity.

The equipment of the two suppliers have similar characteristics (2MW capacity) However, Chuí and Minuano facilities, equipped with the GAMESA aerogenerators, are expected to deliver a lower net capacity than that of the registered PDD (plant load factor weighted average of the windfarms was 46,2% and now is 44.4%, and the net capacity was 185.6 MW and now is 178.5 MW). Therefore, when compared to the previous configuration, the current project is expected to deliver a smaller amount of energy to the grid and, therefore, smaller-than-anticipated electricity revenues shall be observed. Moreover, this whole process was associated with not-anticipated costs and to delays in the start date of the electricity generation (and, therefore, cash inflow) (refer to Table 3 – Timeline for implementation of registered project activity). In conclusion, the changes in the project configuration do not adversely impact the additionality of the project activity.

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

Facility	Operation Start
Verace I	Feb/2015
Verace II	Feb/2015
Verace III	Feb/2015
Verace IV	Feb/2015
Verace V	Feb/2015
Verace VI	Feb/2015
Verace VII	Feb/2015
Verace VIII	Feb/2015
Verace IX	Feb/2015
Verace X	Feb/2015
Chuí I	May/2015
Chuí II	May/2015
Chuí IV	May/2015
Chuí V	Apr/2015
Minuano I	Apr/2015
Minuano II	Apr/2015

B.2. Post-registration changes**B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

Not applicable.

B.2.2. Corrections

Not applicable.

B.2.3. Changes to the start date of the crediting period

At the registered PDD, the start date of crediting period was due 01/01/2014. As the energy generation of the project did not commence before 2015, the start date of the crediting period was changed to 1st January 2015.

B.2.4. Inclusion of monitoring plan

Not applicable.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

As mentioned in Appendix 7 of Version 10.1. of the PDD – the project underwent post registration changes. Changes have been approved by the Board on 07 Dec 17 as registered in the document “Post Registration Changes form (version 06.0) - PRC-8012-001” as applicable from the period prior to this monitoring period.

B.2.6. Changes to project design

As mentioned in Appendix 7 of Version 10.1. of the PDD – the project underwent post registration changes. Changes have been approved by the Board on 07 Dec 17 as registered in the document “Post Registration Changes form (version 06.0) - PRC-8012-001” as applicable from the period prior to this monitoring period .

B.2.7. Changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

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 ($EG_{facility,y} = EGP_{J,y}$) will be monitored in the meters localized in the interconnection point with the Brazilian national grid (SIN); The electricity metered by these meters may also include energy generated by facilities outside the project boundary (currently, only CHUI IX, also referred as CHUI III, is connected, and not part of this project). 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 4) Only the facilities within the project boundary will be considered for the ER calculations. 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 from 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. $EG_{facility,y} = EGP_{J,y}$.

