

MONITORING REPORT

PARQUE EÓLICO MALDONADO

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of the project is the generation of electricity from renewable sources through the construction and operation of a 50 MW wind farm, located at the department of Maldonado, in the Southeast region of Uruguay. This wind farm consists of 25 turbines with a capacity of 2 MW each. The energy generated by the project is supplied to the national grid of Uruguay through the substation “Estación Francisco Veira” annexed to the park.

Purchase of main equipment happened on July 20th 2012 when the wind turbines were bought. The wind farm started its construction on November 11th 2012 and got its environmental authorization on July 30th 2013. Commercial operation started on April 10th 2014. Since then has been in continued operation.

During the monitoring period presented from April 10th 2014 to September 30th 2016, the total GHG emissions reductions amounted to 245,861 t CO₂e, because of displacement the electricity generated in fossil fuel fired power plants of the grid.

1.2 Sectoral Scope and Project Type

Sectoral scope 1. VCS sectoral scope: Energy (renewable/non-renewable).

Approved consolidated baseline methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”; Version 16.0

The proposed project activity is not a grouped project.

1.3 Project Proponent

Organization name	R del Sur S.A.
Contact person	Pablo Lorente
Title	Project Director
Address	Gabriel Otero 6462 Oficina 206 11500 Montevideo Uruguay
Telephone	+598 2 6007201
Email	plorente@rdelsur.com.uy

1.4 Other Entities Involved in the Project

Organization name	Carlos Alvarez Garcia and Rosa M ^a Pérez Puente
Role in the project	VCS Consultant

Contact person	Carlos Alvarez Garcia and Rosa M ^a Pérez Puente
Title	Managing Directors
Address	-
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1.5 Project Start Date

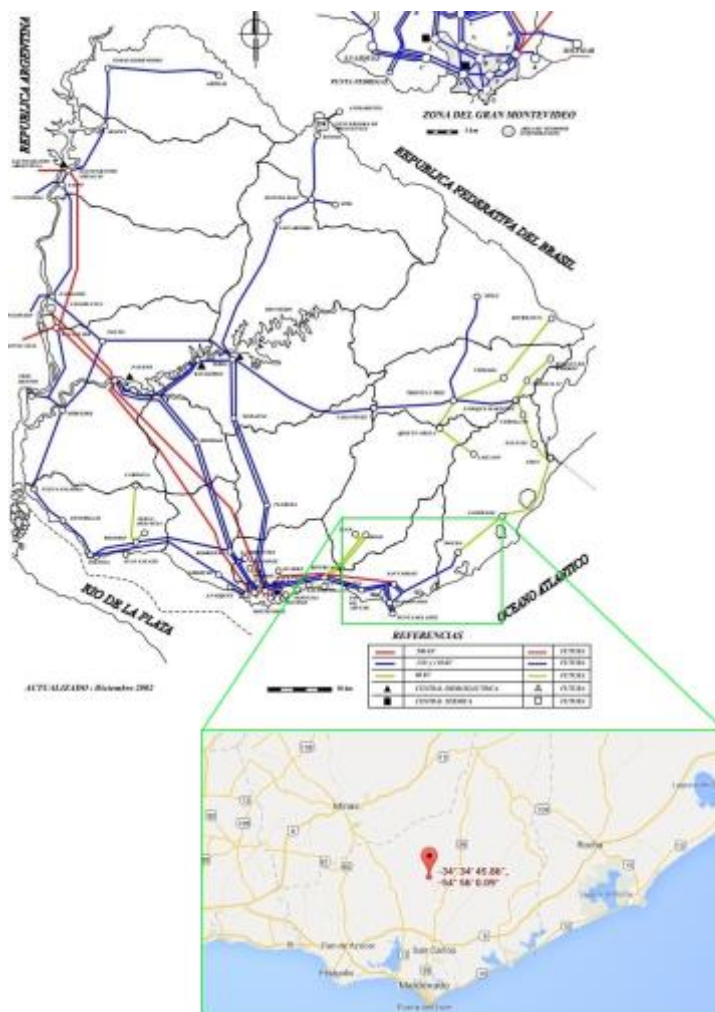
The project had its start date on April 10th 2014. This is the date of commencement for the commercial operation of the project.

