Monitoring report form for CDM project activity
(Version 08.0)

MONITORING REPORT			
Title of the project activity	Cerro de Hula Wind Project		
UNFCCC reference number of the project activity	5584		
Version number of the PDD applicable to this monitoring report	10		
Version number of this monitoring report	1		
Completion date of this monitoring report	20/09/2021		
Monitoring period number	Fourth Monitoring Report		
Duration of this monitoring period	01/01/2016 to 31/12/2020		
Monitoring report number for this monitoring period	N/A		
Project participants	Energía Eólica de Honduras, S.A.		
Host Party	Honduras		
Applied methodologies and standardized baselines	"ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.2.0, EB 65)		
Sectoral scopes	Sectoral scope: 1 – Energy industries (renewable/non-renewable sources). Project type: Renewable Energy		
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	1,348,746 TCO_{2e}	0
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	1,380,685 TCO_{2e} (5 years from 2016 to 2020)		

SECTION A. Description of project activity

A.1. General description of project activity

The project consists on the first wind farm interconnected to the National Interconnected System of Honduras, located in the Municipalities of Santa Ana and San Buenaventura, Department of Francisco Morazán, 24 km South of Tegucigalpa. The elevation of the Project site is between 1,340 and 1,720m above sea level[1].

The main purpose of the Cerro de Hula Wind Project (hereafter, the "Project") is to provide affordable electricity to the Honduran grid by means of a renewable, clean, and inexpensive (i.e. zero marginal cost) source: the wind. For this purpose, the Project makes use of 56 GAMESA G87 – 2MW 60Hz and 7 GAMESA G97 - 2MW 60Hz wind turbines. The Project has a total installed capacity of 126 MW. The Project owner is Energía Eólica de Honduras, S.A. ("EEHSA") a Honduran legal entity. EEHSA was a subsidiary of Globeleq Mesoamerica Energy (Wind) Limited ("GME") now bought by CMI (Corporación Multinversiones) a family-owned company originated in Central America, constantly increasing investment. CMI Capital includes renewable energy projects, real estate projects and financial services.[2]

The electricity generated by the Project, is sold to the National Power Utility in Honduras called Empresa Nacional de Energía Eléctrica ("ENEE"[3]) through a 25 years Power Purchase Agreement (PPA)[4] No. 229-2012, between EEHSA and ENEE. Furthermore, there was an addendum to expand the PPA by decree No. 229-2012.

The Cerro de Hula Substation was completed in September 2011. Energy tests were performed as part of the commissioning process to assure the functionality and integration of key components of the Project (transformer, control systems, etc.) at the end of the same month (September 27th). Civil works of the first phase (102 MW) were completed in December 2011 and full commercial operations started on the 21st December 2011. The civil works of the second phase (126 MW) started on January, 2014 and full commercial operations started on November 2014. The following table summarizes the Project's main milestones:

Milestones	Date
Substation Completion	**September 2011**
Energy Tests	**September 2011**
Civil Work Completion (Initial Phase-102 MW)	**December 2011**
Commercial operations start date	**December 21, 2011**
Civil Work Start Date (Second Phase-126 MW)	**January, 2014**
Commercial operations start date	**November, 2014**

The total amount of emission reductions achieved in this monitoring period is summarized in the table below:

Monitoring period	Net electricity production	Total emission reductions
01/01/2016 – 31/12/2020	2,056,531 MWh	1,348,746 TCO_{2e}

[1] Energía Eólica de Honduras, S.A. & Mesoamérica Energy. (2008). Feasibility Study. Eoloeléctrico Honduras 2000 Project. Original title in Spanish *"Estudio de Factibilidad. Proyecto Eoloeléctrico Honduras 2000. Cerro de Hula".*

[2] See: https://cmi.co/es/quienes-somos/somos-cmi

[3] ENEE's web page: http://www.enee.hn

[4] The PPA Title (in Spanish): Contrato de Suministro de 124 MW de Energía Asociada.

A.2. Location of project activity

a) Honduras

b) Department Francisco Morazán

c) Municipalities of Santa Ana and San Buenaventura

d) The Project is located in the hills of *Cerro de Hula* and Izopo, 24 km south of Tegucigalpa. The geographical coordinates of the Project boundary are the following:

Table 1: Project Coordinates

Longitude	Latitude
87° 16' 21.508'' W	13° 56' 36.776'' N
87° 14' 26.612'' W	13° 57' 58.275'' N
87° 12' 46.619'' W	13° 57' 58.368'' N
87° 08' 23.221'' W	13° 55' 43.472'' N
87° 08' 23.165'' W	13° 54' 10.701'' N
87° 11' 59.759'' W	13° 54' 10.550'' N
87° 09' 43.032'' W	13° 51' 37.660'' N
87° 10' 32.975'' W	13° 50' 55.308'' N
87° 13' 53.031'' W	13° 53' 47.664'' N
87° 14' 59.663'' W	13° 53' 37.883'' N
87° 16' 21.439'' W	13° 55' 38.184'' N