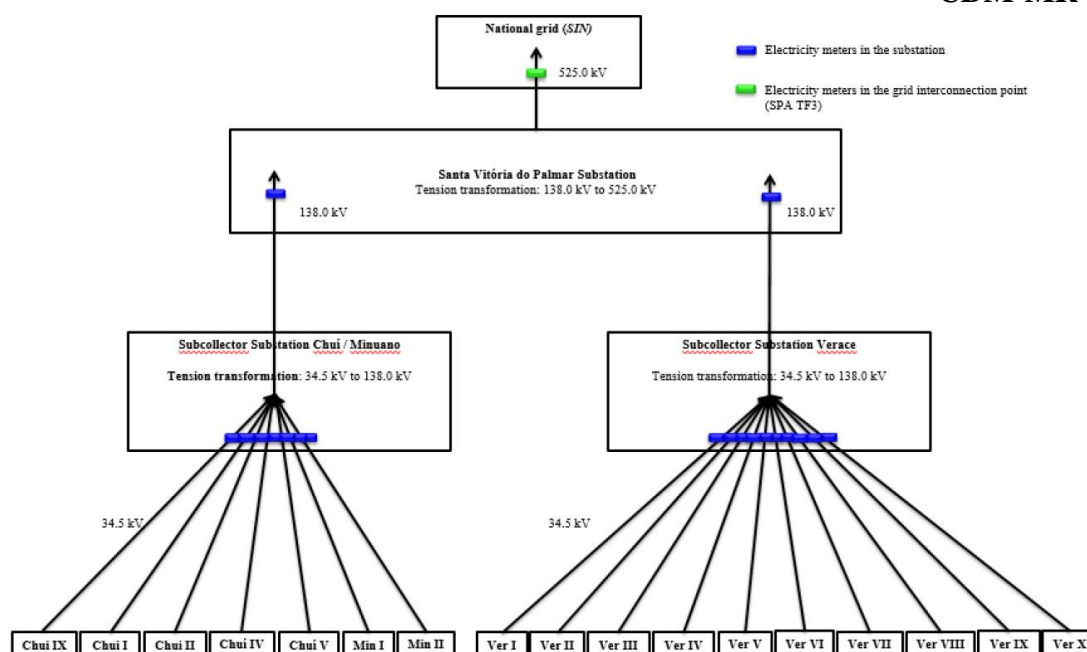


Figure 2. Simplified wiring diagram indicating the delivery point, location of the meters and tension transformation. Electricity meters in the interconnection point will be utilized in the emission reduction calculations; meters localized in the substation will be utilized for crosschecking.

The National Operator of the Electric System (*Operador Nacional do Sistema Elétrico - ONS*) regulates, by means of its Grid Procedures⁵ (*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.

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.

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

⁵ 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.

in SCDE for electricity accounting by CCEE and are available to all energy market participants to control their respective incomes.

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.

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 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*).

Regarding the class of accuracy of energy meters, they 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 $\pm 0.2\%$.

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 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.

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.

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.

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 (EGfacility,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.

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 CO2 emission factor for power units in the top of the dispatch order ($EF_{grid,OM,y}$), the build margin CO2 emission factor ($EF_{grid,BM,y}$) of SIN and the combined margin CO2 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.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	<i>W_{OM}</i>
Unit	Fraction
Description	Weighting of operating margin emissions factor
Source of data	“Tool to 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/parameter	Calculation of baseline emissions
Additional comments	This value will be applied in the subsequent crediting periods.

Data/Parameter	<i>W_{BM}</i>
Unit	Fraction
Description	Weighting of build margin emissions factor
Source of data	“Tool to 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/parameter	Calculation of baseline emissions
Additional comments	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

from 16th of April 2016: 891,330.76 (CCEE data: 883,171.44)
 2017: 1,322,544.45 (CCEE data: 1,320,576.76)
 2018: 1,224,933.62
 2019: 1,162,293.12
 2020: 1,234,538.51

Value(s) of monitored
parameter

Year	Month	EG project activity, month	EG project activity, year
2016	Apr (from the 16 th)	68,048.91	891,330.76
	May	97,984.67	
	Jun	83,754.61	
	Jul	101,148.22	
	Aug	87,814.82	
	Sep	121,716.39	
	Oct	144,521.13	
	Nov	97,276.12	
	Dec	89,065.89	
2017	Jan	94,813.50	1,322,544.45
	Feb	60,170.22	
	Mar	110,135.66	
	Apr	117,866.23	
	May	95,847.47	
	Jun	100,995.18	
	Jul	121,070.76	
	Aug	122,021.10	
	Sep	120,892.58	
	Oct	136,889.01	
	Nov	116,943.02	
	Dec	124,899.72	
2018	Jan	113,484.57	1,224,933.62
	Feb	76,036.31	
	Mar	83,697.60	
	Apr	73,039.88	
	May	90,564.46	
	Jun	98,514.34	
	Jul	121,444.34	
	Aug	115,691.39	
	Sep	119,006.40	
	Oct	99,327.89	
	Nov	124,683.84	
	Dec	109,442.61	
2019	Jan	99,932.33	1,162,293.12
	Feb	47,937.35	
	Mar	84,695.88	
	Apr	80,738.60	
	May	85,806.54	
	Jun	103,074.75	
	Jul	118,123.37	
	Aug	112,326.09	
	Sep	98,690.14	
	Oct	119,743.38	
	Nov	107,831.42	
	Dec	103,393.27	
2020	Jan	48,743.92	1,234,538.51
	Feb	81,084.29	
	Mar	89,526.56	
	Apr	132,409.38	
	May	121,404.58	
	Jun	96,675.71	
	Jul	101,834.84	
	Aug	101,577.91	
	Sep	103,678.76	
	Oct	134,380.84	
	Nov	99,583.76	
	Dec	123,637.95	

