

**EMPRESAS PÚBLICAS DE MEDELLÍN E.S.P**

**MONITORING REPORT 3**

**JEPIRACHI WIND POWER PROJECT  
LA GUAJIRA, COLOMBIA**

**CDM REGISTRATION REFERENCE NUMBER 00194**

**MONITORIG PERIOD: January 1/2008 to December 31/2008**

**Versión 1, May 17, 2009**



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## 1. INTRODUCTION

The main purpose of the present monitoring report is to outline the calculation of the emission reductions achieved by the implementation of the CDM project activity **Jepirachi Wind Power Project** (UNFCCC reference number 0194) for the verification period from January 1<sup>st</sup> 2008 to 31<sup>st</sup> December 2008. Total reported emission reductions for the considered verification period are **14,706.46 tCO<sub>2e</sub>**

This Monitoring Report also includes details about procedures adopted by Empresas Publicas de Medellin (EPM) for management and quality assurance of monitoring data (collection, handling, and archiving of data), as well as applicable calibration and maintenance procedures for applicable monitoring instruments in order to determine real and credible emission reductions.

In addition, this Monitoring Report also presents data for social indicators monitoring in the context of Additional Programs of Environmental Management under the agreement with the Prototype Carbon related to benefits for local communities achieved by EPM and other government agencies in the wind park area.

## 2. DESCRIPTION OF THE PROJECT ACTIVITY

The project activity is the installation of a wind farm with installed capacity of 19 MW. General information about the project design can be found in the PDD and associated documents which are available on the UNFCCC website (<http://cdm.unfccc.int/Projects/DB/SGS-UKL1135244574.04/view>). The project participants are EPM and the International Bank for Reconstruction and Development (IBRD) as the Trustee of the Prototype Carbon Fund (PCF).

## 3. MONITORING PERIOD

This is the second monitoring report for Jepirachi Wind Power Project. It covers the period from 01 January 2008 to 31 December 2008. There are no remaining open issues related to monitoring after the completion of the project validation and last verification.

## 4. APPLIED BASELINE AND MONITORING METHODOLOGY

The project applies the baseline and monitoring methodology is the “ACM0002 - *Consolidated baseline methodology for grid-connected electricity generation from renewable sources* - version 3.

By generating renewable energy using wind energy source, the project will displace fossil fuel based grid electricity, thus avoiding CO<sub>2</sub> emissions and contributes the regional sustainable development. While the project activity represents the installation of a new grid-connected renewable power plant, the baseline scenario is electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The geographic and system boundaries for the relevant electricity grid are clearly identified and information on the characteristics of the grid is available. The electricity system for the project activity is defined as the interconnected system of Colombia (SIN).

## 5. EMISSION REDUCTION CALCULATIONS

According to the monitoring plan of the registered PDD for ACM0002, emission reductions are calculated as baseline emission as reflected in the product between the amount of net electricity generated by the project and the baseline emission factor (combined margin (CM)). In accordance with ACM0002, baseline emissions for Jepirachi Wind Power Project include only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. It is noteworthy that CM is calculated annually for the years in which actual project generation and associated emissions reductions occur along the monitoring period (year 2008).

The baseline emission factor (EF<sub>y</sub>) is calculated as a combined margin (CM), consisting of the as the weighted average of Operating Margin (OM) emission factor (EF<sub>OM,y</sub>) and Build Margin (BM) emission factors (EF<sub>BM,y</sub>) where the weights of 50% for each emission factor ( $w_{OM} = w_{BM} = 0.5$ ). Operating Margin emission factor(s) (EF<sub>BM,y</sub>) is calculated based on the Dispatch Data Analysis OM method.

For the calculation of both Operating Margin emission factor (EF<sub>BM,y</sub>) and the Build Margin (BM) emission factors (EF<sub>BM,y</sub>), dispatch data is from database of Administrador del Sistema de Intercambios Comerciales (ASIC) which manages the wholesale energy market and coordinates the dispatch within the SIN. Plant emission factors used for the calculation of operating and build margin emission factors were obtained *directly* from Unidad Planeación Minero Energética (UPME) which is the entity who makes planning for the development and uses of the energetic and mining resources of Colombia.

