CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Amayo 40 MW Wind Power Project - Nicaragua
Version 1 – 21/04/2008

A.2. Description of the project activity:

The main objective of the Amayo Wind Power Project is to provide affordable electricity to the Nicaraguan grid using a clean and renewable energy source: the wind. For this purpose, the project will make use of nineteen 2.1 megawatt Suzlon S88 60HZ wind turbine generators, for a total power capacity of 39.9 MW per year. The net power production provided to the national grid is expected to be approximately 169 GWh per year. The project activity involves every stage, from the development, design, engineering and financing, to the construction, operation and maintenance of the Amayo's power plant facilities.

Nicaragua's grid (namely, National Interconnected System, "NIS") consists mainly of thermal power plants and has an estimated emission factor of 0.7669. This implies that the project will be able to displace around 130 thousand tonnes of carbon dioxide ("tCO_2e") per year by providing energy from a clean source instead of the usual fossil-fueled thermal plants.

"Consorcio Eólico Amayo, S.A" ("Amayo" or "CEA"), a special purpose Panamanian corporation operating in Nicaragua through a Nicaraguan branch has been established by Arctas Capital Group LP ("Arctas"), Centrans Energy Services, Inc ("Centrans") and ENISA (the "Owner Group") to collectively develop the project. CEA has signed two fifteen year power purchase agreements (hereafter, "PPA") with the two primary distribution companies of Nicaragua, Dissur and Disnorte, both wholly owned subsidiaries of Union Fenosa.

After reviewing several competitors for the construction of the facility, CEA selected Socoin, a company highly experienced in the construction of wind projects, to provide a turnkey price for the site civil works and the balance of plant including the substation. In addition, Suzlon -the supplier of the wind turbines and ancillary systems- was contracted to provide a 5 year operations and maintenance service plan and warranty. An operating and maintenance building will be erected on the Project Site and will be used to manage the plant, to store critical spare parts and tools as well as the supervisory control and data acquisition system ("SCADA").

The project will connect to the NIS using a substation built for this specific purpose. The latter was the subject of a detailed study by the firm Recursos Hidrolicos which concluded that the project can be interconnected to the grid with minimal system upgrades.

Contribution to sustainable development;
The Amayo wind farm will produce significant benefits to Nicaragua. These include:

- Increase in power supply in a country with energy deficit: The Amayo wind project will have an installed capacity of 39.9 megawatts, which will increase the supply of electricity and will reduce the rolling blackouts in Nicaragua[1]. This will improve living conditions of households and reduce business interruptions, therefore stimulating population income, employment and enhancing tax receipts of the Nicaraguan government.

- Reduction in electricity costs: The project will produce significant savings in respect to electricity costs offering one of the cheapest sources of energy in the country. The average power plant in Nicaragua utilizing fuel oil currently costs the Nicaraguan people approximately $135 per megawatt hour, while the Amayo wind farm will have an initial cost to the Nicaraguan people $86.25 per megawatt hour for a savings of nearly $50 per megawatt hour. This will help make Nicaraguan industry more competitive and make electricity more affordable to the Nicaraguan people.

- Reduction of oil imports: The use of indigenous renewable energy sources will help reduce Nicaraguan consumption of imported fuel oil by 216,560 barrels per year, thereby reducing currency expenditures of fuel purchases of approximately $10.8 million per year. This will enhance Nicaragua's balance of trade and strengthen the country's currency.

- Displacement of old carbon-intensive technology: The Amayo wind project will reduce the Nicaragua's reliance on expensive deteriorated fossil fuel fired power plants that are unreliable and significantly more expensive to operate

- Employment generation: During the construction of the project, Socoin, the contractor installing the civil and electrical works, will be employing approximately 90 to 125 Nicaraguans. Suzlon, the supplier of the wind turbines will also employ 20 Nicaraguans during the installation of the components of the wind turbines. Once the plant becomes operational, the Amayo wind farm will employ approximately 18 permanent operational personnel, thus providing working opportunities for locals in an economically depressed area. In addition, the project is expected to create 60 indirect jobs in the local area.

- Technology transfer: Amayo is the first project to employ this kind of resource in Nicaragua, which results in an important technology transfer to local workers. Suzlon will train the staff who will manage the operations of the facility and assist in the performance of warranty work as needed. This will create a pool of people in the country with operating experience in wind power generation.

- GHG emissions reduction: The Amayo wind power project is in line with the goals of Nicaragua's "Plan of National Action against Climate Change" (in Spanish, "Plan de Acción Nacional para enfrentar al Cambio Climático[2]"). This is because the proposed project activity will be generating electricity from a clean source, displacing generation from carbon-intensive technologies in the grid.

A.3. Project participants:

[1] These have been experienced frequently in recent years.

[2] This document is available upon request.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nicaragua (Host Party)	Consorcio Eólico Amayo (Private Entity)	**No**
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Consorcio Eólico Amayo S.A. (Amayo Wind Consortium - CEA) was created by the firms Arctas (45% owner), Centrans (45% owner) and ENISA (10% owner) to collectively develop the project.

Centrans is a Guatemala based group with interests in shipping and electricity generating plants. Centrans is a one of the earliest developers of private power in Central America and an active player in the power generation in the Central American region. CES owns a 50% interest in (Empresa Energética de Corinto, Ltd. - EEC) a 70 MW thermal power plant in Nicaragua.

Arctas is a Houston (US) based firm specialised in energy infrastructure investments in emerging markets. The Principals at this firm have over 35 years of experience in power plant development, operation, management, financing and mergers and acquisitions. They became involved with the region in 1992, as the lead developer of the PQPC power project in Guatemala, and then partnered with CES in developing the 70 MW Corinto plant.

ENISA is a Nicaraguan firm and the original developer of the project.

Contact information on project participants is provided in Annex 1

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The Amayo Wind Power Project will be located in the province of Rivas, approximately 129 KM south of Managua.

A.4.1.1. Host Party(ies):

Nicaragua

A.4.1.2. Region/State/Province etc.:

Rivas

A.4.1.3. City/Town/Community etc:

Rivas

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Amayo site is located 129 Km to the south of the capital city, Managua, on the Pan-American Highway near Rivas. The site is located on the south west coast of Lake Nicaragua. Figure A.1 provides detailed description of the project location.

Figure A.1 – Amayo wind farm location

A.4.2. Category(ies) of project activity:

The Amayo Wind Power Project falls into:

Scope number: 1

Sectoral Scope: Energy Industries - Renewable Sources

A.4.3. Technology to be employed by the project activity:

The layout of the Amayo Wind Project location has the main elements of a wind farm: wind turbines, wind measuring stations, a control house and an electrical substation. The location also has clear access to the roads, transmission lines, and the shore of Lake Nicaragua.

For approximately seven years, wind measurements have been taken[3] in two different points of the Amayo site, where the wind mill park will be located. This data has been collected under a strict and professional methodology, using calibrated NRG Systems equipment. Periodically, the machines were backed up and then reinstalled so they could continue recording data. Each tower included an anemometer and a wind indicator at 40, 30 and 15 meters of height. The logger used was an NRG System model 9200 which was programmed to measure wind velocity as well as direction every two seconds from three different heights, and record the average every 10 minutes. This allowed to estimate that the annual wind average is 7.5 meters per second on the west side of the park (at a height of 40 meters), and 8.4 meters per second on the East side of the park (at a height of 40 meters), closer to the shoreline of the lake.

The Project will consist of nineteen (19) 2.1 megawatt (“MW”) Suzlon S88 60HZ wind turbine generators (“WTGs”), with the following operating data: cut-in wind speed 4 m/s, rated wind speed 14 m/s, cut-out wind speed 25 m/s, survival wind speed 60 m/s. Suzlon wind turbines are designed to withstand the toughest environmental conditions. The robust design of the wind turbine, with its uniform weight distribution, ensures high levels of safety, reliability and enhanced service life. Suzlon’s Advanced Control System includes precisely calibrated sensors installed at each critical junction that closely monitors factors like temperature, wind speed, vibrations etc. The remote monitoring and control option enhances ease of operation. A high-quality corrosion protection system comprising several layers of epoxy coat, protects the structure and increases its service life. Suzlon’s weather resistant nacelle cover is made of plastic reinforced fiber and designed in such a way that the internal components are fully protected against various ambient conditions.