Monitoring equipment	Type: Electricity Meter ION 8650									
	Facility	Meter code	Meter serial#	Meter type	First calib. date	First calib. #	Second calib. date	Second calib. #	Third calib. date	Third calib. #
	Chuí I	RSCHU-CH01-01P (UMF1)	MW-1310A3 64-01	Main	29/09/2015	16/2015	20/09/2017	043/17	29/10/2019	0047/2019
	Chuí I	RSCHU-CH01-01R (UMF2)	MW-1309A5 08-01	Back up	01/10/2015	17/2015	22/09/2017	044/17	30/10/2019	0048/2019
	Chuí II	RSCHU-CH02-02P (UMF3)	MW-1310A5 04-01	Main	30/09/2015	18/2015	20/09/2017	045/17	29/10/2019	0049/2019
	Chuí II	RSCHU-CH02-02R (UMF4)	MW-1309A7 23-01	Back up	30/09/2015	19/2015	20/09/2017	046/17	30/10/2019	0050/2019
	Chuí IV	RSCHU-CH04-03P (UMF7)	MW-1308A3 59-01	Main	30/09/2015	22/2015	21/09/2017	049/17	30/10/2019	0053/2019
	Chuí IV	RSCHU-CH04-03R (UMF8)	MW-1309A2 81-01	Back up	02/10/2015	23/2015	23/09/2017	050/17	30/10/2019	0054/2019
	Chuí V	RSCHU-CH05-04P (UMF1)	MW-1309A5 64-01	Main	02/10/2015	24/2015	23/09/2017	051/17	31/10/2019	0055/2019
	Chuí V	RSCHU-CH05-04R (UMF2)	MW-1310A1 82-01	Back up	03/10/2015	25/2015	24/09/2017	052/17	31/10/2019	0056/2019
	Chuí IX	RSCHU-CH09-07P (UMF5)	MW-1309A7 18-01	Main	30/09/2015	20/2015	20/09/2017	047/17	29/10/2019	0051/2019
	Chuí IX	RSCHU-CH09-07R (UMF6)	MW-1310A1 89-01	Back up	30/09/2015	21/2015	22/09/2017	048/17	31/10/2019	0052/2019
	Min. I	RSCHU-MN01-05P (UMF3)	MW-1310A5 68-01	Main	02/10/2015	26/2015	23/09/2017	053/17	31/10/2019	0057/2019
	Min. I	RSCHU-MN01-05R (UMF4)	MW-1309A0 56-01	Back up	04/10/2015	27/2015	24/09/2017	054/17	01/11/2019	0058/2019
	Min. II	RSCHU-MN02-06P (UMF5)	MW-1310A3 44-01	Main	03/10/2015	28/2015	23/09/2017	055/17	31/10/2019	0059/2019
	Min. II	RSCHU-MN02-06R (UMF6)	MW-1310A4 02-01	Back up	03/10/2015	29/2015	24/09/2017	056/17	01/11/2019	0060/2019
	SPA LT Chuí	RSSPA2CECH-05P (UMF5)	MW-1310A3 40-01	Main	05/10/2015	34/2015	30/08/2016	057/16	18/04/2018	0006/2018
	SPA LT Chuí	RSSPA2CECH-05R (UMF6)	MW-1310A5 08-01	Back up	07/10/2015	35/2015	31/08/2016	058/16	19/04/2018	0010/2018
	Verac e I	RSCBGTEVRC 101P (UMF1)	MW-1310A1 91-01	Main	11/11/2015	40/2015	09/06/2017	031/17	02/10/2019	0025/2019
	Verac e I	RSCBGTEVRC 101R (UMF2)	MW-1310A1 84-01	Back up	12/11/2015	41/2015	10/06/2017	035/17	03/10/2019	0029/2019
	Verac e II	RSCBGTEVRC 202P (UMF3)	MW-1310A5 72-01	Main	11/11/2015	42/2015	10/06/2017	032/17	02/10/2019	0026/2019
	Verac e II	RSCBGTEVRC 202R (UMF4)	MW-1309A3 72-01	Back up	12/11/2015	43/2015	11/06/2017	036/17	03/10/2019	0030/2019
	Verac e III	RSCBGTEVRC 303P (UMF5)	MW-1310A3 98-01	Main	11/11/2015	44/2015	10/06/2017	033/17	02/10/2019	0027/2019
	Verac e III	RSCBGTEVRC 303R (UMF6)	MW-1310A5 26-01	Back up	12/11/2015	45/2015	11/06/2017	037/17	03/10/2019	0031/2019