### 5.1 CALCULATION OF THE COMBINED MARGIN EMISSION FACTOR

For the dispatch data analysis OM, use the year in which the project activity displaces grid electricity and update the emission factor annually for the considered monitoring period (year 2008).

Imports from connected electricity system located in another country the emission factor is 0 tons CO<sub>2</sub> per MWh. As required by ACM0002 version 3, electricity exports were not subtracted from electricity generation data used for calculating and monitoring the combined margin (CM) emission factor.

### 5.2 CALCULATION OF THE OPERATING MARGIN EMISSION FACTOR

As required by ACM0002 version 3, Operating Margin emission factor (EF<sub>BM,y</sub>) is calculated based hourly generation weighted average emissions per electricity unit (tCO<sub>2</sub>/MWh) of the set of power plants ( $n$ ) in the top 10% of grid system dispatch order during hour ( $h$ ). While dispatch of SIN in Colombia is determined by the system's operator (Centro Nacional de Despacho - CND\_)<sup>1</sup> from an *ideal* (and not necessary real) dispatch order (which takes into account all data for each hour and day of the respective year), there is thus no complete public data regarding the real dispatch order in which power plants connected to SIN dispatch electricity into the grid. Thus, in order to calculate EF<sub>BM,y</sub> in accordance to the selected Dispatch Data Analysis OM method, an interactive model was adopted in order to determine the set of power plants falling within the top 10% of the system dispatch (under the merit order at each hour  $h$  for the group of power units  $n$  in the dispatch margin including the power generation units in the top 10% of total electricity dispatched in the hour  $h$ ). Such interactive model uses *ideal* dispatch order data and criteria performed by the system's operator.

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<sup>1</sup> Centro Nacional de Despacho is a special, division of XM Company, charged of planning, coordination, supervision and control of the integrated operation of the power generation and transmission resources of the Colombian electric system). It provides data hour by hour and day by day for all plants of energy market in Colombia

See in Annex 1 the guideline for the calculation of the Combined Margin Factor and the computed application for calculations for the electricity system in Colombia.

### 5.3 CALCULATION OF THE BUILD MARGIN EMISSION FACTOR

In accordance to ACM0002 version 3, the Build Margin (BM) emission factors ( $EF_{BM,y}$ ) is determined considering the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The system's actual generation is available as entry data. These data are submitted by the CND. This value is used to calculate the 20% generation, which would be taken into account for the calculation. UPME submits data including the project's entry date. These projects are chronologically organized starting from the most recent plant in operation to the former one.

The first plant is then assigned its actual generation as submitted by the CND, by using the actual operation data of the plant. The same proceedings are followed with the rest of the plants until completing the system's 20% actual generation. Plant generations included in the 20% of the system's actual generation are multiplied by their respective emission factor which is given by UPME. If the factor is zero, it means it is a hydraulic plant. Emissions related to each plant within the 20% margin are obtained with this multiplication.

Emissions related to plants in the 20% threshold of the system's actual generation, are summed up. Finally, the build margin emission factor results from dividing the sum in the 20% threshold of the system's actual generation.

## 6. MONITORING PLAN IMPLEMENTATION

The ACM0002 monitoring methodology requires monitoring of the following data:

- Net electricity generation data from the project activity;
- Data needed to recalculate the operating margin emission factor as based on *Dispatch Data Analysis Operating Margin*
- Data needed to calculate the build margin emission factor

### 6.1 NET ELECTRICITY GENERATION DATA

The power plant Jepirachi belongs to the Metropolitan Area, an EPM Department under Power Generation Business Unit, and is charged of the operation and maintenance of the power plants. Monitoring of electricity exported by Jepirachi Wind Farm is implemented on site and data is assessed remotely using tele-measurement technology. Data from installed power meters are read via the MV-90i software every 24 hours and uploaded in software of the Commercial Generation Department.

The Equipo de Medidas (EM-Metering Team) belongs to Transmission and Distribution Business Unit and is charged of taking the measurements of all plants. It has a total independence of EPM Power Generation Business Unit, and it is the only accredited laboratory for power calibration for different industries in Medellin and the just one for calibration on site. EM team is responsible for reporting the generation boundaries to Mercados Expertos (XM) a company of ISA group which offers services in operation, management and development of electrics markets.