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Honduras (Host)	Energía Eólica de Honduras, S.A. (private entity)	No

A.4. References to applied methodologies and standardized baselines

a) The baseline and monitoring methodology applied is ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.2.0, EB 65).
b) The tool for demonstration and assessment of additionality used is: "Tool for demonstration and assessment of additionality" (Version 06.0.0, EB 65).
c) The tool for calculation the emission factor for an electricity system used is: "Tool to calculate the emission factor for an electricity system" (Version 2.2.0, EB 61).
d) The "Guidelines on additionality of First of its kind Project activities" (Version 01.0, EB 63). Reference to the UNFCCC CDM web site: http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

A.5. Crediting period type and duration

Type: 10 years fixed crediting period

The crediting period of the project activity is from 24/04/2012 to 23/04/2022.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

On September, 25th 2011, the Cerro de Hula substation was energized and the Project (102 MW) was connected to the grid. The testing operation period went from 27/09/2011 until 20/12/2011 with the official commissioning of the plant for commercial operation as per the PPA was 21/12/2011. On November 2014, the capacity of the project was increased to a total of 126 MW (consisting of 63 wind turbines of 2 MW each), by installing 12 additional WTGs of 2 MW each. The Project Activity was registered as a CDM Project on 24/04/2012 under reference number 5584, and these changes were approved on 17/02/2014.

The Project uses state of the art wind power technology and has a total of 126 MW installed capacity, consisting of 56 Gamesa G87-2-MW 60Hz and 7 Gamesa G97-2-MW 60Hz wind turbines. Assuming a net capacity factor of 39.5%, the total estimated net annual generation is 420,876 MWh/yr[5].The specific Project data is shown in the following table:

Table 2: Project Data

Project Features	**Total nominal capacity**	**126 MW**
	Maximum contracted power[6]	**124 MW**
Turbine Features	**Brand**	**GAMESA**
	Model	**G87 and G97**
	Type	**3 blades**
	Capacity	**2.0 MW**
Generator data	**Type**	**Doubly-fed with wound rotor and slip rings**
	Nominal power	**2000 kW (stator + rotor)**
	Voltage	**690 V ac**
	Frequency	**60Hz**

During this monitoring period (01/01/2016 - 31/12/2020), the net electricity supply by the Project to the utility was 2,056,531 MWh. The monitoring in the Project is carried out as established in the Monitoring Plan by continuous metering of the received and delivered energy.

Regarding events that may impact the GHG emission reductions during the monitoring period, the following are mentioned:

Table 3: Event Log

Year	Date	Description	Start hour	Close hour	TT
2016	12/05/2016	T644 transformer maintenance clearance	7:47:00	8:11:00	0:24
	12/05/2016	T644 transformer maintenance clearance	8:30:00	23:59:00	15:29
	13/05/2016	T644 transformer maintenance clearance	0:00:00	17:01:00	17:01
	3/10/2016	T644 Maintenance Clearance	6:02:00	23:59:00	17:57
	4/10/2016	T644 Maintenance Clearance	0:00:00	6:40:00	6:40
	04/10/2016	T630 Maintenance Clearance	6:41:00	19:13:00	12:32
2017	25/09/2017	T630 OLTC Maintenance	5:36:00	23:59:00	18:23
	26/09/2017	T630 OLTC Maintenance	0:00:00	11:24:00	11:24

[5] The estimation made in the “Energy Yield Assessment for Cerro de Hula Wind Farm, Honduras” (see above reference) is 420,876 MWh/year and includes the total project installed capacity (126 MW).

[6] The PPA with ENEE establishes in clause 2.1 an annual estimation of up to 361,788,000 kWh to be delivered to the ENEE with a 100 MW installed capacity. In order to cover energy production losses due to scheduled maintenance periods and unforeseen events an additional 2MW capacity is installed.