Monitoring equipment	Facility	Meter code	Meter serial#	Meter type	First calib. date	First calib. #	Second calib. date	Second calib. #	Third calib. date	Third calib. #
	Verace IV	RSCBGTEVRC 404P (UMF7)	MW-1310A4 01-01	Main	12/11/2015	46/2015	10/06/2017	034/17	02/10/2019	0028/2019
	Verace IV	RSCBGTEVRC 404R (UMF8)	MW-1309A5 52-01	Back up	13/11/2015	47/2015	11/06/2017	038/17	03/10/2019	0032/2019
	Verace V	RSCBGTEVRC 505P (UMF1)	MW-1309A4 57-01	Main	13/11/2015	48/2015	06/06/2017	019/17	04/10/2019	0033/2019
	Verace V	RSCBGTEVRC 505R (UMF2)	MW-1309A3 32-01	Back up	14/11/2015	49/2015	07/06/2017	023/17	05/10/2019	0037/2019
	Verace VI	RSCBGTEVRC 606P (UMF3)	MW-1310A3 90-01	Main	13/11/2015	50/2015	07/06/2017	020/17	04/10/2019	0034/2019
	Verace VI	RSCBGTEVRC 606R (UMF4)	MW-1310A1 81-01	Back up	15/11/2015	51/2015	07/06/2017	024/17	05/10/2019	0038/2019
	Verace VII	RSCBGTEVRC 707P (UMF5)	MW-1309A4 18-01	Main	14/11/2015	52/2015	07/06/2017	021/17	04/10/2019	0035/2019
	Verace VII	RSCBGTEVRC 707R (UMF6)	MW-1309A2 90-01	Back up	15/11/2015	53/2015	08/06/2019	025/17	06/10/2019	0041/2019
	Verace VIII	RSCBGTEVRC 808P (UMF7)	MW-1309A3 27-01	Main	14/11/2015	54/2015	07/06/2017	022/17	04/10/2019	0036/2019
	Verace VIII	RSCBGTEVRC 808R (UMF8)	MW-1309A4 22-01	Back up	15/11/2015	55/2015	08/06/2017	026/17	06/10/2019	0042/2019
	Verace IX	RSCBGTEVRC 909P (UMF1)	MW-1310A0 26-01	Main	16/11/2015	56/2015	08/06/2017	027/17	05/10/2019	0039/2019
	Verace IX	RSCBGTEVRC 909R (UMF2)	MW-1310A1 74-01	Back up	17/11/2015	27/2015	09/06/2017	029/17	06/10/2019	0043/2019
	Verace X	RSCBGTEVR10 10P (UMF3)	MW-1310A3 96-01	Main	16/11/2015	58/2015	08/06/2017	028/17	05/10/2019	0040/2019
	Verace X	TF1 RETAGUARDA (UMF2)	MW-1310A3 72-01	Back up	18/11/2015	59/2015	09/06/2017	030/17	06/10/2019	0044/2019
	SPA LT Ger	RSSPA2CEGBT 03P (UMF3)	MW-1309A4 52-01	Main	05/10/2015	32/2015	30/08/2016	055/16	18/04/2018	0005/2018
	SPA LT Ger	RSSPA2CEGBT 03R (UMF4)	MW-1310A1 86-01	Back up	05/10/2015	33/2015	31/08/2016	056/16	19/04/2018	0008/2018
	SPA TF3 525 kV	RSSPA2EGBC M04P (UMF1)	MW-1309A1 14-01	Main	05/10/2015	30/2015	30/08/2016	059/16	19/04/2018	00007/2018
	SPA TF3 525 kV	RSSPA2EGBC M04R (UMF2)	MW-1309A4 44-01	Back up	05/10/2015	31/2015	30/08/2016	060/16	19/04/2018	0009/2018