The monitoring of net electricity generation is based on continuous metering of electricity generation on site using digital measurement equipment (All ION 8600) at the substation (interconnection facility to the grid). Daily data are read remotely using MV-90xi software. Furthermore as an additional QA/QC procedure, there is a day by day registration, with an Excel sheet to register wind speed, power generation, maintenance and special events (binnacle) at in Jepirachi Wind Park.

The data are cross -checked by SCADA system ("Supervisory Control And Data Acquisition") comparing the generation measured in terminals vs. generation o from ASIC.

#### 6.1.1.Generation report scheme and loss analysis

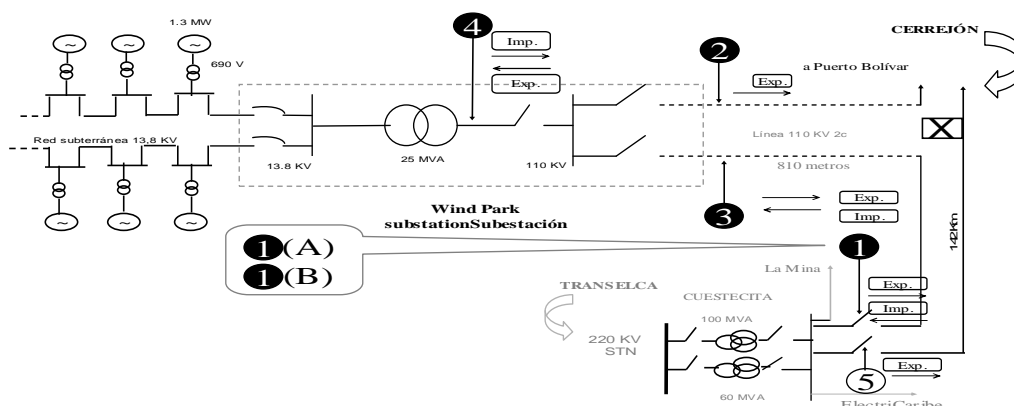
The procedure of measuring power generation at Jepirachi Wind Park is related with a particular generation model of this wind farm into a special circuit called Cerrejon to which it's connected, and also a three frontier commercial scheme (two commercial frontiers for Jepirachi and one for Puerto Bolivar). All makes sense through an energy measuring balance at Cuestecita's substation, (this is where Puerto Bolivar and Jepirachi are connected). It also takes into account its losses and assigns them to a responsible agent, depending upon the current flow.

At Cuestecitas Substation, through the LN742 circuit, (Cuestecita's circuit – Jepirachi and Jepirachi-Puerto Bolivar), one can find two frontiers exporting. One of them is measuring the consumption of auxiliary services on the Jepirachi generator, 1A (E), where A means auxiliaries and E means Exporting. The other one measures Puerto Bolivar consumption, 1 B (E). With the commercial frontier 4(I) net, reports the net energy generation injected from Jepirachi Wind Farm to the National Interconnected System (SIN in Spanish). See Figure 1.

The hourly reports from these three frontiers, 1A (E), 1B (E) y 4(I) net is made out with the measures taken from the meters 1(I), 1(E), 2(E), 3(I), 3(E), 4(I) y 4(E) at Cuestecita – Jepirachi and Puerto Bolivar. The losses are accounted through the hourly measures, on two current flow scenarios. Here the responsibilities of these losses lie on Puerto Bolivar's demand or Jepirachi generation, depending if the energy is enough or not for Puerto Bolivar consumption, and also the exports to Cuestecita's Substation and the auxiliary services at Jepirachi. Everything regulated by the formulas previously agreed and the values form the meters involved, based in Resolución 025, 1995 ASIC.

(Cerrejon: main coal mine in Colombia. <sup>1</sup>Puerto Bolivar: where Cerrejon exports its coal).

**FIGURE 1. UNIFILAR CONNECTION DIAGRAM  
JEPIRACHI WIND PARK**



For the estimations the information on the energy supplied to the National Grid –connected electricity System (SIN) is uploaded to the official database (NEON - [www5.ISA.com.co /neonweb](http://www5.ISA.com.co/neonweb)) by the Centro Nacional de Despacho (CND);

Once the information is uploaded, EPM achieve a data validation and a text file is created and it is send to XM. The code assigned by ASIC to this plant is JPR1, and in these code is the official data reported to XM.

