CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

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SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

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Paso Ancho Hydroelectric Project
Version 1
1/3/2006

A.2. Description of the small-scale project activity:

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The Paso Ancho hydroelectric project (the "Project") is located in the south west region of Panama near the border of Costa Rica. The Project will utilize water from the Chiriqui Viejo River to generate renewable electricity starting in 2008. The Project consists of the construction, operation and maintenance of a hydroelectric power plant and ancillary facilities with an installed capacity of 5 MW and estimated cost of US$ 7.5 million. It will be composed of a concrete dam, 2 Francis-type turbines with installed capacity of 2.5 MW each, a new substation of 34.5 kV, and a transmission line of 3.5 km. The average annual water flow is 6.17 m^3/s. No relocation will be required due to the project.

The Project will contribute to the host nation's sustainable development in the following ways:

- Generate clean energy which will be supplied primarily to rural households.
- Through increased electricity in the Panama grid leading to a more stable supply, improve the quality of life of the affected households and increase productivity in the community.
- Through increased productivity, allow for greater economic growth in the communities.
- Create temporary and permanent jobs for the area.
- Strengthen the national and local economy by contributing with additional employment, electricity and taxes.
- Demonstrate replicable clean energy technology.
- Contribute to the reforestation of the surrounding areas. The developer has created a reforestation plan, given that the land has been deforested due to the plantations existing on the site.
- Reduce greenhouse gas (GHG) emissions by displacing thermal power plants that may have been built.

A.3. Project participants:

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Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be indicated using the following tabular format.		
Name of Party involved	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Panama (host)	Paso Ancho Hydro-Power Corp (Private entity)	No
United Kingdom	EcoSecurities Ltd. (CDM	No

	consultant)	

(*) 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.

Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.

EcoSecurities Ltd. is the official contact for the CDM project activity. Further contact information for the project participants are provided in Annex 1 of this document.

A.4. Technical description of the small-scale project activity:

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Paso Ancho Project

The Project utilizes run-of-river hydropower technology that will use water from the Chiriqui Viejo River, which has an average water flow between 4.23 m^3/s during the dry season (January to May) and 8.52 m^3/s during the rainy period (June to December), amounting in an average water flow of 6.17 m^3/s. The diversion dam will be constructed from concrete and is 5 meters high. Water will be conducted to the reservoir via a 410 m canal and a 654 m tunnel. A penstock that is 167.29 m long with a diameter of 2 m will carry water to the superficial power house. The net head is 79 m. The power house will be equipped with 2 Francis type turbines that are 2.5 MW each. The transmission voltage is 34.5 kva and the length of the interconnection line is 3.5 km.

Project data (Table 1)

Installed capacity	5 MW
Annual generation	35.04 GWh
Gross head	79.8 m
Net head	79 m
Design flow	7.17 m^3/sec
Number of units	2 Francis turbines
Diversion dam	5 m high, 18 m long, concrete
Channel	410 m

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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Panama

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

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Chiriqui Province

A.4.1.3. City/Town/Community etc:

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Volcan Community

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

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The Paso Ancho Project is located along the Chiriqui Viejo River in the District of Bugaba of the Chiriqui Province in the south west region of Panama. Near Costa Rica´s border, this new hydro plant will be located between the following UTM coordinates: 318750 – 320400 E, 973000 – 974800 N. The small hydroelectric generator will intake the water upstream at an elevation of 1462 m above sea level, area which is bordered by the community of Volcan and others. The site can be reached via the Panama international airport, Tocumen, which is approximately 25 minutes from Panama City. The closest local airport is E. Malek in David City, approximately one hour from the Project site.

A.4.2. Type and category(ies) and technology of the small-scale project activity:

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The category for the project activity according to the UNFCCC's published simplified procedures for small-scale activities is Type I.D. (AMS-I.D) – Renewable Electricity Generation for a Grid. The Project conforms to the project category since the nominal installed capacity of the Paso Ancho project is below the 15 MW threshold.

The Project will use two 2.5 MW Francis turbines; these are a standard type of turbine used throughout the world. Electricity generated will enter the Panama electricity grid. 80% of its generated electricity will be sold to Elektra Noreste, a private Panamanian energy distribution company, under a Power Purchase Agreement (PPA), and 20% will be sold on the spot market.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

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The Paso Ancho 5 MW hydropower will produce 35,040 MWh of electricity per year that will directly reduce GHG emissions by 24,878 tCO_2e/yr by replacing fossil fuel power generators that are currently in use in Panama. Under the business as usual scenario there would be continuing growth in thermal based electricity generation capacity and large-scale hydroelectric projects. Refer to Section B.3 for the description of why the emission reductions would not occur in the absence of Paso Ancho and Section E.1.2.4 for explanation of the emissions reductions.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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(Table 2)

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emissions reductions shall be indicated using the following tabular format.