The developer of the WTGs is Suzlon Energy, a fully integrated wind power company that ranks amongst the top ten companies in the sector. Suzlon integrates consultancy, design, manufacturing, operation and maintenance services to provide customers with total wind power solutions. Germanischer Lloyd WindEnergie, a renowned international independent engineering firm, has certified that the Suzlon S88 wind turbine has been assessed by Germanischer Lloyd concerning the system design, prototype testing, manufacturer’s quality system and the implementation of the design requirements in production and erection. Germanischer Lloyd attested compliance concerning the design in respect to the following:

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[3] This study was performed by an independent consultant (Braselco, a Brazilian firm specialized in wind and solar energy). The “Braselco Wind Study Report on Amayo” is available upon request by the DOE.

- Load Assumptions according to GL Type Class 2A, 80 meters Hub Height
- Safety System and Manuals
- Rotor Blade
- Machinery Components
- Tubular Steel Tower, Hub Height 80 meters
- Electrical Equipment 60 Hz
- Commissioning
- Nacelle Cover and Spinner

The Suzlon S88 wind turbines were originally installed on wind farms in the United States in 2005. Since then, version two and version three of the Suzlon S88 have been released with improvements in each successive version. The version of the WTGs that will be installed on the project site is version 3, which is equipped with more efficient rotors blades.

The power curve used for the calculation of the annual production of energy corresponds with the power curve furnished by Suzlon and used by Braselco for the wind study for the project. This power curve is guaranteed by Suzlon and has been registered. A copy of this power curve can be found in the Braselco brochure which is available upon request.

The wind park of Amayo will have a control center and a 230/kV outdoor substation. The control center will be of approximately 180 square meters and will consist of the following:

- The control room where the computer control center of the wind farm will be housed.
- 13.8 kV (LV) cabinets, (one for each of the lines coming from each of the generators)
- A warehouse, where the critical spares and other material will be located for the operation and maintenance of the wind farm.
- Restrooms and changing rooms for the use of the operation and maintenance personnel and visitors.
- A Meeting Room, for the wind farm personnel and for the reception of any institutional visits to the wind farm.

The outdoor electrical substation will be 600 square meters of area and will be annexed to the control building where all of the 230/ kV electrical equipment of the wind farm will reside, which includes the following: power transformer, interrupters, disconnecting switch, autovalves and a high voltage transformer.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

The projects expected dispatch is 169,512 MWh per year. As the grid's combined margin emission factor is 0.7669 tCO_2/MWh, the number of displaced emissions will be of approximately 129,999 tCO_2e per year.

Table A.1 - Estimated amount of emission reductions during the First Crediting Period (*)

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2008 (Oct. to Dec. – 20% of yearly generation)	26,000
2009	129,999
2010	129,999
2011	129,999
2012	129,999
2013	129,999
2014	129,999
2015 (Jan to Sep – 80% of yearly generation)	104,000
Total estimated reductions (tonnes of CO_2 e)	**909,993**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**129,999**

(*) 2008 and 2015 are considered as one year

A.4.5. Public funding of the project activity:

There are no public funds involved in this project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Approved baseline and monitoring methodology applied:

- ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 07 – December 2007)

The following tools were applied together with the methodology:

- "Tool to calculate the emission factor for an electricity system" (Version 01)
- "Tool for the demonstration and assessment of additionality" (Version 05)

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The consolidated baseline methodology for grid-connected electricity generation from renewable sources is justified as the proposed project consists of the construction of a zero-emission wind power plant that will provide energy to Nicaragua's national grid. As required by the methodology, the proposed project does not involve switching from fossil fuels to renewable energy.

Similarly, the geographic and system boundaries for the Nicaraguan National Interconnected System (NIS) can be clearly identified. Lastly, all relevant information on the main aspects of the grid is readily available.

B.3. Description of the sources and gases included in the project boundary

As stated in the ACM0002, renewable energy projects shall only account for the amount of CO_2 emissions from electricity generation derived from fossil fuelled power plants that are displaced due to the project activity. The following table summarizes the relevant sources of gases considered both for the baseline and the project activity.

Table B.1. Emission Sources

	Source	Gas	Included?	Justification/Explanation
Baseline	Grid Electricity Generation	CO_2	Yes	Main emission source
		CH_4	No	Not considered (as stated by the ACM0002 methodology)
		N_2O	No	Not considered (as stated by the ACM0002 methodology)
Project Activity	Wind Power Generation	CO_2	No	There are no CO_2 emissions generated from wind power projects
		CH_4	No	There are no CH_4 emissions generated from wind power projects
		N_2O	No	There are no N_2O emissions generated from wind power projects

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to ACM0002, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario consists of the electricity that would have been delivered to the grid in the absence of the proposed project activity, by:

a) Other plants currently in the grid, or
b) New additions to the system

Other plants in the grid: description of the NIS

Nicaragua's National Interconnected System (NIS) relies heavily on fossil-fuel technology. In 2006, 57% of the grid's effective capacity depended directly on the combustion of either fuel oil or diesel. Moreover, 73% of the NIS generation was provided by thermal plants in the same year. In contrast, the shares for renewable energy were significantly smaller: only 11% for hydro, 10% for geothermal and 7% for cane bagasse. This is shown in Table B.2 below:

Table B.2 – Nicaraguan Grid Composition
National Interconnected System (NIS) Overall Capacity and generation (2006)

Technology type	Nominal Cap.		Effective Cap.		Net Generation	
	MW	%	MW	%	GWh	%
Hydroelectric	104.40	14%	100.00	18%	299.25	11%
Thermal (Fuel Oil + Diesel)	432.50	58%	313.35	57%	2,058.13	73%
Geothermal	87.50	12%	39.83	7%	276.98	10%
Cane bagasse	126.80	17%	100.30	18%	194.35	7%
Total	751.20	100%	553.48	100%	2,828.71	100%

Source: INE

The proposed project is expected to affect this generation mix mainly by displacing those power plants that have higher marginal costs, i.e. fossil fuelled thermal plants. Therefore, if the proposed project activity never took place, the generation mix presented in the table above would continue to prevail.

Future and recent additions to the NIS

Together with those plants which are already a part of the grid, future additions to the latter are also prone to be affected by the proposed project activity. This is due to the project's impact on supply. By raising the amount of power available, the project dampens the price signals that motivate new investments.

Though regulated, generation and distribution in Nicaragua are both decentralized markets. Despite government guidelines for the expansion of the grid –e.g the periodic reports by the National Energy Commission- investments on this sector usually come from private actors who are free to choose the projects they want to develop according to their own perception of the market. In addition, public investment in the sector has increased in order to alleviate the energy crisis that the country is facing.

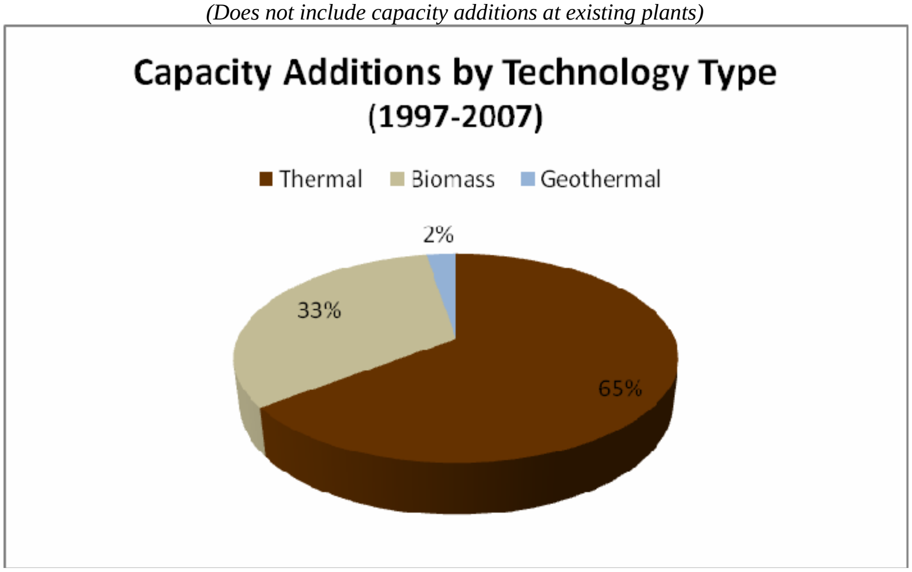
In order to have an idea of the technology that is likely to be considered by these actors for future additions, their most recent additions are observed. The latest private power plants entering the grid have been geothermal ("San Jacinto Tizate", registered as a CDM project), thermal ("Corinto" and "Tipitapa") and biomass ("Monte Rosa" and "NSEL", the former of which is a CDM project). Public investments, on the other hand, have been exclusively thermal (namely, the "Hugo Chavez" plants, which provide 60 MW and run on diesel engines). Table B.3 presents a list of the most recently built plants, by type of technology and origin of the funds.