	26/09/2017	T644 OLTC Maintenance	11:24:00	23:59:00	12:35
	27/09/2017	T644 OLTC Maintenance	0:00:00	12:24:00	12:24
	10/10/2017	32-T44 transformer maintenance	6:09:00	23:59:00	17:50
	11/10/2017	32-T44 transformer maintenance	0:00:00	18:50:00	18:50
	13/10/2017	32-T30 transformer maintenance	6:18:00	15:50:00	9:32
2018	16/01/2018	Trigger T2 -Bar Differential Protection.	19:45:00	21:45:00	2:00
	25/04/2018	T644 Transformer Clearance	6:06:00	18:31:00	12:25
	25/04/2018	T644 Transformer Clearance	8:27:00	18:18:00	9:51
	26/04/2018	T630 Transformer Clearance	9:46:00	17:31:00	7:45
	13/05/2018	Trigger T2 (Line Low Frequency)	21:50:00	23:59:00	2:09
	14/05/2018	Trigger T2 (Line Low Frequency)	0:00:00	12:30:00	12:30
	14/05/2018	Clearance for repair in cell 32-T30 (T2)	8:09:00	23:59:00	15:50
	15/05/2018	Clearance for repair in cell 32-T30 (T2)	0:00:00	15:00:00	15:00
	14/05/2018	Clearance for repair in cell 32-T30 (T1)	8:09:00	12:30:00	4:21
	03/07/2018	Triggering faults in the metalclab terminals of the T630 transformer	8:54:00	23:59:00	15:05
	12/07/2018	Repair of T630 transformer metalclab terminal faults	0:00:00	16:24:00	208:24:00
	10/09/2018	Trip of T2 damaged terminal of T2 power cable	19:22:00	20:42:00	1:20
	12/09/2018	Clearance for repair of phase C terminals in cell 32T-T30	12:05:00	13:28:00	1:23
	13/09/2018	Clearance for repair of phase C terminals in cell 32T-T30	9:50:00	14:19:00	4:29
	05/11/2018	Annual maintenance of T644 (T1)	6:22:00	17:12:00	10:50
	05/11/2018	Annual maintenance of T644 (T1)	9:26:00	17:12:00	7:46
	12/11/2018	Cell pit maintenance clearance for C2, C3, C4, C5 and T1	12:23:00	15:22:00	2:59
	12/11/2018	Cell pit maintenance clearance for C1, C6 and T2	15:37:00	23:59:00	8:22
	13/11/2018	Cell pit maintenance clearance for C1, C6 and T2	0:00:00	18:55:00	18:55
2019	20/02/2019	T644 de-energization for replacement of terminal "A and B" of the low side bushing	6:23:00	12:24:00	6:01
	16/09/2019	Failure in line L615 of interconnection between Nicaragua and Honduras (T1)	11:50:00	14:34:00	2:44
	16/09/2019	Failure in line L615 of interconnection between Nicaragua and Honduras (T2)	11:50:00	14:34:00	2:44
	29/10/2019	T644 transformer maintenance clearance	5:57:00	23:59:00	18:02
	14/11/2019	Transfer of load from T630 to T644	0:00:00	19:34:00	355:34:00
	19/11/2019	Annual maintenance of T630 transformer	5:55:00	23:59:00	18:04
	20/11/2019	Annual maintenance of T630 transformer	0:00:00	13:09:00	13:09
2020	07/05/2020	Transfer of load from T644 to T630	13:05:00	23:59:00	10:54
	08/05/2020	Transfer of load from T644 to T630	0:00:00	20:26:00	20:26
	08/05/2020	Transfer of load from T644 to T630	20:26:00	21:50:00	1:24
	20/05/2020	Overload in 230 kV network in Toncontin substation (T1)	9:28:00	11:40:00	2:12

	20/05/2020	Overload in 230 kV network in Toncontin substation (T1)	9:28:00	11:40:00	2:12
	12/10/2020	Annual maintenance of T630	5:28:00	11:45:00	6:17
	12/10/2020	Trip of L619	11:43:00	11:45:00	0:02
	12/10/2020	Trip of L619	12:20:00	12:50:00	0:30
	12/10/2020	By resetting L619	15:03:00	15:19:00	0:16
	16/10/2020	Transfer of load from T644 to T630 (T1)	11:44:00	13:51:00	2:07
	20/10/2020	Annual maintenance of T644 (T1)	5:31:00	23:59:00	18:28
	20/10/2020	Annual maintenance of T644 (T2)	5:31:00	5:47:00	0:16
	23/10/2020	Annual maintenance of T644 (T1)	0:00:00	14:31:00	14:31
	23/10/2020	Overvoltage at T644	21:53:00	22:35:00	0:42
	27/10/2020	Test Apollo Project Open / Close Switches SE (T1)	9:35:00	10:40:00	1:05
	27/10/2020	Test Apollo Project Open / Close Switches SE (T2)	9:35:00	10:40:00	1:05
	13/11/2020	Clearance of T644 by Removal of OLTC Filtration Equipment	13:43:00	14:40:00	0:57
	14/11/2020	T644 Clearance for OLTC Oil Non-Operating Conditions	10:01:00	23:59:00	13:58
	15/11/2020	Transfer of Load from T630 to T644	0:00:00	10:36:00	10:36

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

(a) Corrections that have been approved by the Board as applicable from the period prior to this monitoring period:

The Project Participant was updated in the revised PDD (approved on 17/02/2014) to coincide with the valid MoC. 5584. Post-registration change reference PRC-5584-001.

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

Not applicable

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

(a) Changes that have been approved by the Board as applicable from the period prior to this monitoring period:

A request for approval of changes to the project activity (PRC ref No. PRC-5584-001) was submitted by the DOE to UNFCCC on 07/01/2014 and approved on 17/02/2014.

Information on this request and related documents are available as of today on the UNFCCC CDM web site < http://cdm.unfccc.int/Projects/DB/PJR_CDM1324448058.56/history>

B.2.6. Changes to project design

(a) Changes that have been approved by the Board as applicable from the period prior to this monitoring period:

A request for approval of changes to the project activity (PRC ref No. PRC-5584-001) was submitted by the DOE to UNFCCC on 07/01/2014 and approved on 17/02/2014.