1.6 Project Crediting Period

The crediting period of the project is 10 years. It is running from April 10th 2014 to April 10th, 2024. The crediting period lasts 10 years and is renewable at most twice. The first crediting period started on April the 10th 2014. The last VCS crediting period will end at the date when the last CDM crediting period of the project activity will expire as per paragraph 3.8.3 of the VCS Standard (version 3.4). This means, VCS crediting period will end on April 09th 2034.

1.7 Project Location

The 25 wind turbines that make up the wind farm are being distributed along the Sierra de los Caracoles in the municipality of San Carlos in the department of Maldonado, fitting in pages F-26, F-27 and F-28 MTN 1: 50,000.



The location of both the wind turbines, as control towers and evacuation transformer substation are shown in the following tables:

Turbine location		
UTM (21H)	X	Y
CAR-03-01	689,559	6,171,657
CAR-03-02	689,726	6,171,981
CAR-03-03	689,902	6,172,301
CAR-03-04	690,052	6,172,635
CAR-03-05	690,845	6,174,762
CAR-03-06	691,010	6,175,096
CAR-03-07	691,103	6,175,453

CAR-03-08	691,234	6,175,819
CAR-03-09	691,338	6,176,167
CAR-03-10	691,444	6,176,514
CAR-03-11	691,539	6,176,866
CAR-03-12	691,601	6,177,221
CAR-03-13	691,734	6,177,584
CAR-03-14	691,844	6,177,961
CAR-03-15	691,972	6,178,319
CAR-03-16	692,413	6,179,538
CAR-03-17	692,546	6,179,922
CAR-03-18	692,676	6,180,258
CAR-03-19	692,781	6,180,602
CAR-03-20	692,907	6,181,037
CAR-03-21	693,020	6,181,567
CAR-03-22	693,097	6,181,926
CAR-03-23	693,201	6,182,342
CAR-03-24	693,286	6,182,699
CAR-03-25	693,342	6,183,054

Control towers are located at the following coordinates:

Location of the meteorological towers		
UTM (21H)	X	Y
MAL-TC01	689,559	6,179,729
MAL-TC02	689,726	6,183,256

Finally, the substation is available at the following coordinates:

Location of Maldonado Substation		
UTM (21H)	X	Y
SETMAL	689,559	6,173,601

1.8 Title and Reference of Methodology

The project uses the UNFCCC approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources --- Version 16.0".

The project uses the following UNFCCC tools, also referred in the methodology:

- “Tool to calculate the emission factor for an electricity system --- Version 05.0”
- “Tool for the demonstration and assessment of additionality --- Version 07.0.0”
- “Combined tool to identify the baseline scenario and demonstrate additionality---Version 06.0.0”

1.9 Other Programs

Emissions Trading Programs and Other Binding Limits: The project does not reduce GHG emissions from activities that are included in an emission-trading program or any other mechanism that includes GHG allowance trading. There is no national program or cap, applicable to this project. The project will not use its GHG emission reductions and removals for compliance, under any such programs or mechanisms.

Uruguay is not an Annex I country of the Kyoto protocol so it is not participating in the Assigned Amount Unit (AAU) markets. Also, the country has not implemented a national emission rights market.

Other Forms of Environmental Credit: The Project is a renewable energy generation project. It discharges no emission during the operation period, thus, the project doesn't fall into categories that create GHG emissions primarily for its subsequent removal or destruction.

The Project has not created another form of environmental credit, now or in the future. This will be verified by the DOE.

Participation under Other GHG Programs: The project is registered not under the CDM scheme.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Parque eólico Maldonado started its commercial operations on April 10th 2014. The carbon crediting period and therefore the monitoring starts on April 10th 2014, when the plant finished starting tests and commenced electricity generation. At the time of starting the commercial operations, the project was fully operational.

The relevant implementation dates of the Parque eólico Maldonado, are set out in the following table:

Project timeline		
Date	Event	Document
20/07/2012	Purchase of main equipment	20120720 Equipos - Contrato compraventa aerogeneradores

19/11/2012	Start of Works	20121116 Nota DINAMA previo inicio obras
30/07/2013	Environmental authorization	20130730 Resolución de unificación del Parque Eólico
10/04/2014	Start Date	20140414 Acta habilitación

During the first monitoring period (10/04/2014 to 30/09/2016), the project has operated continuously and satisfactorily.

No other relevant event or situations have been reported during the monitoring period.

The amount of energy generated has been continuously measured through a bidirectional main meter at the connection and measurement point along with the substation “Estación Francisco Veira”, in the project land, and a backup meter, installed in parallel with the main meter.