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)	<p>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 4).</p> <p>$EG_{PJ,y}$ is calculated as the electricity metered by SPA TF3, pro-rated by the electricity generated by the project plants (CHUI I, CHUI II, CHUI IV, CHUI V, Minuano I, Minuano II, Verace I, Verace II, Verace III, Verace IV, Verace V, Verace VI, Verace VII, Verace VIII, Verace IX, Verace X) and the electricity generated by CHUI IX.</p> <p>The pro-rating formula is:</p> $EG_{PJ,y} = \sum_h \{ EG_{SPA\ TF3,h} * \sum_{project_facility} (EG_{project_facility,h}) / [\sum_{project_facility} (EG_{project_facility,h}) + EG_{Chui\ 9,h}] \}$ <p>Where:</p> <p>$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the CDM project activity (MWh/yr);</p> <p>$EG_{SPA\ TF3,h}$ = Hourly electricity generation measured by the meter SPA TF3 (MWh/hour);</p> <p>$EG_{project_facility,h}$ = Hourly electricity generation by the project plants (CHUI I, CHUI II, CHUI IV, CHUI V, Minuano I, Minuano II, Verace I, Verace II, Verace III, Verace IV, Verace V, Verace VI, Verace VII, Verace VIII, Verace IX, Verace X) measured by their respective individual meters located at subcollector substations Chui / Minuano or Verace (MWh/hour);</p> <p>$EG_{Chui\ 9,h}$ = Hourly electricity generation by CHUI IX measured by its individual meters located at subcollector substations Chui / Minuano (MWh/hour).</p>
QA/QC procedures	<p>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 – <i>Câmara de Comercialização de Energia Elétrica</i>). 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.</p> <p>For the years 2016 and 2017 we verified that the amount metered at the subcollector substation were, respectively, 0.91% and 0.15% higher than the amount of electricity accounted / invoiced by CCEE. Therefore, for conservativeness reasons, the values of CCEE were adopted in the ER calculations in those years.</p>
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	“SPA LT Ger” and “SPA LT Chui” monitor the electricity generation of all facility of Verace, Chui/Minuano, respectively. 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. Available at: https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/missao_despacho.html
Value(s) of monitored parameter	2016 from April 16 th onwards: 0.5108 tCO ₂ /MWh 2017: 0.4453 tCO ₂ /MWh 2018: 0.4118 tCO ₂ /MWh 2019: 0.4167 tCO ₂ /MWh 2020: 0.3651 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 (<i>WOM</i> and <i>WBM</i>).
QA/QC procedures	As per the most recent version of the "Tool to calculate the emission factor for an electricity system".
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	N/A