For type (iii) small-scale projects the estimation of project emissions is also required.

Years	Annual estimation of emission reductions in tonnes of CO2e
Year 2008	24,878
Year 2009	24,878

Year 2010	24,878
Year 2011	24,878
Year 2012	24,878
Year 2013	24,878
Year 2014	24,878
*After the initial 7-year crediting period, the baseline will be reassessed, generating a new estimate of emissions reductions yet to be determined.	
Total estimated reductions (tonnes of CO2e)	174,146
Total number of crediting years	7 (renewable up to 21 years)
I. ANNUAL AVERAGE OVER THE CREDITING PERIOD OF ESTIMATED REDUCTIONS **(TONNES OF CO2E)**	24,878

A.4.4. Public funding of the small-scale project activity:

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This project has not received and is not seeking public funding.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

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Based on the information provided in Appendix C, this Project is not a debundled component of a larger project activity since the project participants have not registered or operated another project in the region surrounding the project boundary.

SECTION B. Application of a baseline methodology:

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

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Project Activity I.D. (AMS-I.D.), version 7, 28 November 2005 – "Renewable electricity generation for a grid" as outlined in Annex B of the simplified modalities and procedures for CDM small-scale project activities.

B.2 Project category applicable to the small-scale project activity:

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Appendix B of the simplified modalities and procedures for CDM small-scale project activities offers the following two choices for preparing the baseline calculation for this type of project activity:

(a) The average of the "approximate operating margin" and the "build margin"

OR

(b) The weighted average emissions (in kgCO2/kWh) of the current generation mix.

Option (a) is selected for this project because the majority of the most recent plants in the grid are fossil fuel run thermal plants. Although, along with the fossil fuel plants, the grid contains a number of hydroelectric power plants, the majority of the hydro plants were constructed many years ago; two of which were constructed in 1908. See section E.1.2.4 for emission reductions calculations.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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Market Situation:

59.4% of Panama's grid is composed of hydroelectric power plants and 40.6% of thermal power plants. The fuel composition used in the thermal plants in Panama is as follows: 41% diesel, 31% heavy fuel oil, and 28% bunker C fuel. The five most recently built plants are all large-scale projects: three thermal and two hydro[1]. Energy demand is expected to grow 4-5% yearly. In Panama, hydro has the potential of satisfying most of this demand, given that the country has the potential to produce 2,400 MW of hydroelectric power. However, only 833 MW, or 35% of the potential capacity, is currently installed[2].

ADDITIONALITY:

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities evidence to why the proposed project is additional is offered under the following categories of barriers: (a) investment barrier, (b) technological barrier, and (c) prevailing practice.

a) Investment Barrier:

Although the region of Central America historically had a large amount of hydropower, the entry of foreign investors and the privatization of energy markets has led to the development of numerous new thermal generation plants in the region[3]. This contributed to difficulties in sourcing financing for the Paso Ancho small-scale hydropower project.

Local banks and lending institutions in Panama historically have not issued long term debt to privately developed small-scale renewable energy projects. Moreover, the due diligence costs associated with international and multi-lateral lending institutions (such as CABEI, IFC, and IDB) is prohibitively high for small-scale renewable energy projects. To overcome these barriers, it was necessary for the project developers to acquire a loan from a Costa Rican bank, the Interfin Bank.

Additional equity was necessary from E+Co, an independent company that provides business development services and modest loans or equity investments for clean energy projects. Carbon credits and the CDM aspect of the Project, therefore, provided an additional income assurance for E+Co to finance the project and were an important component in the bank's investment decision (see Annex 4).

[1] Energy Policy Commission, Comision de Politica Energetica, 2003

[2] The Ministry of Economy and Finance, Republic of Panama, 2005

[3] Energy Information Administration, Regional Indicators: Central America. 2002.

When calculating the economics of its involvement in the project, E+Co included revenue from carbon credits; without the carbon credit revenue, the IRR for E+Co would not have been high enough for the company to invest in the project. Without this investment, the developers would not have been able to complete their equity contribution and financial closure of the project, which will be reached in March 2006, would probably not occur. Please see Annex 4 for a letter from E+Co confirming the necessity of the carbon credits for the company's investment in the project.

b) Technological Barrier:

As there is no prevailing practice of small-scale hydropower plants, but of thermal and large-scale hydroelectric plants, the availability of technical know-how and capacity to implement small-scale hydro projects in Panama is very limited. Of the five existing small-scale hydroelectric projects in Panama, two were built in the 1930s and one in the 1960s. With only 0.9% of installed capacity corresponding to small-scale hydro and with at least three of the five existent small-scale hydro projects being more than 35 years old, knowledge about the technology that will be used in the project is lacking.

c) Prevailing Practice:

The prevailing practice is large-scale hydroelectric power or thermal power plants. Small-scale projects are much less common in Panama than large-scale hydroelectric and thermal power plants, and they have a greater risk and longer payback time than large-scale hydro projects. Only five of the of the 13 hydropower plants in Panama's grid are small-scale, accounting for only 15 MW or less than 2% of 833 MW of hydro currently installed; this is only 0.9% of the capacity of the grid. Additionally, the existing small-scale hydroelectric projects were constructed many years ago.