Information on this request and related documents are available as of today on the UNFCCC CDM web site < http://cdm.unfccc.int/Projects/DB/PJR_CDM1324448058.56/history>

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

Not applicable

SECTION C. Description of monitoring system

As part of the expansion required at the Cerro de Hula Substation in order to adequately handle all the energy coming from the wind farm, an additional pair of bi-directional electricity meters were installed and verified. The provider of the new electricity meters is Power Logic and the model for both the main (MMED-1) and back-up (MMED-2) meters are ION 8650, series number MW-1308A261-01 and MW-1310A906-01 respectively.

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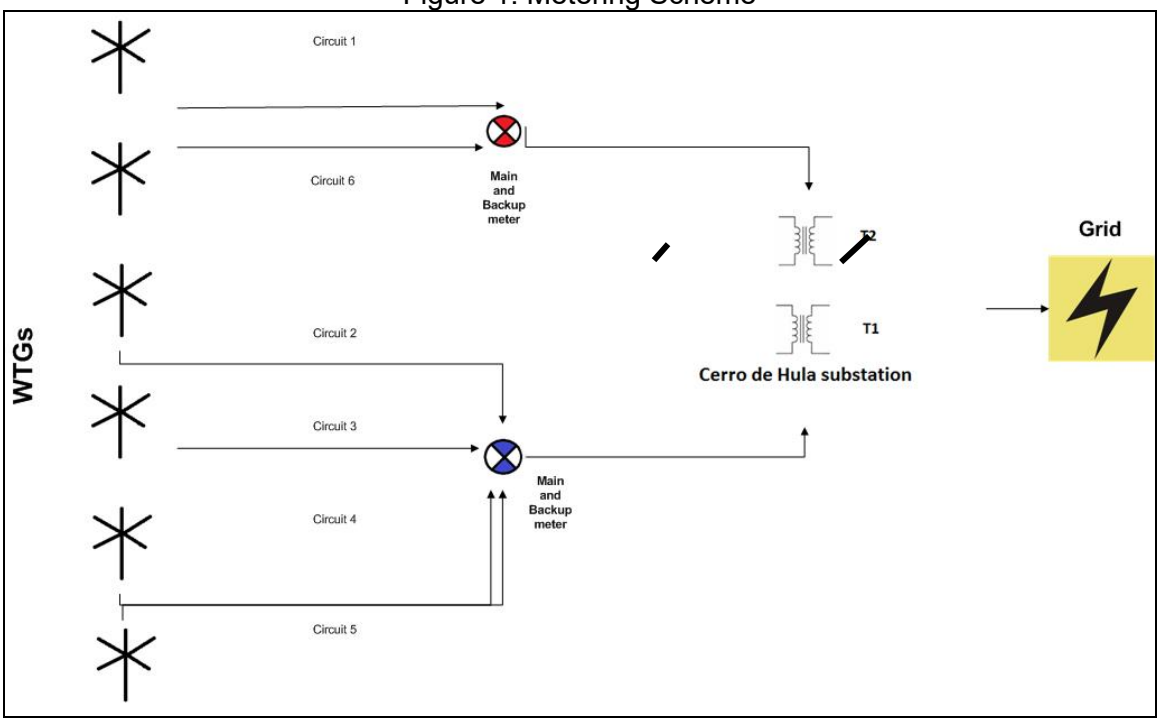
Electricity supplied to the grid by the Project will be monitored at two Metering Points through a Metering System, each of which is comprised by a pair of bi-directional meters. Initially, the Metering Points will be located before each of the two power transformers at the interconnecting substation (*Cerro de Hula*). The total quantity of net electricity supplied to the grid results from the addition of the net electricity determined at each metering point.

As per Figure 1 below, the WTGs will deliver their energy to the 1st transformer via circuits 2, 3, 4 and 5 and to the 2nd transformer via circuits 1 and 6. In case of failure and/or maintenance works at one of the transformers, the energy will be delivered to the functional one; however, under this scenario (i.e. only one operational transformer) the capacity will be limited to 100 MW by the SCADA system.

Figure 1: Metering Scheme



In reference to the circuits detailed in the last figure, Table 4 shows WTG´s distribution in each circuit.