Table B.3 – Most recently built power plants in the NIS (1997-2007)
(Does not include capacity additions at existing plants)

Plant Name	Technology	Public/Private	Year of entrance	Capacity (MW)
Hugo Chavez (GECSA)	Thermal	Public	2007	60
Polaris Energy Nicaragua	Geothermal (CDM)	Private	2005	10
Monte Rosa	Biomass (CDM)	Private	2002	68
Emp. Energética de Corinto	Thermal	Private	2000	74
Tipitata Power Co	Thermal	Private	1999	52
NSEL	Biomass	Private	1998	59
CENSA – Amfels	Thermal	Private	1997	64
			Total	**387**

Source: INE

Figure B.1 – Most recently built power plants in the NIS (1997-2007)
(Does not include capacity additions at existing plants)



Source: INE

The tables above show that thermal is both the prevalent technology in the country *and* the most common choice when it comes to new additions, and such is the baseline situation in which the project is expected to take place. A quantitative estimate of these two aspects of the current scenario is presented in section B.6, where the baseline emission factor is calculated.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

To demonstrate that the proposed project activity is not a part of the above mentioned baseline scenario (i.e. to demonstrate that the project is additional), the "Tool for the demonstration and assessment of additionality" (version 05) was used. Although construction works at the project site begun on December 2007, the project participants have documented evidence to show that the CDM incentives are considered critical for the economic desirability of the proposed project and the corresponding decision to carry on with the latter. As stated on a meeting held by the board of directors of Consorcio Eólico Amayo on august 16th, 2007:

"The President (of the Board of Directors) *indicated that the purpose of the meeting was (...) to authorize the officers to commercialize, and to locate a party to assist in the registration and commercialization of the carbon credits,* ***which are critical to the financial viability of the company's 40 MW wind project in Rivas*** *(the 'Project'). Upon motion duly proposed, seconded and unanimously approved, it was resolved (...),* ***given the importance of the Carbon Credits to the economic viability of the Project****, to direct and authorize the officers of Amayo to secure a contract with a reputable firm on behalf of Amayo to assist with the registration and commercialization of the Project's Carbon Credits.*[4]*"*

The additionality tool consists of a series of steps, as stated below:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

This step presents realistic and credible alternatives to the project activity. These alternatives can be part of the baseline scenario described in Section B.4.

Sub-step 1a. Define alternatives to the project activity:

The output of the project activity consists of electricity that will be delivered to the Nicaraguan grid from a renewable, zero-emission source. The project was awarded the power purchase agreement after winning a renewable energy bid solicitation conducted by Union Fenosa affiliates, Dissur and Disnorte in the summer of July 2006. The utility also selected a hydroelectric project from the same solicitation. Valid alternative scenarios are mainly:

1. The proposed project activity undertaken without being registered as a CDM project activity;
2. Continuation of the current situation, i.e. no project activity undertaken.

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[4] Extracted from the *Minutes of the Meeting of the Board of Directors of Consorcio Eólico Amayo, S.A* (held on August 16th, 2007, at 11 a.m in the City of Houston, Texas). These minutes are available upon request by the DOE.

Sub-step 1b. Consistency with mandatory laws and regulations:

Regulatory framework relevant for the proposed project involves the following set of norms:

- Ley No. 217: Ley General del Medio Ambiente y los Recursos Naturales ("General Law for the Environment and Natural Resources").
- Decreto No. 78 (2002): Pautas y Criterios para el Ordenamiento Territorial ("Guidelines and Criteria for Territorial Organization").
- Decreto No. 45 (1994): Reglamento de Permiso y Evaluación de Impacto Ambiental ("Regulation for Environmental Impact Assessments and Permits").
- Ley No. 272 (1998): Ley de la Industria Eléctrica y Decreto No. 42 (1998): Reglamento a la Ley de la Industria Eléctrica ("Law of the Electricity Industry and its Regulatory decree").
- Ley No. 467 (2003): Ley de Promoción al Sub-sector Hidroeléctrico ("Law For The Promotion Of The Hydroelectric Sub-Sector").
- Ley No. 531 (2005): Ley de Reforma a la Ley No. 467 de Promoción al Sub-sector Hidroeléctrico ("Reforms to the Law for the Promotion of the Hydroelectric Sub-Sector").
- Ley No. 532 (2005): Ley para la Promoción de Generación Eléctrica con Fuentes Renovables ("Law for the Promotion of Power Generation from Renewable Sources").

The first alternative complies with all of these laws and regulations; the second alternative consists of no project activity and therefore no regulatory framework is applicable.

Step 2. Investment analysis

The purpose of this step is to show that the proposed project activity is economically and financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method

The project activity generates incomes other than CDM related income, so a straight forward cost analysis cannot be applied. Instead, benchmark analysis (Option III) will be used.

Sub-step 2b. Option III: Benchmark analysis

The Internal Rate of Return (IRR) is one of the most widely accepted financial indicators for project evaluation. As stated in the tool for the demonstration and assessment of additionality, and considering there is not just one potential developer for this type of project, the project IRR was used[5].

The most plausible benchmark to compare the project IRR has been derived from government bond rates (MHCP Bonds[6]), presented below:

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[5] Project IRRs calculate a return based on project cash flows only, irrespective the source of financing.

[6] In Spanish, "Bonos del Ministerio de Hacienda y Credito Público - MHCP". The presented rates correspond to the August-November 2007 auctions. The official, more detailed document from the auction is available upon request.

Table B.4 – Government Bond Rates

Maturity (years)	Amount (million dollars)	IRR (%)
3	1.04	11.53
3	0.5	11.23
3	0.3	11.33
3	0.27	11.28
Weighted average		11.40

Source: Nicaragua's Central Bank (www.bcn.gob.ni)

This average rate is adjusted by a suitable risk premium to reflect the project type. This premium is usually no less than[7] 4%. Therefore, the benchmark rate is 11.40% + 4% = 15.40%.

Sub-step 2c. Calculation and comparison of financial indicators

The project's cash flow analysis developed by Consorcio Eólico Amayo personnel is based on confidential information and its details have only been made available to the DOE[8].

The cash flow is based upon the following assumptions:

- The Amayo Wind Power Project will provide an annual generation of 169,512.20 MWh
- Project life: 28.5 years (the turbine life certified by Gemaniche Lloyd).
- Terminal value of project: 0%
- When considering CDM revenues, validation and verification costs was not included (this is conservative).
- According to Annex 3 of the 22nd Executive Board Report "*Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios* – Version 2", the baseline scenario should refer to a hypothetical situation without any national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies. In the specific case of Nicaragua, the relevant law is the "Law for the Promotion of Power Generation from

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[7] This 4% assumption is a very conservative one since (a) the project activity is much riskier than the alternative of purchasing government bonds and (b) the bonds have a three year maturity, while the Amayo Wind Farm encompasses a considerably larger period (over 28 years).

[8] The model presented to the DOE is the same version of the model used by the project participants to evaluate the financial and economical viability of the project. A simplified version was also made available to the DOE; however, both versions (full and summarised) lead to the exact same results.

Renewable Sources" (Law Number 532)[9]. Therefore, all the incentives established by this law are excluded from the calculations[10].