For calculation then it is taken from NEON database of ASIC which is the final version for commercial uses (files with TXF extension). Is not necessary to process, to complete or to correct the generation data by EPM.

## 6.2 DATA NEEDED TO CALCULATE THE OPERATION MARGIN EMISSION FACTOR

Data needed to calculate the operating margin emission factor as based on *Dispatch Data Analysis Operating Margin*

Dispatch data operating margin is used for each hour  $h$  where the project plant is displacing grid electricity:

- The dispatch order of all grid-connected power plants;
- The total grid electricity demand;
- The quantity of electricity displaced by the project activity (net electricity generated and delivered to the grid by power plant)
- Identification of the plants that are in the top of the dispatch and for each plant information on electricity generation (use of the interactive model)

## 7. MONITORING RESULTS

In Annex 1 a complete document describes how estimations were performed to determine the reduction of tons at Jepirachi Eolic Park. While the grid emission factor calculation is too big, the spreadsheets and files of the process for emission reduction calculations are presented in separated files in a DVD disk.

### 7.1 FORMULAS USED

Considering that there are neither project emissions nor leakage for the project activity, the annual emission reductions (ER) are equal to the estimated CO<sub>2</sub> emissions in the baseline, (BE)

$$ER_y(\text{tonCO}_2 / \text{yr}) = BE_y(\text{tonCO}_2 / \text{yr})$$

The estimated CO<sub>2</sub> emission in the baseline (BE) are calculated applying the combined margin emission factor calculation and the energy generated by the plants

$$BE_y(\text{tonCO}_2 / \text{yr}) = EF_y(\text{tonCO}_2 / \text{MWh}) \cdot EG_y(\text{MWh} / \text{yr})$$

Where  $EG_y$  is the project generation and  $EF_y$ , is the grid emission factor calculated as the weighted average of the Operating Margin emission factor ( $EF_{OMy}$ ) and the Build Margin emission factor ( $EF_{BMy}$ )

**TABLE1. DATA FOR BASELINE EMISSIONS CALCULATION**

Data variable	1. Net Electricity Generation (EG <sub>y</sub> )
Data unit	MWh
Source	ASIC/NEON based on primary measurements conducted by EPM
Measurement procedures, quality control and quality assurance	<p>Measurement of Electricity Generation by EPM: Electricity generation is hourly measured in EPM by electronic electricity meters.</p> <p>This information is backed up by the Informatics Unit of EPM through the Grandes Clientes de Energía database ("Large Energy Consumers") on a daily basis through the SQL Server.</p> <p>To ensure reliability, there are three main and three backup energy meters, located in panel TM 1 at the substation of energy in the area of the Wind Park. They were installed and calibrated in December of 2005 and last calibration was made on March of 2008, and no deviations were detected.</p> <p>Although ION meters do not require calibration, only verification of their accuracy, the meters are approximately calibrated once a year depending on the registration of tendencies variations (error, standard variation), affected by the working conditions. It is achieved by Laboratory of Calibration (Laboratorio de Calibración de equipos de medida de energía y gas), a special department of the Energy Distribution Business Unit that sets up all the meters.</p> <p>Calibration tasks follow national standards and are in accordance with the calibration instructive specified in Colombian standard NTC 4856 for electricity metering devices. EPM has adopted its own procedure based on the Colombian technical norm NTC-ISO-IEC 17025 and NTC 4856, under the so-called "Instructive to perform on-site electricity meter proofs with a pattern metering device" (DIS-EM-LE-IN-009-01). This procedure is carried out to verify that the meters are working properly with the corresponding accuracy. They are also checked for alarms. The patterns used to calibrate the electricity meters in-situ could be any of the following:</p> <ul style="list-style-type: none"> <li>• Portable Standard MTE N° 16, 17, 18 (accuracy 0.05) for on site calibration</li> <li>• Calibration Bench LANDIS TALOGYR 6061 for calibration at EPM laboratory</li> <li>• Calibration Bench ZERA ED 6816 for calibration at EPM laboratory</li> </ul> <p>The accreditation of the laboratory is achieved by Superintendencia de Industria y Comercio de Colombia. All informs of calibration and certifications, the readings and data are kept in the headquarters of EPM in Medellín.</p> <p>The data of power generation of Neon database is daily backed by Subdirección Tecnología de Información through the Unidad informática Generación, which follows policies of quality, safety and reliability.</p>