Summary

The current and expected practice of predominantly relying on thermal sources and large-scale hydropower projects to expand the generation capacity, as well as the combination of lack of access to finance and perceived risks of the small-scale hydropower technology, clearly demonstrate that the Paso Ancho project is additional and therefore not the baseline scenario. The prohibitive barriers that exist in Panama are confirmed by the observed trend in recent capacity additions and the less than 2% share of small-scale hydropower in the total electricity generation in the country.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

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The project boundary is defined as the notional margin around a project within which the project's impact (in terms of carbon emission reductions) will be assessed. As referred to in Appendix B for small-scale project activities, the project boundary for a small-scale hydropower project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source.

The system boundary for the proposed project is defined as the national grid in Panama. The project boundary for the baseline will include all the direct emissions, being the emissions related to the electricity produced by the facilities and power plants to be replaced by the Paso Ancho project. This involves emissions from displaced fossil fuel use at power plants.

Conforming to the guidance and rules for small-scale project activities, the emissions related to production, transport and distribution of the fuel used for the power plants in the baseline are not included in the project boundary as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport are also excluded from the project boundary.

B.5. Details of the baseline and its development:

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As specified for project category Type I.D (AMS-I.D), the appropriate baseline is the average of the "approximate operating margin" and "build margin".

The baseline study was prepared on 1/3/2006 by:

EcoSecurities Ltd., Tel: +1 212 356 0160 (contact: Courtney Blodgett, Courtney@ecosecurities.com). EcoSecurities Ltd. is a project participant.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

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C.1.1. Starting date of the small-scale project activity:

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Construction will begin in March 2006.

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

50y-0m

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

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C.2.1. Renewable crediting period:

>>

Renewable crediting period (at most, 7 years per crediting period, renewable for up to 21 years)

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

>>

1/1/2008

C.2.1.2. Length of the first crediting period:

>>

7 years, 0 months

C.2.2. Fixed crediting period:

>>
N/A

C.2.2.1. Starting date:

>>
N/A

C.2.2.2. Length:

>>
N/A

SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

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According to Type I.D. "Renewable electricity generation for a grid" contained in Appendix B of the simplified M&P for CDM small-scale activities, version 7, monitoring shall consist of metering the electricity generated by the renewable technology (hydropower).

Metering the electricity generated will be conducted as described in the Simplified Procedures for SSC Projects for Type I.D. Projects.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

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The methodology was selected as suggested by the Simplified Monitoring Methodologies for small-scale CDM projects. Measuring and recording the amount of electricity supplied to the buyer is the most accurate method of monitoring the project.

D.3 Data to be monitored:

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ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is archived data kept
1	*Electricity Generation of the Project delivered to the Grid*	*PA*	*MWh*	*M*	*Continuous*	*100%*	*Electronic and paper*	*Crediting period plus 2 years*

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

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The electricity generated by the Project will be supplied to the Panamanian grid. To ensure accuracy, a metering instrument will be installed. The metering system will be acquired from a recognized experienced manufacturer that would provide installation and operating guarantee. This data will be directly used for calculation of emission reductions. Sales records to the grid and other records, e.g. maintenance and plant shut down records, are used to ensure consistency. Data obtained from the grid is considered trustworthy and no further quality assurance activities are necessary apart from ensuring data is correctly transposed and applied in the algorithms for calculation of baseline emission factors.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

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The operator will record the net generation of the Paso Ancho project at least monthly. This data shall be obtained from the metering system of the plant at the feed-in point to the grid. The meter used for this purpose must be an industrial quality sealed meter. The data must be cross-checked with the metering and billing information provided by the grid operator. Leakage will not be considered because the energy generating equipment will not be transferred from another activity. Management of the project will be carried out by Setecoop, a Costa Rican engineering company that has more than 17 years of experience. Setecoop has been involved in all phases of more than 30 hydro projects of less than 20 MW and more than 20 large projects throughout Central America and Colombia. The Project developers will contract a local company with many years of hydropower experience in Panama to carry out operation & generation monitoring.

D.6. Name of person/entity determining the monitoring methodology:

The monitoring methodology was prepared by:
EcoSecurities Ltd., CDM consultant, Tel: +1 212 356 0160 (contact: Courtney Blodgett, Courtney@ecosecurities.com and Eron Bloomgarden Eron@ecosecurities.com). EcoSecurities, Ltd. is a project participant.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

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The Paso Ancho project is based on electricity generation for a grid by small hydroelectric turbines. Appendix B does not currently provide a formula for calculating the baseline for a Type I.D. project. It gives the developer two options to choose in order to determine the total emissions avoided by the project; the emission calculation would be determined by the project developer.