2.2 Deviations

2.2.1 Methodology Deviations

No deviations have taken place in the project from the methodology

2.2.2 Project Description Deviations

No deviations have taken place in the project description.

2.3 Grouped Project

The proposed project activity is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid, CM}
Data unit	tCO ₂ / MW·h
Description	Combined margin CO ₂ emission factor of the grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system” version 05.0
Source of data	Registered VCS-PD
Value applied:	0.5765
Justification of choice of data or description of measurement methods and procedures applied	The Combined Margin emission factor is calculated ex ante, as described in section 3.1 of the PD
Purpose of the data	Calculation of baseline emissions

Comments	
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Data / Parameter	EF _{OM}
Data unit	tCO ₂ / MW·h
Description	Operating Margin CO ₂ emission factor of the grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system” version 05.0.
Source of data	Registered VCS-PD
Value applied:	0.6881
Justification of choice of data or description of measurement methods and procedures applied	The Simple adjusted OM was selected by the proponent to calculate the operating margin, using the ex-ante option for the data vintages, of Ministry of Industry, Energy and Mining has been updated and published by the National Directorate of Energy.
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	EF _{BM,2013}
Data unit	tCO ₂ / MW·h
Description	Build Margin CO ₂ emission factor of the grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system” version 02.2.1.
Source of data	Registered VCS-PD
Value applied:	0.2417
Justification of choice of data or description of measurement methods and procedures applied	As describes in Step 5 (Calculate the build margin (BM) emission factor) The sample group (SET sample) of power units m used to calculate the build margin consists of the set of power units, including power units registered as CDM project activities, and the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (SETsample- CDM->10yrs).

Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	EF _{CO2,m,i,y}										
Data unit	tCO ₂ / MW·h										
Description	CO ₂ emission factor of fossil fuel type i in year y										
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG.										
Value applied:	<table> <tr> <td>EF</td><td>[tCO₂eq. / GJ]</td></tr> <tr> <td>Fuel Oil</td><td>0.07550</td></tr> <tr> <td>Gas Oil</td><td>0.07260</td></tr> <tr> <td>Natural Gas</td><td>0.05430</td></tr> <tr> <td>Landfill Gas</td><td>0.04620</td></tr> </table>	EF	[tCO ₂ eq. / GJ]	Fuel Oil	0.07550	Gas Oil	0.07260	Natural Gas	0.05430	Landfill Gas	0.04620
EF	[tCO ₂ eq. / GJ]										
Fuel Oil	0.07550										
Gas Oil	0.07260										
Natural Gas	0.05430										
Landfill Gas	0.04620										
Justification of choice of data or description of measurement methods and procedures applied	As per Option A.1 of the “Tool to calculate the emissions factor for an electricity system”, version 05.0, CO₂ emission factor of power unit m or k in year y (tCO₂/MW·h) is calculated as: $EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$ IPCC publishes the standard default values of CO₂ emission factor of each fossil fuel type. This is consistent with the equation under Option A.1.										
Purpose of the data	Calculation of baseline emissions										
Comments	Per the “Tool to calculate the emission factor for an electricity system”, if values are reliable and documented in regional or national energy statistics/energy balances, regional or national average default values can be used.										

3.2 Data and Parameters Monitored

Data / Parameter	$EG_{\text{facility},y}$
Data unit	MW·h/yr.
Description	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data	Electricity meter at project site (SMEC)
Description of measurement methods and procedures to be applied	The electricity supply by the project is measured by a SMEC meter, located in the connection and measure point, along with the substation “Estación Francisco Veira” in project land. There is also a backup meter that is only utilized should there be any problem with the main meter. Net energy is calculated subtracting the incoming energy from the outgoing energy meter by the SMEC meter. From January 8th 2016 till December 14th 2016, the meter was not calibrated per the planned schedule. The maximum error of the meter has been considered from January 8st 2016 to September 30th 2016. The maximum error for the main meter as per manufacturer is 0.2%. In the last calibration, the maximum error detected is 0.17%, less than allowed. Hence a 0.2% deviation has been considered in the referred period. Calculations have been made, subtracting 0.2% from the outgoing energy measurement, and adding 0.2% to the incoming energy measurement, thus assuring the most conservative approach.
Frequency of monitoring/recording	The hourly measured reading by SMEC meters is recorded monthly by plant personnel
Value monitored:	$EG_{(\text{facility},2014)} = 127,929.81 \text{ MW} \cdot \text{h}$ $EG_{(\text{facility},2015)} = 178,905.58 \text{ MW} \cdot \text{h}$ $EG_{(\text{facility},2016)} = 119,660.95 \text{ MW} \cdot \text{h}$
Monitoring equipment	The system SMEC has two meters, the main meter, class 0.2, and back up meter, class 0.5, installed in parallel with the main meter.