**TABLE1. DATA FOR BASELINE EMISSIONS CALCULATION (CONT)**

<b>Data variable</b>	<b>2. Colombian grid emission factor (EF<sub>CM</sub>),</b>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Source</b>	ASIC/NEON
<b>Calculation ,quality assurance and quality control</b>	<p>This variable is calculated as referred in section 5, as the weighted sum of EFOM and EFBM and is annually updated and recorded by Commercial Dept of EPM.</p> <p>This variable is no measured but calculated by an informatics application, done by Unidad Informatica Generacion, in SQL Server to get the emission factor of the system and the tons of CO<sub>2</sub> reduced. Seeing that its value is a final result of a long calculation process of operation and building margin emissions factors, it is a very heavy spreadsheets and it must be presented in a magnetic media (CD or DVD discs). A summary of the calculation is presented in a word format for each year in a internal technical report.</p>
<b>Data variable</b>	<b>3. Build Margin emission factor (EF<sub>BM</sub>)</b>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Source</b>	ASIC/NEON
<b>Calculation ,quality assurance and quality control</b>	<p>This variable is calculated as referred in section 5. Annually is updated by Commercial Dept of EPM and indicated in the Operator's guideline for the estimation of combined Margin Factor and the computed application for calculations (Annex 1).</p> <p>The calculation of the building margin emission factor of Jepirachi is systemized in EPM (Unidad Informatica Generacion) through software in SQL SERVER, which uses the data published by ASIC for power generation, getting the results in a Excel spreadsheet format whit recently operating plants that represent 20% of the power demanded.</p>
<b>Data variable</b>	<b>4. Operating Margin emission factor (EF<sub>OM</sub>)</b>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Source</b>	ASIC/NEON
<b>Calculation ,quality assurance and quality control</b>	<p>This variable is calculated as Referred in section 5. Annually updated by Commercial Dept of EPM</p> <p>The calculation of the operating factor of Jepirachi is systemized in EPM (Unidad Informatica Generacion) through software in SQL SERVER, which uses the data published by ASIC for power generation, getting the results in a Excel spreadsheet format with order of bidding prices, power generation that represents 10% at the end of the dispatch order.</p> <p>This variable is calculated , no measured, through the algorithms and macros used to achieve a iterative process to estimate 8760 calculations corresponding to every hour of one year, (taking the generation offering, demand, grid availability , etc) to get the plants which power generation, the power generation of Jepirachi . This is a very heavy spreadsheets and it must be presented in a magnetic media (CD or DVD discs)</p>



**TABLE 2 DATA FOR SOCIAL INDICATORS MONITORING**

Item	Description	Value/Unit	Source
<b>Direct beneficiaries of the programs</b>	Participants registered in the development of each program sponsored or with participation of EPM	Number	EPM report about achievements and development of the Community and Institutional strengthening plan, Subgerencia Ambiental
<b>Indirect beneficiaries of the programs</b>	Other participants in the development of the program different than direct beneficiaries.	Number	EPM report about achievements and development of the Community and Institutional strengthening plan, Subgerencia Ambiental
<b>Job creation</b>	Jobs created in the development of each program	Number	EPM report about contract of labor for services in the wind Park Subgerencia Operacion
<b>Programs achieved in the period</b>	Structured programs by EPM or in cooperation with other agencies started or finalized in the reporting period.	Number	EPM report about achievements and development of the Community and Institutional strengthening plan, Subgerencia Ambiental
<b>Institutions</b>	Public or private agencies involved in the development of the programs	Descriptive	EPM report about achievements and development of the Community and Institutional strengthening plan, Subgerencia Ambiental.

## 7.2 POWER GENERATION BY THE JEPIRACHI WIND POWER PROJECT

**TABLE 3. GENERATION OF THE WIND PLANT FOR YEAR 2008**

Month	2008 Real Power generation MWh
January	5,502.41
February	5,912.37
March	6,480.64
April	5,917.68
May	5,767.04
June	6,500.22
July	6,204.88
August	3,252.94
September	1,699.94
October	1,974.46
November	1,863.22
December	2,842.35
<b>TOTAL</b>	<b>53,918.17</b>

**Source:** Neon database from ASIC

### 6.3 CALCULATION OF COMBINED MARGIN GRID EMISSION FACTOR (CM)

The calculation formula for the Emissions reductions of CO<sub>2</sub> generated by the Jepirachi Wind Power Project according to the consolidated methodology ACM002 option c, for power generation projects connected to the grid is:

According to the data available for the Colombian electricity sector, the methodological choice selected to calculate the OM is the Dispatch Data Analysis (DDA), Option C of the methodology.