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. Available at: https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/missao_despacho.html
Value(s) of monitored parameter	2016 from April 16 th onwards: 0.6284 tCO ₂ /MWh 2017: 0.5928 tCO ₂ /MWh 2018: 0.5034 tCO ₂ /MWh 2019: 0.5217 tCO ₂ /MWh 2020: 0.4528 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/parameter	Calculation of $EF_{GRID, CM, y}$.
Additional comments	N/A

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. Available at: https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/missao_despacho.html
Value(s) of monitored parameter	2016 from April 16 th onwards: 0.1581 tCO ₂ /MWh 2017: 0.0028 tCO ₂ /MWh 2018: 0.137 tCO ₂ /MWh 2019: 0.102 tCO ₂ /MWh 2020: 0.0979 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/parameter	Calculation of $EF_{GRID, CM, y}$.
Additional comments	None

D.3. Implementation of sampling plan

Not applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

Baseline emissions were calculated as follows:

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

Where:

BE_y : Baseline emissions in year y (tCO₂/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);

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 CO₂ emission factor in year y (tCO₂/MWh);

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh);

$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/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:

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

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO₂ emission factor in year y (tCO₂/MWh)

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

$EF_{EL,DD,h}$ = CO₂ emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO₂/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 electricity

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

The parameters $EF_{EL,DD,h}$ 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”.

Baseline emission calculations for the monitoring period are summarized in the table below.

Table 4. Baseline emissions calculations for the monitoring period

Parameter	Results					
	2016	2017	2018	2019	2020	Referências
$EF_{grid,O}$ M,y (tCO ₂ /MWh)	0.6284	0.5928	0.5034	0.5217	0.4528	Calculated from the hourly electricity generation of the project activity and the hourly emission factor of the operating margin as published by the Brazilian Ministry of Science and Technology.
$EF_{grid,B}$ M,y (tCO ₂ /MWh)	0.1581	0.0028	0.137	0.102	0.0979	https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/texto_geral/emissao_despacho.html (formerly

						: http://www.mct.gov.br/index.php/content/view/74689.html . Access date: 16/09/2021).
W_{OM}	0.75	0.75	0.75	0.75	0.75	Available ex-ante
W_{BM}	0.25	0.25	0.25	0.25	0.25	Available ex-ante
EF_{grid,C} M,y (tCO₂/MWh)	0.5108	0.4453	0.4118	0.4167	0.3651	EF _{grid,OM,y} X W _{OM} + EF _{grid,BM,y} X W _{BM}
EG_{PJ,y} (MWh) Project activity	891,330.76	1,322,544.45	1,224,933.62	1,162,293.12	1,234,538.51	Yearly consolidation of EG _{PJ,h}
EG_{PJ,y} (MWh) CCEE	883,171.44	1,320,575.76	1,224,933.62	1,162,293.12	1,234,538.51	
EG_{PJ,y} (MWh) Considered	883,171.44	1,320,575.76	1,224,933.62	1,162,293.12	1,234,538.51	Most conservative data between project activity and CCEE were considered for ER calculations
BE_y (tCO₂)	455,298.00	588,960.00	504,463.00	484,380.00	450,726.00	EG _{PJ,y} * EF _{grid,CM,y}

E.2. Calculation of project emissions or actual net removals

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

Project activity does not remove GHG from the atmosphere.

E.3. Calculation of leakage emissions

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. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
Total	2,477,517	0	0	0	2,477,517	0	2,477,517

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (tCO ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (tCO ₂ e)
2,477,517	2,902,222 tCO ₂ e

E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”

Yearly emission reductions were *ex-ante* estimated in the registered PDD as follows:

$$(1) BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

BE_y : Baseline emissions in year y (616,133 tCO₂/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 (1,563,393 MWh/yr);

$EF_{grid,CM,y}$: Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (0.3941 tCO₂/MWh, based on data provided by the Brazilian DNA for 2010).

As per ACM0002/Version 12.2.0 for this project activity, project emissions are zero ($PE_y = 0$) and leakage emissions are not considered.

$$(2) ER_y = BE_y - PE_y$$

Where:

ER_y : Emissions reductions of the project activity during the year y (616,133 tCO₂e)

BE_y : Baseline emissions during the year y (616,133 tCO₂e)

PE_y : Project emissions during the year y (0 tCO₂e)

The parameters used for ex-ante calculations are compiled in Table 5.