Table 4. WTG´s of wind project circuits

Circuit 1	Circuit 2	Circuit 3	Circuit 4	Circuit 5	Circuit 6
AG1-01	AG3-01	AG6-01	AG8-01	AG10-01	AG8-03
AG1-02	AG3-02	AG6-02	AG8-02	AG10-02	AG8-04
AG1-03	AG3-03	AG6-03	AG9-01	AG10-03	AG8-05
AG2-01	AG3-04	AG6-04	AG9-02	AG10-04	AG8-06
AG2-02	AG3-05	AG6-05	AG9-03	AG10-05	AG8-07
AG2-03	AG4-01	AG6-06	AG9-04	AG14-01L	AG8-08
AG2-04	AG4-02	AG7-01	AG9-05	AG14-02L	AG13-01L
AG2-05	AG4-03J	AG7-02	AG9-06	AG14-03L	AG13-02L
AG2-06	AG5-01	AG7-03L	AG9-07	AG14-04L	AG13-03L
AG3-06	AG5-02		AG9-08	AG14-05L	AG13-04L
AG3-07	AG5-03		AG9-09		AG13-05L

The main meter used during this monitoring period was the MW-1111A186-01 (Model ION 8650) and the backup meter used was MW-1111A188-01 (Model ION 8650). The additional pair of bi-directional electricity meters were installed and verified in 25/08/2014, and were used since 01/11/2014 until 31/12/2020. All meters comply with Annex C-VI “Commercial Measures System” of the PPA, in which it is stated that the meters have to include communication systems that allow off-site readings.

The latter explanation is described in the table below:

Table 5: Meters (main and back-up)

PERIOD	MAIN METER *(MMED1)*	BACKUP METER *(MMED2)*
01/01/2016 – 31/12/2020	**MW-1111A186-01 Model: ION 8650 Security Seal No. CS15-070063**[7]	**MW-1111A188-01 Model: ION 8650 Security Seal No. CS15-070064**
01/01/2016 – 31/12/2020	**MW-1308A261-01 Model: ION 8650 Security Seal No. CS15-070061**	**MW-1310A906-01 Model: ION 8650 Security Seal No. CS15--070062**

As mentioned above, there will be two pairs of independent bidirectional meters at Cerro de Hula Substation – each pair is comprised by a main and a back-up meter. As per the PPA, the data (received and delivered energy) will be read primarily from the main meter at each Metering Point on a monthly basis. If an anomaly is detected in the data of the main meter, the data of the respective back-up meter will be used instead as agreed between EEHSA and ENEE[8]. Representatives of the Project and the power utility will read the meters each month as per the procedure agreed between them. Hence, as per the PPA, the data obtained from the main meters (which is also used to develop the sales invoices) will be used to calculate emission reductions of the Project in a specific monitoring period.

EEHSA`s Operation Supervisor jointly with ENEE´s operator, are in charge of reading the meter records the first day of each month[9], during the morning, at the substation, as per the procedure established in the PPA. Afterwards, EEHSA and ENEE use the meter readings to elaborate an "Energy Meter Constancy" which is approved and signed by both parties and where the monthly generation is stated. This data is used by EEHSA to generate sales invoices to ENEE. The same data is used for emissions reductions calculations.

In addition, the invoices are submitted to ENEE for its revision and approval of the net energy established in the latter. The meter readings/invoices are readily accessible for DOE.

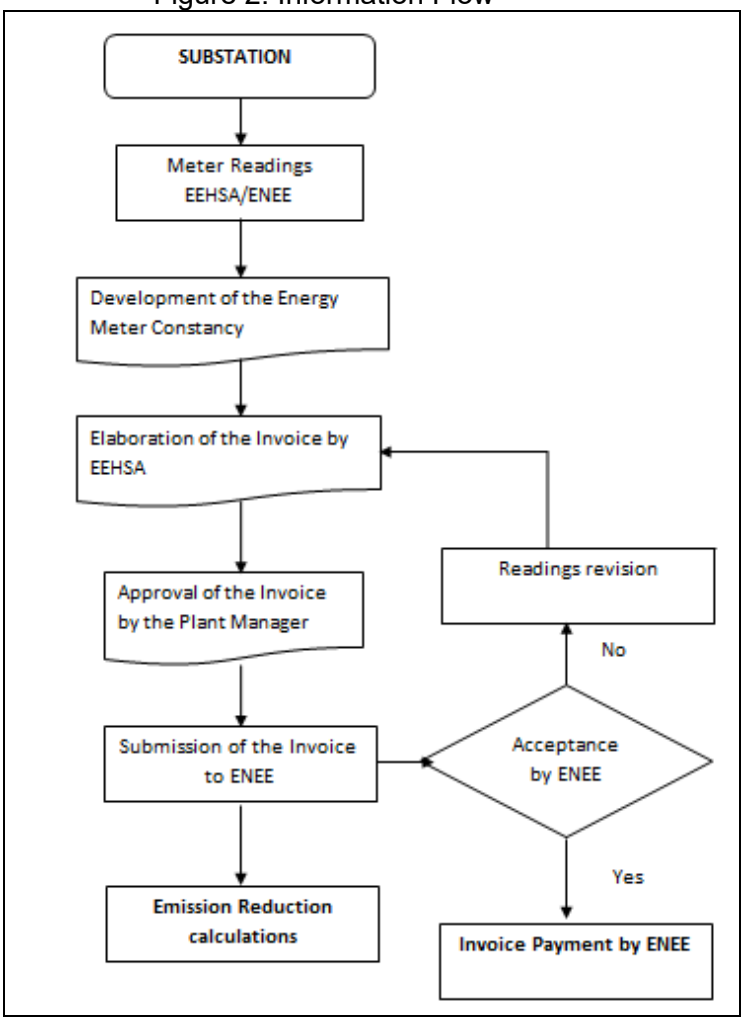
All meter readings are entered into a logbook and excel spreadsheet. The "meter`s load profile" is also stored on a hard disk and a CD-ROM (BACK UP). All Project documents related to the CDM project cycle will be kept on file for the entire crediting period duration plus two (2) additional years.