- CER price is assumed to be at 16 US$/t$CO_2$ for the whole project period.

The IRR analysis outcome is presented in Table B.5 below.

Table B.5 – Benchmark Analysis Results

Without CDM Revenue	No Fiscal Incentives	11.72%
	With Fiscal Incentives	14.30%
With CDM Revenue	No Fiscal Incentives	13.55%
	With Fiscal Incentives	16.75%
Benchmark rate		**15.40%**

The investment analysis clearly shows that the proposed project's IRR falls below the benchmark rate in every case except when both fiscal incentives *and* CDM revenues are considered. This demonstrates that the Amayo Wind Power Project cannot be considered a financially attractive option without the additional revenue provided by the Clean Development Mechanism, i.e. that the project is additional to the baseline scenario.

Sub-step 2d. Sensitivity analysis

The following project variables where identified as uncertain factors and therefore eligible for a sensitivity analysis[11]:

- *Project output:* Wind projects are subject to unforeseen variability in wind flows –mostly, speed and direction-, which may affect the project's power generation. However, the winds flows on the site have been measured over a seven year period, which reduces the risk of unforeseen variability. In its wind study report for the project site, the independent firm Braselco concludes that "the favorable wind conditions observed in the region where the Amayo Wind Farm will be implemented made it clear that the wind presents characteristics similar to those of *trade winds* (macroscale) and *lake breezes* (mesoscale). The simplicity of these two mechanisms of wind formation ensures inter-annual regimes of considerable regularity". Therefore, only ±5% of variability was considered for this variable.

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[9] This is only true for regulations and policies that have been implemented since the adoption of the Kyoto Protocol by the host country. The government of Nicaragua ratified the Kyoto Protocol on November 1999, while the national law established to promote the diffusion of renewable energy (Law Number 532) in this country is dated May 2005. On page 8 of this PDD a list of all the relevant regulations is provided.

[10] Law number 532 establishes fiscal incentives (namely, a seven year income tax holiday and reductions in municipal taxes). It also establishes exemptions on all import taxes and tariffs, but these are not relevant for the project since the kind of capital goods that will be imported during the investment phase have a 0% tax in Central America.

[11] Electricity price is not considered a risky variable since it is clearly determined in the PPAs.

- *Contingent costs:* A ±10% variation in contingent costs during the construction phase is a reasonable range for this variable.

- *O&M costs:* A ±10% margin is assumed for this variable during the risk analysis.

Tables B.6.a and B.6.b below present the results from the sensitivity analysis. The first table refers to the hypothetic scenario with no fiscal incentives; the second one leaves this assumption behind. Figures B.6.a and B.6.b illustrate.

Table B.6.a – Sensitivity evaluation results (No fiscal incentives scenario)

Risk Variable	No Fiscal Incentives		
	Good Scenario	Base Scenario	Bad Scenario
Project Generation (± 5%)	12.42%	11.72%	11.02%
Contingent Costs (±10%)	11.79%	11.72%	11.66%
O&M Costs (±10%)	11.91%	11.72%	11.53%

Figure B.2.a – Sensitivity analysis results

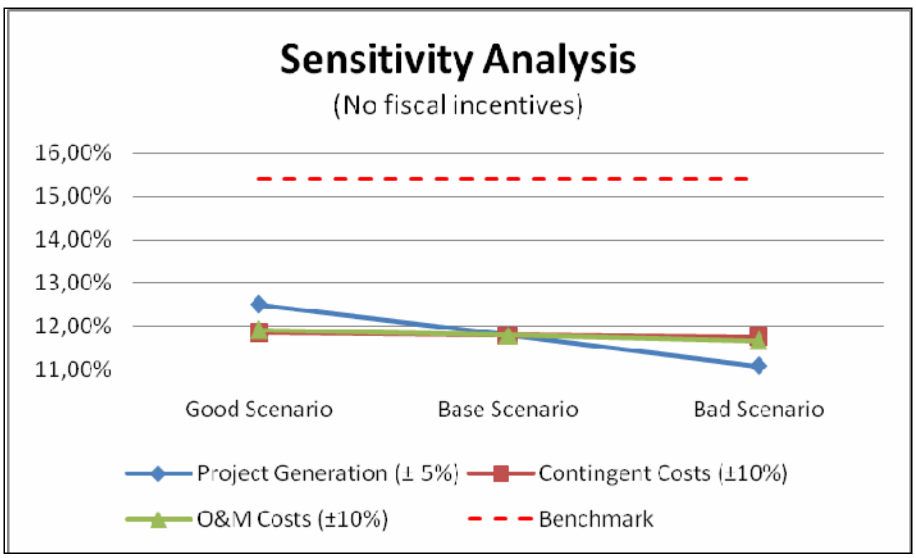
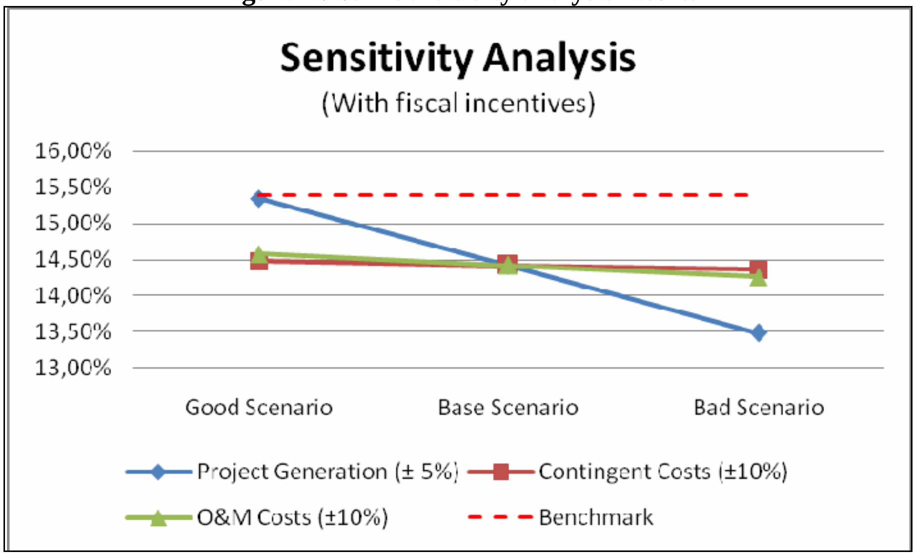


Table B.6.b – Sensitivity evaluation results (considering fiscal incentives)

Risk Variable	With Fiscal Incentives		
	Good Scenario	Base Scenario	Bad Scenario
Project Generation (± 5%)	15.21%	14.30%	13.37%
Contingent Costs (±10%)	14.38%	14.30%	14.21%
O&M Costs (±10%)	14.52%	14.30%	14.07%

It is clear from the above figures that the benchmark IRR is still above the project's expected return, even after considering a reasonable range of variations in the critical assumptions. These results provide a valid argument in favour of the project's additionality since they consistently support the conclusion that the project activity is unlikely to be financially attractive, unless CDM revenues are taken into account.

Figure B.2.b – Sensitivity analysis results



Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

In a broad sense, Nicaragua is still going through an early stage in the development of power generation from renewable sources in general and wind projects in particular. Recent studies[12] show that Nicaragua has an estimated wind-power potential of over 700MW which could eventually reach over 2000MW capacity if the corresponding transmission lines are duly expanded. However, the Amayo Wind Power Project is the very first wind farm in Nicaragua and therefore no similar activities are currently taking place in the country.

The most common renewable sources in the country are hydro, biomass and geothermal. Table B.7 shows all renewable sources in the country:

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[12] See for example "Nicaragua's Wind Map Project" available at http://www.encocentam.com/page.asp?DH=28

Table B.7 – Renewable sources in Nicaragua (year 2006)

Type of renewable source	Plant Name	Capacity (MW)	% of total grid capacity	Private / Public?
Thermal (biomass) (17%)	Nicaragua Sugar Estate Ltd (NSEL)	59.3	8%	Private
	Monte Rosa	67.5	9%	Private
Hydro (14%)	Centroamérica (HIDROGESA)	50	7%	Public
	Santa Bárbara (HIDROGESA)	54.4	7%	Public
Geothermal (12%)	Ormat Momotombo Power Company	77.5	10%	Private
	Polaris Energy Nicaragua (PENSA)	10	2%	Private

Source: INE

None of these plants are similar to the proposed project activity. Hydro technology plants are all public enterprises not comparable to the Amayo Wind Farm since the latter is a private undertaking and as such is subject to greater profitability requirements. Similarly, the only geothermal plant and one of the biomass projects (Monte Rosa) have been registered as CDM projects[13]. Lastly, the NSEL plant is also not comparable to the proposed project since the former is a sugar mill which does not depend solely on the revenues generated by its energy sales to the grid.