Table 5. Parameters used for ex-ante calculations

Parameter	Unit	Value	Description	Comment
ER_y	tCO ₂ /yr	616,133	Emissions reductions in the year y	Calculated
BE_y	tCO ₂ /yr	616,133	Baseline emissions in year y	Calculated
PE_y	tCO ₂ /yr	0	Project emissions in the year y	For this project activity (wind-based electricity generation project) emissions are null, as per ACM0002/Version 12.2.0
$EG_{PJ,y}$	MWh/yr	1,563,393	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	Estimated as the average total yearly net electricity generation by the project activity, as per Inova Energy's study for Verace's facilities (reference: Verace_InovaEnergy_20110413) and per EREDA's study for Chuí and Minuano's facilities (IT-1402-MBF-CertificacionProduccionChui-05)
$EG_{facility,y}$	MWh/yr	1,563,393	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y	Estimated as the average total yearly net electricity generation by the project activity, as per Inova Energy's study for Verace's facilities (reference: Verace_InovaEnergy_20110413) and per EREDA's study for Chuí and Minuano's facilities (reference: IT-

				1402-MBF-CertificacionProduccionChui-05)
EG _{grid, CM, y}	tCO ₂ /MWh	0.3941	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"	Calculated accordingly formula (3) in section B.6.1 of this PDD, as stated in the "Tool to calculate the emission factor for an electricity system", version 02.2.1 in step 6 a (Calculate the combined margin emissions factor – Weighted average CM")
EG _{grid, OM, y}	tCO ₂ /MWh	0.4787	Operating margin CO ₂ emission factor in year y	Operating margin emission factor of the National Interconnected System (2010), as published by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/327118.html#ancora , accession date 01/12/2011)
Parameter	Unit	Value	Description	Comment
EG _{grid, BM, y}	tCO ₂ /MWh	0.1404	Build margin CO ₂ emission factor in year y	Build margin emission factor of the National Interconnected System (2010), as published by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/327118.html#ancora , accession date 01/12/2011)
W _{OM}	Fraction	0.75	Weighting of operating margin emissions factor	Default value for wind-based electricity generation projects, as per "Tool to calculate the emission factor for an electricity system"
W _{BM}	Fraction	0.25	Weighting of build margin emissions factor	Default value for wind-based electricity generation projects, as per "Tool to calculate the emission factor for an electricity system"

Ex-ante estimations of emission reductions achieved during this monitoring period were

Period	Baseline emissions (tCO ₂ e)
16/04/2016 – 31/12/2016	616,133/366*260 = 437,690
01/01/2017 – 31/12/2017	616,133
01/01/2018 – 31/12/2018	616,133
01/01/2019 – 31/12/2019	616,133
01/01/2020 –	616,133

31/12/2020	
Total estimated emission reductions	2,902,222

Premises were yearly baseline emission reductions *ex-ante* estimated in the registered PDD.

E.6. Remarks on increase in achieved emission reductions

The value of the emission reductions (2,477,517 tCO₂) achieved during the monitoring period (16th Apr/2016 to 31st Dec/2020) was 14.63% lower than the value estimated in the ex ante calculation of the registered PDD.

Such difference may be explained by the fact that, 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 value of this parameter was 29.61% higher in 2016, 13.00% higher in 2017, 4.50% higher in 2018, 5.75% higher in 2019 and 7.61% lower in 2020. Such increase was caused by the higher participation of the fossil fuel-fired resources in the Brazilian electric matrix, except for the year 2020.

Moreover, the quantity of net electricity generation that was produced and fed into the grid as a result of the implementation of the CDM project activity was 43.51% lower in 2016, 15.53% lower in 2017 (considering the values of CCEE) and 21.65% lower in 2018, 25.66% lower in 2019 and 21.03% lower in 2020 (considering the values of the project activity).

E.7. Remarks on scale of small-scale project activity

Not applicable.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		