The operating margin is calculated on an hourly basis for each day of the year, for the set of power plants in the top 10% of grid system dispatch order during the hour h.

$$EF_{OM\_DispatchData,y}(tonCO_2 / MWh) = \frac{E_{OM,y}(tonCO_2)}{EG_y(MWh)} \quad (1)$$

Where  $EG_y$  is the generation of the project in year y, and  $E_{OM,y}$  are the emissions associated with the operating margin calculated as:

$$E_{OM,y}(tonCO_2) = \sum_h EG_h(MWh) \cdot EF_{DD,h}(tonCO_2 / MWh) \quad (2)$$

Where  $EG_h$  is the generation of the project in each hour h and  $EF_{DD,h}$  is the hourly generation-weighted average emissions per unit of energy of the set of power plants (n) in the top 10% of grid system dispatch order during hour h.

EPM does not manage fuel consumption of the plants or their heat rate, so the emission factor is calculated with the emission factor provided by UPME.

$$EF_{DD,h} = \frac{\sum_{j,n} EF_j \cdot GEN_{j,n,h}}{\sum_{j,n} GEN_{j,n,h}}$$

The Build Margin (BM) is calculated as the generation-weighted average emission factor of a sample of power plants m, as follows:

$$\frac{\sum_i F_{i,y} \times COEF_i}{\sum_m GEN_{m,y}}$$

The  $EF_y$ , is the grid emission factor (combined margin emission factor) calculated as the weighted average of the Operating Margin emission factor ( $EF_{OM,y}$ ) and the Build Margin emission factor ( $EF_{BM,y}$ ), as follows:

$$EF_y(tonCO_2 / MWh) = w_{OM} \cdot EF_{OM,y}(tonCO_2 / MWh) + w_{BM} \cdot EF_{BM,y}(tonCO_2 / MWh)$$

The relative weights,  $w_{OM}$  and  $w_{BM}$ , are assumed to be equal to 0.5,

**TABLE 4 CALCULATION OF COMBINED MARGIN EMISSION FACTOR (EF<sub>CM</sub>)**

	<b>Unit</b>	<b>2008</b>
<b>Emission Factor of the Operating margin (EF<sub>OM</sub>)</b>	ton CO <sub>2</sub> /MWh	14,639.38/53,918.17= 0.2715
<b>Emission Factor for the Build margin (EF<sub>BM</sub> )</b>	ton CO <sub>2</sub> /MWh	0.2740
<b>(EF<sub>OM</sub>)+(EF<sub>BM</sub> )</b>	ton CO <sub>2</sub> /MWh	(0.5)*(0.2715) + (0.5)*(0.2740)
<b>Emission Factor for Baseline</b>	ton CO <sub>2</sub> /MWh	0.2728

#### 7.4 SUMMARY OF OBTAINED EMISSION REDUCTIONS

For the monitoring period between January 1/2008 to December 31/2008, the Jepirachi Wind Power Project reduced **14,706.46** tons of CO<sub>2</sub> as is indicated in the Table 5.

**TABLE 5. SUMMARY OF OBTAINED EMISSION REDUCTIONS**

		<b>Unit</b>	<b>2008</b>
<b>Project Generation</b>	EG	MWh.	53,918.17
<b>Emission factor</b>	EF	tCO <sub>2</sub> /MWh	0.2728
<b>Base line emission</b>	BE	tCO <sub>2</sub> e	14,706.46
<b>Emission reduction</b>	ER	tCO <sub>2</sub> e	<b>14,706.46</b>

## 8. ENVIRONMENTAL MANAGEMENT PLAN AND SUSTAINABILITY- ECONOMIC AND SOCIAL WELLBEING

Jepirachi Wind Park achieved an environmental management plan that included actions towards mitigating the negative impacts on environment during construction. No environmental licensing was required for this project, thus there is not an official letter of approval of the EIA, but the environmental management plan was approved by CORPOGUAJIRA, the Regional Autonomous Corporation of the Guajira, the environmental authority provided that the project is located in its jurisdiction.