[7] Security seals of both meters were changed on July 13, 2016

[8] Page 63 of the PPA

[9] The meters are programmed to keep the reading from hour 24:00 of the last day of the previous month, so that this is the value that is reported and signed by both parties.

Figure 2. Information Flow



People involved in monitoring of this Project are showed in the following chat and listed on the following table.

Figure 3: Organizational structure of the Project

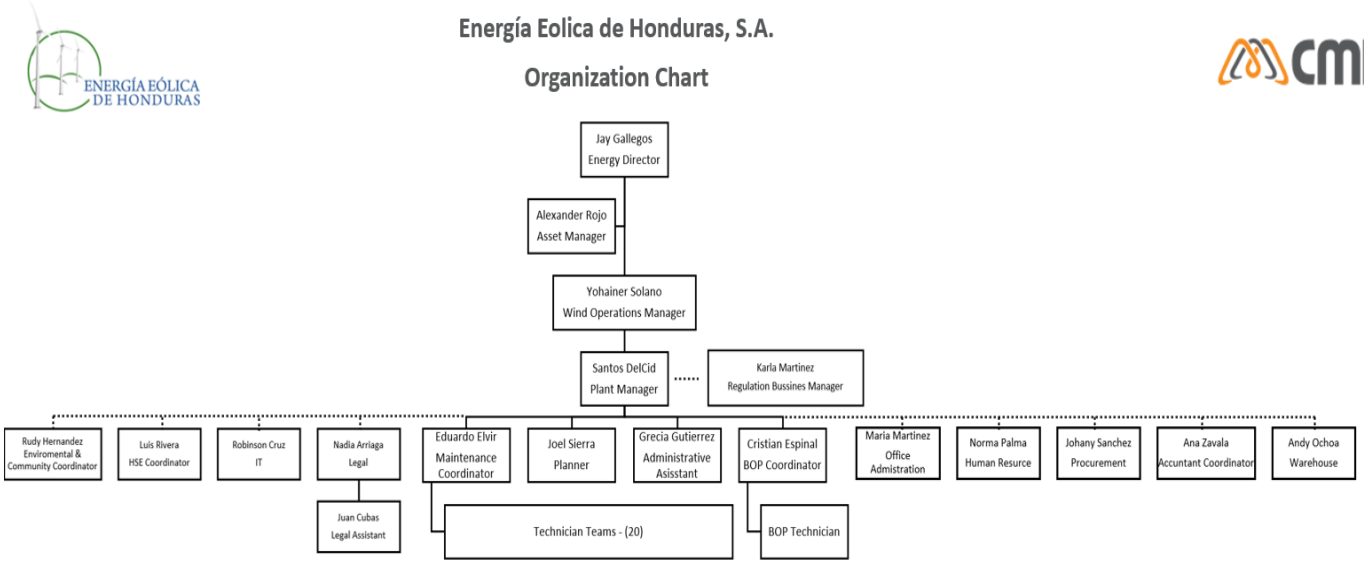


Table 6 - Responsibilities of personnel

Responsible	Tasks
Plant Manager	Responsible for quality assurance and control, including documentation and filing.
Operation Supervisor	Supervise operators and operating processes; coordinate activities and requirements with ENEE; collect data; take power meter readings and cross-check them with invoices.
Environmental Coordinator	Supervise environmental activities; secure, manage and store all information needed to complete the CDM cycle.
CDM Development Manager	Manage information needed to complete the Project's CDM cycle within CMI, coordinate and participate in Project verifications; watch over required staff training on Clean Development Mechanism and Sustainable Development.
Manufacturer or service providing company	Calibrate both ENEE and plant power meters.
ENEE Operator	Take power meter readings; provide power meter maintenance and calibration.

Procedures for handling internal auditing and non-conformities

The metering arrangements and the required quality control procedures to ensure accuracy are defined within the PPA[10] between EEHSA and ENEE.

The Metering Points are located at the power transformers at the interconnecting substation, Cerro de Hula, built by the Project. An Operating Committee, established in the PPA, by both, EEHSA and ENEE, can define additional/alternate Metering Points if necessary. Maintenance of the Metering System is the responsibility of EEHSA, who will conduct maintenance of said system only in the presence of representatives of ENEE.