Sub-step 4b. Discuss any similar options that are occurring:

This section does not apply to the proposed project activity since -as argued in the previous sub-step- there are no similar activities occurring at the moment in Nicaragua.

Thus, the additionality argument for the Amayo Wind Farm concludes it has satisfied all of the steps of the relevant methodological tool.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As stated by the "Tool to calculate the emission factor for an electricity system", the baseline emission factor consists of a weighted average between an *operating margin* (OM) and a *build margin* (BM). The operating margin captures the project's effect on the operation of the power plants that are already part of the grid. This impact occurs because once the new project enters the system, the latter's operator has to adjust the output of the other plants in response to the generation of the new project. This adjustment consists mostly in *reducing* the output of those plants with high marginal costs, mainly, thermal plants based on fossil fuel combustion.

On the other hand, the build margin attempts to capture the project's effect on the construction of new power plants. This accounts for the fact that by increasing generation, a project will increase

[13] As stated by the tool for the demonstration and assessment of additionality, CDM projects are not to be included in this analysis.

reserve margins (relevant in centrally planned systems) and dampen price signals (that motivate new investments in free markets), which in turn implies that even a small project is likely to delay - if not directly displace - the commissioning of a new generation source.

These two effects on the baseline scenario are captured by the *combined margin emission factor* (CM). First, the system operating margin is approximated by the generation-weighted average of every plant's emission factor, excluding low marginal cost/must-run resources[14] on the grounds that the operation of these plants would be unaffected by the additional electricity generated by the proposed project activity. Second, the grid's build margin is approximated by observing the most recent additions to the system, since it is expected that this mix of plants reasonably captures recent trends in the electric sector expansion. The grid's build margin emission rate is estimated as the weighted average emission rate for the identified mix of recent plants[15].

Finally, the *combined* margin emission factor is calculated as the weighted average between the operating and the build margin emission rates. This way, in a hypothetical situation where the national grid consisted mostly of fossil fuel plants, but where recent additions are based on less polluting technologies, the operating margin's effect on the combined emission factor would be attenuated by a lower build margin. The opposite result would occur in a situation where renewable sources are the main components of the grid but with thermal plants becoming increasingly frequent amongst recent additions.

In the specific case of this project, the OM and the BM estimates were computed using the relevant time series from the *INE*[16] (Instituto Nicaragüense de Energía – Nicaraguan Energy Institute) -for the most recent years for which information was available. Also, *IPCC's Guidelines* (2006) and the "*Annual Energy Outlook*[17]" (2007) were used to supplement the data provided by INE.

According to the methodology, project participants do not need to consider leakage (i.e. emissions arising due to activities such as power plant construction). Therefore, the combined margin emissions factor, together with the project's projected output, will suffice to estimate the number of GHG emissions that will be displaced by the project.

The OM emission factor is determined according to Step 2; option "a" (simple OM) from the "Tool to calculate the emission factor for an electricity system". This choice is justified since low-cost/must run resources constitute less than 50% of the total generation mix in Nicaragua[18]. Information on the 3 most recent years for which data is available was collected to perform calculations (*ex-ante* vintage) according to the formulas provided in the methodology. The OM emission factor for each year *y* (hereafter, $EF_{OM,y}$) is calculated as follows:

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[14] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

[15] The set of "recent plants" usually consists of the last five power stations to enter the grid, unless this set is not significant enough relative to the existent plants. In this case the methodology indicates that further plants must be included in the estimation of the build margin.

[16] This data is publicly available at http://www.ine.gob.ni/PagElctric.html

[17] Energy Information Administration (EIA) – Official Energy Statistics from the US government (www.eia.doe.gov).

[18] The last five years composition is presented on Annex 3.

(1) $$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot NCV_i \cdot EF_i}{\sum_{j} GEN_{j,y}}$$

$F_{i,j,y}$ is the amount of fuel *i* (in thousand gals) consumed by power source *j* in year *y*; *"j"* refers to the power sources delivering electricity to the grid (not including low-operating cost and must-run power plants); *NCVi* is the net calorific value (energy content) per volume unit of fuel *i* (MMBtu/10^3 gals); EF_i is fuel *i*´s carbon dioxide content (tCO_2/MMBtu), and $GEN_{j,y}$ is the electricity (in MWh) delivered to the grid by source *j*.

The BM emission factor calculation follows the indications on Step 4 of the "Tool to calculate the emission factor of an electricity system". The sample group of the "*m*" most recent additions –which will be used to estimate the BM - is obtained from table B.8, which presents the latest power units added to the grid.

The group "*m*" consists of either the (i) five most recently–built power *units* or (ii) the capacity additions to the electricity system that comprises 20% of the system generation and that have been built most recently. The alternative which comprises the largest annual generation[19] must be chosen.

In our case, the set "*m*" is defined as follows:

Table B.8 – Nicaragua's recent capacity additions to the grid
(Most recent *units* to enter the NIS – set "m" of power units)

Unit	Technology	Starting Year
NSEL U2 and U3	Biomass	2004
Momotombo U3	Geothermal	2002
CENSA - Mak units	Thermal	2000
ENRON Corinto (*)	Thermal	2000
Tipitapa	Thermal	1999

Source: INE

(*) The entire plant is considered since its corresponding units cannot run independently from one other.

The BM emission factor for each year *y* is obtained according to the following expression:

(2) $$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot NCV_i \cdot EF_i}{\sum_{m} GEN_{m,y}}$$

$F_{i,m,y}$, NCV_i , EF_i and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above.

[19] As stated in the Methodological tool "Tool to calculate de emission factor for an electricity system" Version 01 (pag.13)

Once the EF_{OM} and EF_{BM} are estimated, the combined margin emission factor (EF_{CM}) is obtained according to the following expression:

(3) $$EF_{CM} = \omega_{OM} \cdot EF_{OM} + \omega_{BM} \cdot EF_{BM} \ , \quad \text{with} \quad \omega_{OM} + \omega_{BM} = 1$$

The weights used throughout the first crediting period are the default for wind projects: $\omega_{BM} = 0{,}25$ for the BM and $\omega_{OM} = 0{,}75$ for the OM, as stated by the ”Tool to calculate the emission factor for an electricity system”.

According to the ACM0002, the baseline emissions are calculated as follows:

(4) $$BE_y = EF_{CM} * GEN_y \ ,$$

where GEN_y is the electricity generated by the proposed CDM Project in year y supplied to the Grid (in MWh).

A project’s emission reduction for any year *y* is calculated as the difference between baseline and project’s emissions, the latter of which includes any leakage attributable to the project. As stated earlier, there are no project emissions or leakage attributable to wind projects. Thus, emissions reductions for the Amayo Wind Farm are the estimated emissions of the baseline scenario (equation (4) above).