QA/QC procedures to be applied	The measurement results recorded monthly are used for cross check with records of sold electricity and/or with DTE¹. The SMEC meters are periodically calibrated at least one every two years during the verification of the system, according with Resolution 14/002². First calibration for the main meter type 0.2S took place on January 8th 2014 and for the backup meter type 0.5S took place on July 23rd 2014, and was carried out by UTE Laboratory. Second calibration was supposed to take place on January and July 2016 per the biannual calibration frequency projected. However, an authorization from ADME is needed to remove the seal of the meters, and this was not obtained until October 2016. Calibration for both meters took place on December 14th 2016. From January 8th 2016 till December 14th 2016, the meter was not calibrated per the planned schedule.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	These data are used to calculate directly the emission reductions and are archived electronically as per internal procedures, for two years after the end of the last crediting period.

3.3 Monitoring Plan

The Monitoring Plan is developed in accordance with the approved consolidated baselines and monitoring methodology for grid-connected electricity generation from renewable sources – ACM0002

The staff has been trained to deal with the monitoring and data recording system. This training has taken place prior the operation starting date of the project to train all staff fully in the correct operation of the plant.

Monitoring Management Structure

¹ DTE: it is the Economic Transactions Document published monthly by ADME

² Resolution 14/002 UREE:http://www.adme.com.uy/normativa/pdf/resoluciones/res_smec_2014_002.pdf

To ensure organization in the project in terms of reliable data collection and gathering during the full crediting period, project owner has established the organization of the monitoring team with clear roles and responsibilities assigned to all staff involved in the VCS project.

The project owner has trained the relevant personnel before the project operation.

In summary, the project owner has executed the monitoring plan of the project, in accordance with the requirements of the applicable methodology and the EB on monitoring and verification to ensure that the emission reductions are monitored recorded and reported accurately.

Monitoring equipment and installation

Given that, the emission factor is calculated ex-ante, and referring to the Monitoring Methodology ACM0002, the only monitored data is the quantity of net electricity supplied to the grid by the wind project in every year.

Project owner has installed an electricity meter at the connection and measurement point along with the substation “Estación Francisco Veira”, in the project land. The grid connection diagram indicates the principles for positioning of metering instruments used in the monitoring of emission reductions, in the figure below:

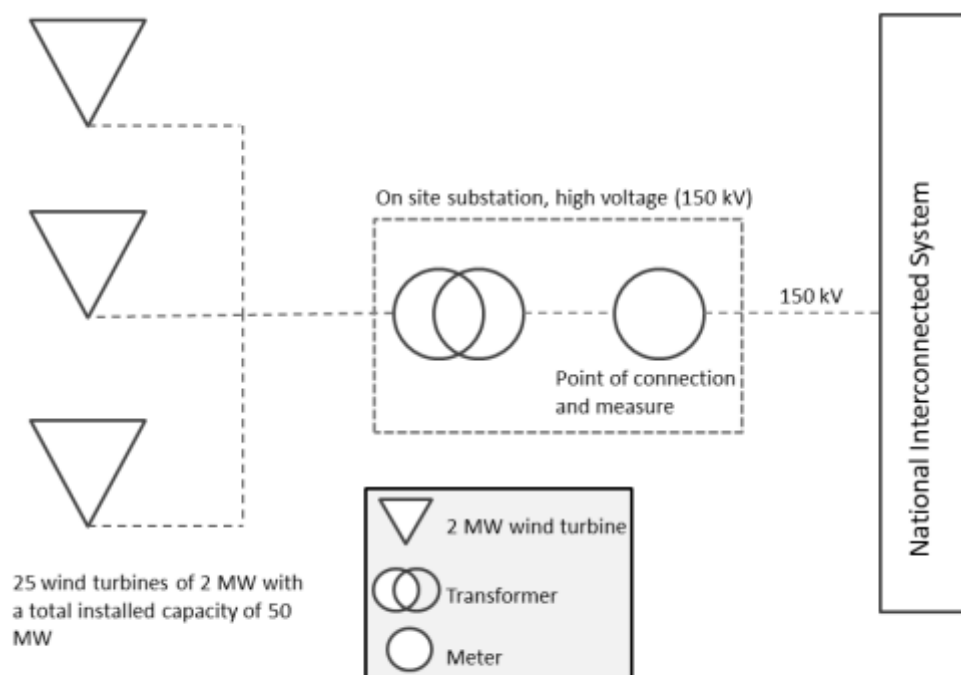


Figure 3: Positioning of metering instruments

Certified entities have provided the equipment used to monitor the electricity production and conducted calibration per the Resolution 14/002 and the standards IEC 62052-11³ and IEC 62053-22⁴ for static active meters of classes 0.2 and 0.5.

Meter	Type	Serial number	Accuracy	Calibration date	Carried out by	Calibration frequency
M1 Main meter	ITRON SL7000	30023003	0.2S	08/01/2014	UTE Laboratorio	Biannual
				14/12/2016	UTE Laboratorio	
M2 Backup meter	EMH LZQJ-XC	3970828	0.5S	23/07/2014	UTE Laboratorio	Biannual
				14/12/2016	UTE Laboratorio	

Data recording and archiving

- A. Project owner has monitored the electricity supplied by the project to the grid using a calibrated electricity meter, and taking monthly records.
- B. Measurements have been crosschecked with sale receipts for electricity and/or with the information published in DTE, using conservative values for calculation of emission reductions.
- C. The project participants have archived all data collected as part of monitoring during the monitoring period plus two years.
- D. Quality assurance and Quality control have been applied:
 - An overarching monitoring system maintains the quality of data generated by this project. This system includes procedures used to double check data, for staff training, meter calibration, accreditation of the facility completing calibration and the adherence to the relevant standards.
 - Measuring equipment has been calibrated per the Resolution 14/002, at least once every two years during the verification period.
- E. Procedures on how to deal with erroneous measurements:

³ Norma IEC 62052-11 (2003): metering equipment

⁴ Norma IEC 62053-22 (2003): Static meters for active energy (classes 0.2S and 0.5 S)

In the event of problem to the measurements system, the information is obtained through one of the following sources of measurement in this order:

- Data from the main meter of SMEC,
- Data from the back-up meter of SMEC,
- Data from SCADA system,
- Data provided by user to the control center of DNC via telephone.

Verification and Monitoring Results

Monitoring personnel have prepared the monitoring report, containing the data report, and the results of the emissions reductions of the project for the defined verification period.

Management structure to monitor emission reductions

The General Manager holds the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations by the plant operation staff.

The project owner appoints a monitoring officer who is responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the wind farm and the calculation of the emissions reductions. The monitoring officer has prepared operational reports of the project activity, review the daily operation of the wind farm station including operating periods, power delivered to the grid, equipment defects, etc. Finally, the General Manager has reviewed the monitoring reports.

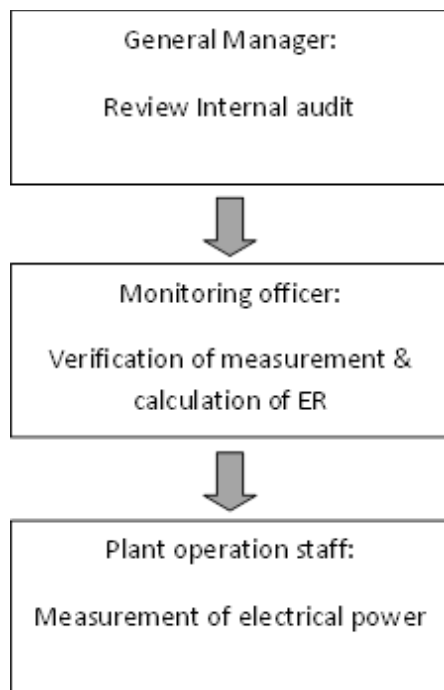


Figure 4: General management structure

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emission is calculated as the product of electrical energy baseline $EG_{(PJ,y)}$ expressed in MW·h, produced by the renewable generating unit and multiplied by the grid emission factor:

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

Where:

BE_y : Baseline Emission in year y (tCO₂).

$EG_{PJ,y}$: Quantity of net electricity generation that is produced and fed into the grid because of the implementation of the CDM project activity in year y (MW·h/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 (tCO₂/MW·h).