The following table sets out the data collection procedures in case of extraordinary faults and events:

Table 7: Data collection procedures in case of extraordinary faults and events

Periodicity	Activity	Responsible	Documentation / Filing
Malfunction in any of ENEE power meters (main or backup)	Immediately report fault to Operations Management, Central Southern Transmission Department, and Operating Committee. Record the event in the logbook. Any equipment replacement or repair should have its own Statement of Work issued by the ENEE & EEHSA Operating Committee. The staff should make sure the new meter is properly installed and calibrated by a qualified company as soon as possible[11].	EEHSA Operation Supervisor & Plant Operator on Duty	Document events, dates, and actions taken on the logbook and in electronic format.
In case any turbine(s) or circuits need to be taken offline or in the event of plant downtime	Turbine/Project downtime should be recorded, as well as the reason for being offline and the time they were brought back in line.	EEHSA Plant Operator on Duty & EEHSA Operation Supervisor	Document events, dates, and actions taken on the logbook and in electronic format.
Unforeseeable cases	Any event preventing wind project operation should be promptly reported to Plant Management.	EEHSA Operation Supervisor &	Document events, dates, and actions taken on the logbook

[10] Please refer to Exhibit C-IV of the PPA.

[11] All notification of installation and certificates calibration will be kept on file.

		EEHSA Plant Operator on Duty	and in electronic format.

Calibration of Meters and Metering

As established in the manufacturer´s specifications the meters don't need to be calibrated. The accuracy and frequency of the verification of precision of the meters is established in the PPA between EEHSA and ENEE. Verification test records of the meters will be maintained for verification of the emission reductions by the DOE. Testing must be conducted by a qualified independent laboratory.

The metering arrangements and the required quality control procedures to ensure accuracy are defined between EEHSA and ENEE. The precision class, requirements for meters and metering transformers, data recording and communication system, commissioning and periodic testing of the metering system, are agreed between EEHSA and the power utility, too.

Trainings on CDM

CDM training is given to EEHSA staff working in areas related with project monitoring and verification (i.e. management, operations, and environment). Three training process have been held, the first one at the beginning of the Project cycle, the second was held on November 2012, for new employees involved in the process and the third was held on June 8th, 2016 to the General Manager and the Senior Operator[12].

Training will subsequently be provided to new EEHSA staff involved in the process by the CDM Development Manager of CMI.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EFgrid, CM, 2007, 2008, 2009
Unit	tCO_2/MWh
Description	Combined Margin Emission Factor of the Grid Calculated with the latest published official statistical data, using the default weights for wind projects w_{OM} = 0.75 and w_{BM} = 0.25
Source of data	IPCC 1996 and ENEE data. Determined in the registered PDD.
Value(s) applied	0.6561
Choice of data or measurement methods and procedures	
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	This parameter is fixed for the whole crediting period.

[12] Certificates of attendance and the list of trained personnel are kept on file.

D.2. Data and parameters monitored

Data/Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the Project plant/unit to the grid in year *y*
Measured/calculated/ default	Measured
Source of data	Electricity meter reading
Value(s) of monitored parameter	2,056,531 MWh/yr

Monitoring equipment	The energy is continuously metered at the Delivery Point by two electronic line meters. The MW-1111A186-01 (ION 8650) meter served as the main meter and the MW-1111A188-01 (ION 8650) as the backup meter Period from 01/01/2016 to 31/12/2020 **Main (MMED1)** **Series: MW-1111A186-01** Brand: ION, Model: 8650 Calibration/verification dates: • 18/12/2013 (valid until 17/12/2015). • 13/07/2016 (valid until 12/07/2018). • 04/04/2019 (valid until 03/04/2021) Power Accuracy: 0.2% Date of meter installation to the plant: 16/05/2012 **Back Up (MMED2)** **Series: MW-1111A188-01** Brand: ION, Model: 8650 Calibration/verification dates: • 18/12/2013 (valid until 17/12/2015). • 13/07/2016 (valid until 12/07/2018). • 04/04/2019 (valid until 03/04/2021) Power Accuracy: 0.2% Date of meter installation to the plant: 16/05/2012. Both meters had a delayed calibration affecting the months from January to July 2016. And Months from July 2018 until April 2019. Max. error was applied in the calculations. **Main (MMED1)** **Series: MW-1308A261-01** Brand: ION, Model: 8650 Calibration/verification dates: • 25/08/2014 (valid until 24/08/2016). • 13/07/2016 (valid until 12/07/2018) • 04/04/2019 (valid until 03/04/2021) Power Accuracy: 0.2% Date of meter installation to the plant: 25/08/2014 **Back Up (MMED2)** **Series: MW-1310A906-01** Brand: ION, Model: 8650 Calibration/verification dates: • 25/08/2014 (valid until 24/08/2016). • 13/07/2016 (valid until 12/07/2018). • 04/04/2019 (valid until 03/04/2021) Power Accuracy: 0.2% Date of meter installation to the plant: 25/08/2014. Both meters had a delayed calibration affecting the months from July 2018 until April 2019. Max. error was applied in the calculations. Verification frequency of the meters: every 2 years as per the PPA.