### 8.1 MANAGEMENT OF ENVIRONMENTAL IMPACTS IN OPERATION

At present EPM achieve the monitoring environmental plan in operation phase, which involves physical-biotic and social aspects to protect natural resources and to promote a sustainable development,. The purpose of the environmental monitoring plan is to verify the results of the environmental management plan and to do corrections if is necessary, in special programs as impact of birds with wind mills or electrics wire conductions, survival of cactus experimental plantation and reestablishment of vegetation, landscape perception, noise impact, job creation and sustainability of compensation actions (houses, desalinization plant).

EPM has developed different actions, which are not part of the commitment with World Bank but respond to his social responsibility for developing areas where the projects are located. They are focused in organizational strengthening for local institutions, such as cultural events, promotion of education actions, health campaigns, and monetary support for the Wayuu Festival and supply of scholar kits and books. EPM supports other projects institutions as rural electrification and aqueduct, for local communities of the wind park.

## 8.2 ADDITIONAL PROGRAMS OF ENVIRONMENTAL MANAGEMENT

The project company is aware of his social responsibility and has contributed to social programs for benefits in the community. Furthermore of the compensations plan for social impacts, in the agreement signing with the Prototype Carbon Fund for the reduction of emissions (renegotiated ERPA in 2007), it was defined to give to EPM an extra paid of US\$1.40 for each equivalent ton reduced, with a exclusive destination to projects and programs that contribute in an effective way to the local development of the communities and institutions and for improving quality life of the population in the project area. This is included in The Community and Institutional Strength Plan (PFIC), with specific indicators.

In 2008 EPM addressed his activities toward the join and participation of local and regional governmental agencies for developing social programs in order to improve the quality of life of the indigenous communities in the influence area of the Jepirachi Wind Park. In addition, EPM considered the participation of the communities leaders and authorities in different events and situations such as meetings for program coordination, institutional agreements, and joint definition of projects, based in communitarian self management. In tables 7 and 8, 9 are shown the main aspects of the social programs executed by EPM with its indicators

**TABLE 7 SUMMARY OF SOCIAL INDICATORS**

INDICATOR	TOTAL
<b>Direct beneficiaries of the programs</b>	50 people; 79 families
<b>Indirect beneficiaries of the programs</b>	50 families; 350 personas
<b>Direct Jobs</b>	3
<b>Indirect Jobs</b>	3
<b>Programs achieved in the period</b>	2
<b>Institutions involved</b>	7

## 9. ROLES AND RESPONSIBILITIES

In the Energy Generation Business Unit at EPM (Gerencia de Generacion Energía) there are several areas in charged of the CDM activities, and data collection responsibility, depending on the phase of the project (Planning, Building, Operating and Marketing). As Jepirachi Wind Park is in commercial operation since 2004, the main CDM activities are related to development actions included in the Monitoring Plan, and in the Project Design Document (PDD), and in ERPA undersigned with the World Bank, in especial the requirements for monitoring, verification of the emission reductions, and some social and environmental programs for sustainable development:

- **Areas Planeacion Generación (Planning Generation dept):** It's aligned with different areas of EPM in order to prepare the monitoring report and facilitate the verification audit.
- **Subgerencia Ambiental Generación (Energy Generation-Environmental Dept):** is responsible for monitoring the environmental and social indicators at Wind Park Area.
- **Subdireccion Investigacion y Desarrollo Generacion (R&D Department):** support the application of the methodology, supervises the calculation of the emission reduction and has an integrated knowledge of the functioning of the dispatch in the Colombian electric system.
- **Subgerencia Comercial Generación (Commercial Dept):** consults the database of energy and makes the calculations about the real dispatch, and summarize the power generation data.
- **Subgerencia Operación Generación (Operations Dept):** operates the wind park. It is in charge of metering the energy, the transmission of the data, and support to the following of the environmental and social indicators for monitoring report.
- **Equipo de Medidas (Metering Team of the Transmission and Distribution Business Unit):** receives the energy data and transmits it to ASIC; calibration of the meters.