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**NCV_i**
Data unit:	$MMBtu/10^3$ gals
Description:	Net calorific value (energy content) per volume unit of fuel i
Source of data used:	Energy Information Administration (EIA) – “Annual Energy Outlook 2007” Appendix G: (available at www.eia.doe.gov/oiaf/archive/aeo07/index.html).
Value applied:	Fuel Oil: 149.690 Diesel: 138.071
Justification of the choice of data or description of measurement methods and procedures actually applied :	No other data is publicly available. EIA values have been used since they do not require previous conversion from volume to mass units.
Any comment:	

Data / Parameter:	***EF_i***
Data unit:	$tCO_2/MMBtu$
Description:	CO_2 emission factor

Source of data used:	IPCC default values at the lower limit if the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National Greenhouse Gas Inventories.
Value applied:	Fuel Oil: 0.0796522 Original value: 75.5 tCO_2/TJ (TJ = 947.87 MMBtu) Diesel: 0.0765928 Original value: 72.6 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	No other data is publicly available. IPCC guidelines have been used in a conservative manner.
Any comment:	Conversion from TJ to MMBtu was made with the following equivalency: 1 TJ = 947.87 MMBtu/TJ (from www.unit-converter.org)

Data / Parameter:	***$F_{i,j,y}$ ($F_{i,m,y}$)***
Data unit:	Thousand gals
Description:	Amount of each fossil fuel consumed by each power plant/unit
Source of data used:	INE - Instituto Nicaragüense de Electricidad (Nicaraguan Electricity Institute)
Value applied:	Data for the 2004-2006 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	A summary of this data is publicly available at http://www.ine.gob.ni/ (see "Electricidad" at the menu on the website).

Data / Parameter:	***$GEN_{j,y}$ ($GEN_{m,y}$)***
Data unit:	MWh
Description:	Annual electricity generation of each power plant in the grid
Source of data used:	INE - Instituto Nicaragüense de Electricidad (Nicaraguan Electricity Institute)
Value applied:	Data for the 2004-2006 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	A summary of this data is publicly available at http://www.ine.gob.ni/ (see "Electricidad" at the menu on the website).

Data / Parameter:	***Plant name***
Data unit:	Text

Description:	Identification of power sources for the OM (all the plants in the grid)
Source of data used:	INE- Instituto Nicaragüense de Electricidad (Nicaraguan Electricity Institute)
Value applied:	Data for the 2004-2006 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	This data is publicly available at http://www.ine.gob.ni/

Data / Parameter:	***Plant name***
Data unit:	Text
Description:	Identification of power sources for the BM (recent additions to the grid)
Source of data used:	INE- Instituto Nicaragüense de Electricidad (Nicaraguan Electricity Institute)
Value applied:	Table B.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	This data is publicly available at http://www.ine.gob.ni/

B.6.3 Ex-ante calculation of emission reductions:

Expressions (1) to (4) are used to estimate the number of emissions displaced by the proposed project's activity. Tables B.9 and B.10 present the NIS's fuel consumption[20] ($F_{i,j,y}$.) as well as the energy generated by each plant in the last 3 years ($GEN_{m,y}$ and $GEN_{j,y}$). Both tables are based on information provided in Annex 3. With this information we are able to estimate EF_{OM} according to formula (1) for each year in the period. The generation weighted average of the values obtained from this calculation is $EF_{OM} = 0.7996\ tCO_2/MWh$.

[20] In Nicaragua, fuel Oil and diesel Oil are the only fuels used for electricity generation.

Table B.9 - National grid fossil fuel consumption by type and tCO2 emissions (2004-2006)

Fuel Type	Volume (10^3 gals)			Coef	tCO_2		
	2004	2005	2006	($tCO_2/10^3$ gals)	2004	2005	2006
Fuel Oil	133,465	124,672	136,273	11.9232	1,591,330	1,486,489	1,624,810
Diesel	2,362	2,136	5,123	10.5753	24,979	22,589	54,177
				Total	**4,804,374**		

Source: Authors estimations based on data by INE, -EIA and the IPCC guidelines (2006)

Table B.10 – Net Generation by fuel type (including imports) – (2004 – 2006)

Fuel Type	Net Generation (MWh)		
	2004	2005	2006
Fuel Oil	1,954,870	1,842,160	1,988,996
Diesel	25,990	25,340	69,128
Imports	23,310	25,160	53,319
	6,008,273 MWh		

Source: INE

The BM emission factor is obtained in a similar way, except that the set *m* (table B.3) is used instead of the set *j*. Table B.11 displays the fuel consumption in plants *m* and table B.12 shows its overall power generation for the same years.

Table B.11 – Recent additions to grid, fossil fuel consumption by type and tCO2 emissions (2006)

Unit	Fuel Type	Measure Unit	Consumption	Coef ($tCO_2/10^3$ tonnes)	tCO_2
NSEL U2 and U3	Biomass	Metric tons	388,281		0
Momotombo U3	Geothermal	10^3 M^3	9,240		0
CENSA - Mak units	Thermal	10^3 gls	7,638	11.9232	91,070
ENRON Corinto	Thermal	10^3 gls	31,744	11.9232	378,493
Tipitapa	Thermal	10^3 gls	25,597	11.9232	305,201
				TOTAL	**774,764**

Source: Authors estimations based on data by INE, EIA and the IPCC guidelines (2006)

Table B.12 – Recent additions to grid, net generation (2006)

Unit Name	Technology	Starting Year	Net Generation (MWh)
NSEL U2 and U3	Biomass	2004	65,187
Momotombo U3	Geothermal	2002	47,105
CENSA - Mak units	Thermal	2000	97,415
ENRON Corinto	Thermal	2000	528,403
Tipitapa	Thermal	1999	420,184
		Total	**1,158,294**

Source: INE

Formula (3) is applied using the above information; the result is $EF_{BM} = 0.6689$. Now we can estimate the CM Emission Factor (EF_{CM}) and the number of GHG emissions reduced by the project. These results are summarized in the following section.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Table B.13 – Summary of the ex-ante estimation of emission reductions

Parameter	2008 (20%)	2009	2010	2011	2012	2013	2014	2015 (80%)
OM weight	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
BM weight	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
CM (tCO2 / MWh)	0.7669	0.7669	0.7669	0.7669	0.7669	0.7669	0.7669	0.7669
Project generation (MWh)	33,902	169,512	169,512	169,512	169,512	169,512	169,512	135,611
Emissions reduced	26,000	129,999	129,999	129,999	129,999	129,999	129,999	104,000

B.7 Application of the monitoring methodology and description of the monitoring plan:

Data / Parameter:	***EG_y***
Data unit:	MWh
Description:	Electricity supplied to the grid by the project
Source of data to be used:	On-site metering system (same data submitted to INE / SIN)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	169,512 MWh
Description of measurement methods and procedures to be applied:	Data will be measured on site on an hourly basis. Monthly records will be kept by the system operator (CNDC).
QA/QC procedures to be applied:	Meter should have a maximum error of ±0.2% and be calibrated periodically according to local standards for electricity transactions in the SIN. Data can be double checked by receipt of sales to the grid.
Any comment:	

B.7.2 Description of the monitoring plan:

Since the Amayo Project Participants have chosen to use *ex-ante* emission factors, there is no need to recalculate each of the latter during the crediting period. Thus, the main variable that requires monitoring is the electricity generation from the proposed project activity.

Suzlon wind turbines are bundled with specific software and hardware for data monitoring. The SC-Turbine software provides control for each single wind turbine, allowing for all process data to be monitored. Among the variables registered are rotation speed, wind conditions, component temperatures, electrical data and also production and operation hours. All historical and statistical data are stored on the controller flash memory, with 7 day storage capacity. A wind park server can download this data automatically to the wind park database as necessary. All this information data will be provided by SC-Turbine to the SC-Commander software, with which it is possible to read the data and create reports and statistics easily.

The project developer will implement a management structure where monitoring responsibilities will be explicitly defined. The O&M department's will be responsible for ERs monitoring, record keeping and the implementation of proper QA procedures. All the information from this department will be consistent and easily verifiable with all the relevant data from other departments in case an external audit should require it.

All O&M procedures will be adapted to include the carbon monitoring component and the adequate accounting of the emission reductions.
The person in charge of the carbon credits monitoring will report to the O&M manager and will receive training in accordance with the owners training procedures. This individual area will be in charge of the following activities:

- Calculation and record keeping of the emissions reduced by the project activity, according to the general guidelines described in the monitoring plan.
- Managing all the validation, registration and certification process of the project's GHG emission reduction.
- Coordination and management of the marketing of the CERs in the relevant carbon markets.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

This baseline and monitoring methodology application study was completed on 14/03/2008 by Martín Rodriguez Marat at Geoingeniería Ingenieros Consultores S.A., San José - Costa Rica.