Calculation of $EG_{(PJ,y)}$

The calculation of $EG_{PJ,y}$ is different for (a) Greenfield plants, (b) retrofits and replacements, and (c) capacity additions. These cases are described next:

Since the project involves the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity (Case (a) Greenfield plant), then:

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

Where:

$EG_{PJ,y}$: Quantity of net electricity generation that is produced and fed into the grid because of the implementation of the CDM project activity in year y (MW·h/yr.).

$EG_{facility,y}$: Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MW·h/yr.).

The electricity supply by the project is measured by a SMEC meter, located in the connection and measure point, along with the substation “Estación Francisco Veira” in project land. There is also a backup meter that is only utilized should there be any problem with the main meter. At the time of writing this report, the main meter has been used at all times.

Net energy is calculated subtracting the incoming energy from the outgoing energy meter by the SMEC meter. This measurement is cross-checked with invoices from ADME.

From January 8th 2016 till December 14th 2016, the meter was not calibrated per the planned schedule. The maximum error of the meter has been considered from January 8th 2016 to September 30th 2016 being the end of the verification period.

The maximum error for the main meter as per manufacturer is 0.2%. In the last calibration, the maximum error detected is 0.17%, less than allowed. Hence a 0.2% deviation has been considered in the referred period. Calculations have been made, subtracting 0.2% from the outgoing energy measurement, and adding 0.2% to the incoming energy measurement, thus assuring the most conservative approach.

Crosscheck is not affected by this, as the resulting energy supply is always more conservative than the one provided by ADME with invoices.

The results are presented in the following table:

Year	Month	Net electricity generation (MW·h)
2014	April	5,920.30
2014	May	10,934.14
2014	June	16,037.62
2014	July	17,293.29
2014	August	18,226.85
2014	September	14,745.38
2014	October	15,154.22
2014	November	15,967.55
2014	December	13,650.46
2015	January	14,578.31
2015	February	11,672.49
2015	March	11,933.63
2015	April	14,554.45
2015	May	13,692.55
2015	June	19,240.75
2015	July	13,609.49

2015	August	18,110.45
2015	September	16,247.12
2015	October	18,465.27
2015	November	13,869.01
2015	December	12,932.06
2016	January	15,049.65*
2016	February	11,932.09*
2016	March	14,666.50*
2016	April	14,472.48*
2016	May	10,881.94*
2016	June	12,361.96*
2016	July	12,843.43 *
2016	August	14,387.25 *
2016	September	13,065.66 * ⁵

The total electricity supplied by the project during the monitoring period is 426,496.33 MW·h

$EG_{(PJ,2014)} = EG_{(facility,2014)} = 127,929.81 \text{ MW} \cdot \text{h}$

$EG_{(PJ,2015)} = EG_{(facility,2015)} = 178,905.58 \text{ MW} \cdot \text{h}$

$EG_{(PJ,2016)} = EG_{(facility,2016)} = 119,660.95 \text{ MW} \cdot \text{h}$

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

The Combined Margin emission factor is calculated ex ante, as described in section 3.1 of the PD, and the value applied is 0.5765 tCO₂/MW·h

4.2 Project Emissions

For most renewable energy project activities, the project emissions are neglected. Following the methodology, as the project is a run-of-the-river project, it does not lead to any GHG emissions and therefore project emissions are considered equal to zero.

$PE_y = 0 \text{ tCO}_2\text{e} / \text{year}$

⁵ The maximum error of the meter has been considered from January 8th 2016 to September 30th 2016 being the end of the verification period.

4.3 Leakage

Following the applied methodology, 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, and transportation). These emissions sources are neglected.

4.4 Net GHG Emission Reductions and Removals

The net GHG emission reduction is calculated following the guidance of the methodology ACM0002, as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y : Emission reduction in year y (tCO₂)

BE_y : Baseline Emission in year y (tCO₂)

PE_y : Project emission in year y (tCO₂)

$$ER_y = BE_y - 0$$

$$ER_{2014} = 73,747 \text{ tCO}_2\text{e}$$

$$ER_{2015} = 103,133 \text{ tCO}_2\text{e}$$

$$ER_{2016} = 68,981 \text{ tCO}_2\text{e}$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2014	73,747	0	0	73,747
2015	103,133	0	0	103,133
2016	68,981	0	0	68,981
Total	245,861	0	0	245,861