**TABLE 8. JOBS CREATION DURING IN THE PERIOD**

SERVICES	JOBS				SOURCE OF INFORMATION	ADDITIONAL INFORMATION
	before	2008	New in the period	DIRECT/INDIRECT OCCASIONAL		
Supply of transportation for wind park	1	1	0	Direct	Annual contract with Anna Watta kai Foundation 030419558 y 29990430356	Driver and vehicle of the local community for people and cargo
Supply of transportation for wind park	1	1	0	Direct Occasional	Contract with Anna Watta kai Foundation 030419558 y 29990430356	Driver and vehicle of the local community for people and cargo
Supply of transportation for visitors of EPM to the park	1	1	0	Direct Occasional	Bills paid by EPM	Driver and vehicle from La Guajira
Supply for the wind park of safety guards	13	13	0	Direct	Contract with Private company PROTEVIC	12 guards and one supervisor of local communities
Supply for the wind park of Cleaning up facilities.	1	1	0	Direct	Contract with Anna Watta kai Foundation 29990430396	Changes every tree months between 2 local communities
Mechanical technicians	2	2	0	Direct	Contract with Anna Watta kai Foundation 29990430396	From Medellin
Multipurpose workers(picking up and transportation of the garbage insect fumigation, septic tank maintenance)	3	3	0	Direct Occasional	Contract with Anna Watta kai Foundation 29990430396	From local community
Maintenance of the roads in Jepirachi Wind park.	0	3	3	Indirect Occasional	Contract with Anna Watta kai Foundation 29990430396	From local community
Maintenance of the desalination plant service	1	1	0	indirect	Contract with Local municipality	From local community
Tour guide	1	1	0	Direct	Contract with Anna Watta kai Foundation 29990428825 y 29990432413	From local community
Accommodation	0	3	3	Direct	Bills paid by EPM	From local

SERVICES	JOBS				SOURCE OF INFORMATION	ADDITIONAL INFORMATION
	before	2008	New in the period	DIRECT/INDIRECT OCCASIONAL		
and restaurant services in the project area						community
Accommodation and restaurant services at Cabo de la Vela	4	4	0	Direct	Contract with EPM	From local community
Teachers in weave's techniques	3	6	0	Direct	Agreement with SENA 29990829594	From La Guajira
Weave's artisan	5	21	0	Indirect	Anna Watta kai information	From local community
Teachers in nutritional, health care	1	1	0	Direct	Agreement with SENA 29990829594	From La Guajira
Administration of social programs	1	1	0	Direct	Contract with University La Guajira number 267	One specialist in social camp
Labor Services	2	5	0	indirect	Anna Watta kai	Administrative Staff of Ana Watta kay foundation

**TABLE 9. BENEFICIARIES OF INTERINSTITUTIONAL PROGRAMS**

PROGRAM	DIRECT BENEFICIARIES		INDIRECT BENEFICIARIES	OBJECTIVES	INITIAL AND FINAL DATES OF THE CONTRACT	INSTITUTIONS *	SOURCE OF INFORMATION	ADDITIONAL INFORMATION
Training in the production and Trading for Wayuu's handicrafts in Media Luna village at Uribia Municipality	2008	New In the period	50 families	Formation in weave's techniques quality. Design, colors in artisan products.	May18,2007 May 16,2008	SENA EPM Municipio Uribia Fundación Anna Watta Kai	EPM Subgerencia Ambiental Informe de la gestión social	10 artisan of Kasiwolin Village , and 5 artisan of Arutkjuy village
	50 people	0						
Integral care for families from Media Luna village, at Uribia municipality	79 families	0	350 people	Nutritional, health care and projects related to healthily families, sanitation, and infrastructure, training for the development of productive projects with special support from local, regional and national institutions.	June26,2007 June24,2008	SENA ICBF EPM Municipio Uribia, Universidad de la Guajira, Fundación Anna Watta Kai Fundación Cerrejón	EPM Subgerencia Ambiental Informe de la Gestión social	

\*ENA: Servicio Nacional de Aprendizaje

\*EPM: Empresas Publicas de Medellín

\*ICBF: Instituto Colombiano de Bienestar Familiar

## ANNEX

### 1. GUIDELINE FOR THE ESTIMATION OF THE EMISSION FACTOR



Guideline for  
emission reduction ca