- Phone: + (506) 2231 0167 / Fax: + (506) 2290 5297
- E-mail: info@geoingenieria.co.cr

The entity above is not considered a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

Construction at the project site began on 14/12/2007. Commercial operations are expected to start in 01/10/2008.

C.1.2. Expected operational lifetime of the project activity:

This project has an estimated operational lifetime of 28.5 years. Further operation of the plant will demand significant new investments.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

08/10/2008 (or the project's date of registry)

C.2.1.2. Length of the first crediting period:

7 (seven years)

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Since a renewable period was chosen, this section is not applicable.

C.2.2.2. Length:

Since a renewable period was chosen, this section is not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

An environmental impact assessment (EIA) for the proposed project activity was conducted by the independent consultants Fiallos y Asociados between November 1998 and April 1999. The study was carried out by a multidisciplinary team upon request by ENISA and according to the regulations of the Nicaraguan DNA (Designated National Authority) MARENA (Ministerio del Ambiente y los Recursos Naturales, in English: Environment and Natural Resources Ministry). The following is the list of the areas covered in the study:

- Archaeology
- Characterization of the bodies of water
- Climate
- Geology
- Geo-technical exploration
- Noise study
- Socio-economics

- Soil study
- Vegetation and soil usage
- Forest fauna

The EIA concludes that the project is environmentally viable since the project's benefits (mainly its socioeconomic benefits to the people of Nicaragua) will compensate for its minor impact on the physical and biotic environment. Additionally, the EIA establishes an Environmental Management Plan to mitigate these impacts. Since the current environmental conditions are the same as those when the original study was carried out, MARENA has emitted an authorization to extend the validity of the EIA and the corresponding permits[21].

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The EIA considered two main impact areas: the *natural* environment and the *social* environment. In order to evaluate the Amayo Wind Farm's impact on each of these areas, the project was divided into three stages: implementation, operation and dismantling.

The environmental impact study concludes that bird species are the component that may suffer the greatest harm during all of the project stages. During the implementation phase, the most negative impact will be the project's visual effect on the landscape. On the other hand, the project will greatly benefit local employment, especially during construction and dismantling stages.

Actions to mitigate and correct environmental impacts

The following is a brief summary of the environmental action plan that will be implemented throughout the different stages of the proposed project in order to mitigate the latter's negative impacts while enhancing its positive ones. Among the main measures aimed at reducing the project's impact are the following:

- **Birds and Land Fauna:** In order to prevent to the greatest extent possible the collision of birds (specially migratory species), sonic deterrents will be placed in strategic places in order to repel birds from flying dangerously close to the turbine's blades. In addition to this, ornithological monitoring will be carried out during the periods of heaviest bird migration (March to May and September to November).

- **Landscape:** In order to minimize their impact on landscape, all the towers and their complementary elements meet international design standards. The installation of wind towers on lands of high ecological value will be avoided.

- **Soil:** During the project's construction and dismantling phases, it will be necessary to clear the sites where the generation towers will be installed. This will affect the soil by leaving it

[21] A summary of the EIA study, together with the original environmental permit and its renewal are available upon request by the DOE.

exposed to erosion due to water runoff. Therefore, once the above-mentioned stages are concluded, the uprooted vegetation will be replanted to prevent soil erosion. As for the provisory camping sites, the areas with non-perennial vegetation will be selected in order to prevent the falling of trees.

- **Air:** Water will be poured to the dirt roads surrounding the project area so as to prevent the suspension of dust particles in the air.

- **Superficial waters and aquatic fauna:** During the installation and dismantling stages of this kind of projects, inadequate disposals of lubricant wastes are likely to occur affecting the natural bodies of water they may reach. To prevent this, lubricant wastes will be stored in safe barrels, thus facilitating their final disposal.

- **Noise:** To prevent the influence of noise generated by the rotor blades, a minimum distance of 300 to 500 meters will be considered between the wind turbines and any households in the area.

- **Flora:** The wind field will be constructed in open areas so as to avoid damaging existing forest areas. Similarly, the project participants will promote reforestation as a complementary activity, along with a program to protect the natural flora of the project's site, thus conserving the area's existing bio-diversity.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholder presentation took place on Thursday May 29th, 2008, at 2:00 p.m. in the Nicarao Inn Hotel in the city of Rivas, Nicaragua.

The main objectives of this presentation were: (a) to inform the local stakeholders of the project activity and its characteristics as a CDM project; and (b) to gain insights on local concerns and opinions regarding the project activity.

Activities in preparation for the event are described below:
A preliminary research and selection for invitees was carried out by Consorcio Eólico Amayo S.A. (CEA). After the selection of the organizations and people, CEA delivered personalized invitation cards on site. The Project is located in the Municipality of Rivas, which is located in the Department of Rivas. The Municipality of Rivas has the local offices of the governmental institutions which were also invited.
The selected stakeholders were: the local government, including many of the governmental institutions, universities, schools, NGOs and neighbours from the Project's surroundings (which consist on landowners), and representatives of the local government from other communities of Rivas's Department.

Also CEA delivered personalized invitation cards to several institutions of the national government in the capitol of Managua.

CEA and the DNA also announced the stakeholder presentation in the most popular newspaper in Nicaragua: “La Prensa” on May 19th, 2008, more than one week before the event.[22] The DNA also announced that the PDD was available for public comments in ONDL’s website and in MARENA’s offices in Rivas since May 19th until May 26.

More than 35 participants attended the stakeholder presentation representing a total of around 16 organizations, institutions and communities, mostly located around the project site but also coming from the capital of Nicaragua, Managua.

Phases of the stakeholder presentation:
At the entrance of the conference room the registration process was carried on and a brochure with specific information from the Amayo project was handed out as well as a paper form in which the assistants could write their questions and/or comments related to the project.

The public consultation started with a Power Point presentation that explained the project’s features regarding its technology, construction, operation, mitigation measures and Clean Development Mechanism aspects.

After the presentation an open question round was held. A video of the entire stakeholder presentation is available and can be submitted upon request. A summary of the questions and comments can be found in section E.2.

E.2. Summary of the comments received:

No comments were submitted in the ONDL´s website during the week (May 19-26) established by the DNA for public comments.

At the end of the stakeholder presentation, some comments and questions were made by the participants. The main topics of these comments and questions are summarized below:

The participants had questions on how the project will benefit the local economy and how it is going to be integrated within the local government, municipalities, and communities, in general which is going to be the link between the project and the municipalities, so they can benefit from the project.

Other participants had questions on when the project is going to be operational and whether or not it is possible in the country to combine eolic energy with other renewable sources like geothermal and hydro. Others asked about the wind potential in Rivas. They asked if the project’s capacity could be expanded and the timing and location of the expansion. Another attendee person asked about the value of the CERs and how they were included in the financial analysis of the project.

A professor from a university in Rivas (Universidad Politécnica) wanted to know if they have information about the project to give to the students.

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[22] Respective copies of the announcements are available upon request.

At the end of each question, satisfactory and comprehensive answers were provided to all concerned.

Only positive comments were received by the participants, who highlighted the benefits of the project, such as taxes to be distributed among inhabitants, the positive impact in energy prices, which will in turn benefit the Nicaraguan people.

Another benefit they mentioned is that the use of a renewable resource will reduce the country's consumption of imported fuel oil by a specific amount of oil barrels, therefore improving the Nicaraguan current account and reducing the foreign currency expenditures that can be used internally around the Country.

No negative comments or concerns were received.

E.3. Report on how due account was taken of any comments received:

The Consorcio Eólico Amayo clarified all the stakeholder's concerns by providing relevant data and answered all question to the satisfaction of the participants. Detailed Minutes of meeting delineating the above questions and CEA's responses have been recorded and written down. These are available upon request.

The Consorcio Eólico Amayo also informed the stakeholders that the project activity would contribute to the sustainable development of the region and country by facilitating and catalyzing local and regional opportunities, thereby creating sustainable shareholder, economic, social and environmental value.