Measuring/reading/recording frequency	Two pairs of independent bidirectional meters are installed at the Metering Points in the Cerro de Hula Substation, each pair is comprised by a main meter and a back-up meter. The bidirectional meters measures both electricity generated that is being imported to the grid (imports) and discount electricity that is consumed by the Project (exports). The data (net electricity supplied to the grid) will be calculated from the readings from the main meter at each Metering Point at the Project site (recording both imports and exports that will be deducted to obtained the net electricity), as per the PPA. The total quantity of net electricity supplied to the grid results from the addition of the net electricity determined at each metering point. If an anomaly is detected in the data of the main meter, the data of the back-up meter will be used instead. The energy is continuously metered, the recording is done every 15 minutes and the frequency of the readings will be done on a monthly basis.
Calculation method (if applicable)	N/A
QA/QC procedures	Meter readings are checked for completeness on a monthly basis by ENEE and EEHSA and cross checked with the sales invoices. Meters will be verified according to the PPA.
Purpose of data/parameter	Calculation of baseline emissions.
Additional comments	Data will be archived by means of electronic and paper backup for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

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

According to ACM0002, the baseline emissions of the project are equal to:

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

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) ($EG_{facibility}$)

$EF_{grid,CM,y}$ 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).

y	$EG_{PJ,y}$ (MWh)	$EF_{grid,CM,y}$ (tCO2 / MWh)	BE_y (tCO_2e) [13]
2016	418 278	0.6561	274 432
2017	409 298	0.6561	268 541
2018	466 877	0.6561	305 991
2019	404 762	0.6561	265 347
2020	357 316	0.6561	234 435
Total	**2,056,531**		**1,348,746**

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

There are no project emissions attributable to wind projects. Consequently PEy = 0.

E.3. Calculation of leakage emissions

There is no leakage attributable to wind projects. Consequently Ly = 0.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	Project GHG emissions or actual net GHG removals ($t CO_2e$)	Leakage GHG emissions ($t CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
Total	1,348,746	0	0		1,348,746		1,348,746

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

Amount achieved during this monitoring period ($t CO_2e$)	Amount estimated ex ante for this monitoring period in the PDD ($t CO_2e$)
1,348,746 tCO_{2e} (total 2016-2020)	276,137 tCO_{2e} (per year) 1,380,685 tCO_{2e} (total in 5 year)

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

The calculation of "amount estimated ex ante for this monitoring period in the PDD" was made as per formula below:

$ER_y = BE_y - PE_y$

[13] Total emission reductions after rounding down.

According to ACM0002 v12.2.0, there are no expected project emissions related to the generation of electricity from a wind power project. Therefore, PEy = 0.
Therefore: ERy = BEy

The baseline emissions were calculated as follows:

$BE_{y} = EG_{PJ, y} * EF_{grid, CM, y}$

The emission reduction for the first crediting period at full capacity was calculated as follows:

$ER_y = EG_{PJ, y} * 0.6561\ tCO_2/MWh$

$EG_{PJ, y}$ = 420,876 MWh once full capacity (126 MW) was in place (since December 2014).

ER_y= 276,137 tCO_{2e}

E.6. Remarks on increase in achieved emission reductions

The actual values of emission reductions achieved during this monitoring period are 1,348,786 tCO_{2e}; 2.39% lower than the values estimated ex ante in the registered PDD for 2016-2020 which is 1,380,685 tCO_{2e}. This is a direct consequence of an equally higher electricity generation, as compared to the estimate used in the PDD for a same period of time (i.e. 2,104,380 MWh versus 2,056,533 MWh).

However, in 2018, the ex-ante calculation of 276,137 tCO_{2e} calculated for a complete year, was lower than the ER achieved in this year, of 305,991 tCO_{2e}. Hence, for an equivalent amount of time, the emission reductions achieved were 10.8% higher, only during this year. This is a direct consequence of an equally higher electricity generation, as compared to the estimate used in the PDD for a same period of time (i.e. 420,876 MWh versus 466,877 MWh).

Production at wind farms varies greatly from year to year due to changes in weather patterns and frequency distribution of wind speeds. This was the case of year 2018, where wind power generation was greatly affected in Honduras by means of the *"Fenómeno del Niño"*, which was reflected mainly in disorder of the rainy season and the behaviour of the temperature and wind. Because of "*El Niño*", in 2018, Cerro de Hula, generated an increase in wind speeds compared to the estimated for that year, specifically during the months in which normally a slow wind speed is expected, for example August 2018 registered a generation of 48.4 GWh versus 29.4 GWh that were forecasted, more than 64%, as well as September 2018, where a generation of 25.1 GWh was registered versus 13.8 GWh forecasted, 82% more.

Figures with the wind behaviour and monthly generation of the Cerro de Hula Project, are available to the DOE, which show how in the rainiest months (August and September) the wind speed increased in comparison with previous estimates.

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

Not applicable

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Document information

Version	*Date*	*Description*
08.0	6 April 2021	Revision to: • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • 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: • 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: • 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: • 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 *F-CDM-MR* to *CDM-MR-FORM*; • 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.

Version	*Date*	*Description*
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).
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.

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