Finally, it's important to emphasize that the entire project complies with environmental laws and their respective requirements and most important that residents and the local government are all very supportive of the proposed project activities.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Consorcio Eolico Amayo S.A.
Street/P.O.Box:	Los Robles V etapa Edificio 26
Building:	26
City:	Managua
State/Region:	Managua
Postfix/ZIP:	NA
Country:	Managua
Telephone:	(505) 278-4044
FAX:	
E-Mail:	porter@arctas.com
URL:	
Represented by:	Sean Porter
Title:	Coordinating Manager
Salutation:	Mr.
Last Name:	Porter
Middle Name:	Raymond
First Name:	Sean
Department:	
Mobile:	505-438-3392
Direct FAX:	
Direct tel:	505-278-4044
Personal E-Mail:	porter@arctas.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

All the information on the project's funding is presented on section A.4.5.

Annex 3

BASELINE INFORMATION

Table A.1 – National Grid Fuel Consumption – 2004 to 2006

Plant Name	2004	2005	2006
Thermal (Fuel Oil - thousand gals)	**133464.66**	**124671.75**	**136273.13**
. Nicaragua (GEOSA)	40256.17	33536.96	43240.21
. Nicaragua	0	0	0
. Managua (GECSA)	18482.38	15311.28	16283.07
. Managua	0	0	0
. Censa - AMFELS	19795.32	20002.95	19381.3
. Empresa Energética de Corinto	29849.61	31348.35	31744.26
. Tipitapa Power Company	24640.7	24472.21	25597.28
. Generadora San Rafael, S.A. (Gesarsa)	440.47	0	0
. Nic.Sugar Estate Ltd. (NSEL)	0	0	27.01
Thermal + Gas Turbines (Diesel - thousand gals)	**186.36**	**68.31**	**102.58**
. Managua	0	0	0
. Empresa Energética Corinto	93.98	66.76	101.78
. Las Brisas	0	0	0
. Chinandega	0	1.55	0.8
. Generadora San Rafael, S.A.	92.38	0	0
Thermal – Biomass (thousands of cane bagasse)	**924.92**	**1010.79**	**950.94132**
. Nic.Sugar Estate Ltd. (NSEL)	494.36	585.44	563.41264
. Monte Rosa	430.56	425.35	387.52868
. Agroindustrial Azucarera S.A. (Timal)	0	0	0
Thermal – Wood (Metric tonnes)			
. Nic.Sugar Estate Ltd. (NSEL) - Leña	50670.4	25972.84	26746.42
. Monte Rosa, S.A. - Leña	1071.43	203.04	300.74
. Nic.Sugar Estate Ltd. (ISA) - Casc.Arroz	0	0	0
Hydro (millons m3 of water)	**582.11**	**801.6**	**558.93**
. Centroamérica (HIDROGESA)	337.95	392.29	319.77
. Santa Bárbara (HIDROGESA)	244.16	409.31	239.16
. Wabule	0	0	0
. Las Canoas	0	0	0
Gas turbines (Diesel Oil – thousand gals)	**2175.64**	**2068.12**	**5020.34**
. Chinandega (GEOSA)	97.08	67.27	110.68
. Las Brisas (GECSA)	2078.56	2000.85	4909.66
Geothermal (thousands of tonnes of steam)	**1758.34**	**1990.79**	**2532.61**
. Ormat Momotombo Power Company a/. Ormat Energy Converters (OEC)	1758.34	1699.74	1730.53
. Polaris Energy Nicaragua, S.A. (Pensa)	0	291.05	802.08
Total Fuel Oil GRID (miles de glns)	**337.95**	**392.29**	**4,997.52**
Total Diesel GRID (miles de glns)	**924.92**	**1,010.79**	**950.94**

Source: INE

Table A.2 – National Grid Generation – 2004 to 2006 (In Gwh)

POWER PLANTS	2004	2005	2006
Thermal Plants	**2082,79**	**2045,59**	**2183,35**
. Nicaragua (GEOSA)	505,28	419,68	546,15
. Managua (GECSA)	216,88	179,17	180,02
. Censa - Amfels	318,51	319,61	314,24
. Empresa Energética de Corinto, Ltda.	499,59	523,87	528,40
. Tipitapa Power Company	409,06	399,83	420,18
.Generadora San Rafael, S.A. (Gesarsa)	5,55	0	0,00
. Nic.Sugar Estate Ltd. (NSEL)	84,19	113,6	100,42
. Monte Rosa (CDM)	43,73	89,83	93,93
. Agroindustrial Azucarera S.A. (Timal)			
Hydro Plants	**311,41**	**426,25**	**299,25**
. Centroamérica (HIDROGESA)	194,59	230,25	184,88
. Santa Bárbara (HIDROGESA)	116,82	196	114,37
. Wabule			
. Las Canoas			
Gas turbines Plants	**25,99**	**25,34**	**69,13**
. Chinandega (GEOSA)	0,7	0,49	0,82
. Las Brisas (GECSA)	25,29	24,85	68,31
Geothermal Plants	**227,16**	**241,22**	**276,98**
. Ormat Momotombo Power Company a/	227,16	223,17	225,58
. Polaris Energy Nicaragua, S.A. (PENSA) (CDM)		18,05	51,39
National Interconnected System	**2647,35**	**2738,4**	**2828,71**

Source: INE

Table A.3 – Entrance year on each power unit of the NIS

Plant Name	Year of Entry	Number of generators	Type of facility	Fuel Type	Nominal capacity (MW)	Effective capacity (MW)
Hidrogesa					**100.8**	**94**
Planta Centroamericana	1965	2	Hydro	Water	50.4	48
Planta Santa Bárbara					50.4	46
GECSA					**199,22**	**149**
Planta Managua						*50.7*
Unit 3	1971	1	Thermal	Bunker C	46.92	40
Unit 4	1994	1	Thermal	Bunker C	6.28	5.4
Unit 5	1998	1	Thermal	Bunker C	6.28	5.3
Planta Las Brisas						*54*
Unit 1	1992	1	Thermal	Diesel (No.2 Oil)	30.94	20
Unit 2	1998	1	Thermal	Diesel (No.2 Oil)	48.80	34
Planta Hugo Chávez						*44.3*
Grupo 1	2007	8	Thermal	Diesel (No.2 Oil)	15.00	9.8
Grupo 2	2007	24	Thermal	Diesel (No.2 Oil)	45.00	34.5
GEOSA					**121.34**	**104.24**
Planta Nicaragua						
Unit 1 y Unit 2	1976 - 1977	2	Thermal	Bunker C	105.4	91.44
Planta Chinandega	1967	1	Thermal	Diesel (No.2 Oil)	15.94	12.8
GEMOSA					**76,415**	**31**
Planta Momotombo						
Unit 1 y Unit 2	1983 - 1989	2	Geothermal	Geothermal	70.04	
Planta OEC	2002	1	Geothermal	Geothermal	6,375	
PENSA					**10**	**7.2**
Planta San Jacinto (Polaris)	2005	2	Geothermal	Geothermal	10	7.20
CENSA - AMFELS					**63.6**	**31**
Caterpillar Units	1997	9	Thermal	Bunker C	36	
Mark Units	2000	4	Thermal	Bunker C	27.6	
Tipitapa Power Company					**57.8**	**50.9**
TPC-Coastal	1999	5	Thermal	Bunker C	57.8	
ENRON (Corinto)					**73.79**	**68.5**
EEC-ENRON	1999	3	Thermal	Bunker C	55.34	50
EEC ADIC - ENRON	2000	1	Thermal	Bunker C	18.45	18.5
NSEL-PSA					**59.3**	**30**
Mitsubishi 1	1999	1	Biomass	Cane Bagasse	19.3	
Mitsubishi 2	2004	1	Biomass	Cane Bagasse	20	
General Electric	2004	1	Biomass	Cane Bagasse	20	
MONTE ROSA					**64.4**	**30**
Unit 1	2004	1	Biomass	Cane Bagasse	16.4	
Unit 3		1	Biomass	Cane Bagasse	3	
Unit 4	1999	1	Biomass	Cane Bagasse	15	
Unit 5		1	Biomass	Cane Bagasse	5	
Unit 6		1	Biomass	Cane Bagasse	5	
Unit 7	2004	1	Biomass	Cane Bagasse	20	
					826.67	**595.84**

Source: INE

Annex 4

MONITORING INFORMATION

All relevant information on the project's monitoring programme is presented on section B.7.

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