E.1.2 Description of formulae when not provided in appendix B:

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E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

No formula is used. Emissions by sources are zero since hydroelectric power is a zero CO_2 emissions source of energy.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

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This is not applicable as the renewable energy technology used is not equipment transferred from another activity. Therefore, as per the Simplified Procedures for SSC Project Activities, no leakage calculation is required.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

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Zero emissions

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

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The baseline emissions reduction (BE_y) resulting from the electricity supplied to the grid is calculated as follows, where EG_y is the annual electricity generated from the Project and EF_y is the grid coefficient (Equation 1):

$$BE_y = EG_y * EF_y$$

For the Paso Ancho project:

$$BE_{1\text{-}7} = 35{,}040 \text{ MWh} * 0.71 \text{ } CO_2e/\text{MWh} = 24{,}878 \text{ } tCO_2e \text{ per year}$$

The baseline emissions factor is a weighted average of the EF_OM_y and EF_BM_y (Equation 2).

$$EF_y = (\omega_{OM} * EF\_OM_y) + (\omega_{BM} * EF\_BM_y)$$

Where,

EF_OM_y = calculated operating margin value factor (in tCO_2/MWh)
EF_BM_y = calculated build margin value factor (in tCO_2/MWh)
ω_{OM} = weight of the calculated operating margin, in this case ½ is adopted
ω_{BM} = weight of the calculated build margin, in this case ½ is adopted
$\omega_{OM} + \omega_{BM} = 1$

For the proposed project activity:

$EF_{1-7} = (0.50*0.8\ tCO_{2e}/MWh) + (0.50*0.61\ tCO_2e/MWh) = 0.71\ tCO_2e/MWh$

This section describes how the emission factor (EF_y) of the project activity calculated as a combined margin (CM) has been determined based on the instructions for calculating the emission factors of the operating margin (OM) and build margin (BM).

Operating Margin (OM)

The OM is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation sources. Low-operating cost and must run power plants include typically hydro, low cost biomass and geothermal. The OM is calculated as follows (Equation 3):

$$= \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

where
$F_{i,j,y}$ is the amount of fuel (mass or volume) *i* consumed by relevant power sources *i* in year(s) y,
j refers to the power sources delivering electricity to the grid not including low-operating cost and must run plants, including imports to the grid, $COEF_{i,j}$ is the CO_2 emission coefficient of fuel (tCO_2/mass or volume) taking into account the carbon content of the fuels used by the relevant power sources j and the percent oxidation of the fuel in year(s) *y*, and $GEN_{i,j}$ is the electricity (MWh) delivered to the grid by source j.

The CO_2 emission coefficient $COEF_i$ is obtained from the following equation (Equation 4):

$$COEF_i = NCV_i \cdot EF_{CO2} \cdot OXID_i$$

where
NCV_i is the net calorific value of the unit of fuel i,
$OXID_i$ is the CO_2 is the oxidation factor of the fuel,

EF_{CO2} is the CO_2 emission per unit of energy of the fuel i.[4]

For diesel fuel:
0.0433 TJ/tonne fuel * 20.2 tC/TJ * 44/12 tCO_2/tC * 99%= 3.18 tCO_2/tfuel

For bunker C fuel:
0.0402 TJ/tonne fuel * 21.1tC/TJ * 44/12tCO_2/tC * 99%= 3.08 tCO_2/tfuel

The OM was calculated using 2004 Panama grid data from the Energy Policy Commission.

The OM for Paso Ancho is calculated as follows:

$$EF\_OM_{1\text{-}7} = 1{,}569{,}370 tCO_2 \ / \ 1{,}959{,}790 \text{ MWh} = 0.80 \ tCO_2e/\text{MWh}$$

Build Margin (BM)

The BM is calculated using the five power plants most recently built. The total of these five most recently built power plants produce 954,690Wh, which is equal to 21%. This is more than 20% of the annual electricity generated and thus data for the five most recently built plants are selected to calculate the BM. An overview of the data on the performance of the five selected power plants is presented in Annex 3.

The Build Margin emissions factor (*BM*) is calculated as the generation-weighted average emission factor of the five most recently built plants, using the following formula (Equation 5):

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

The BM of Paso Ancho is calculated as follows:

$$EF\_BM_{1\text{-}7} = 579{,}460 \ tCO_2 \ / \ 954{,}690 \text{ MWh} = .61 \ tCO_2e/\text{MWh}$$

Calculation of the baseline emissions factor

The final step in applying the consolidated methodology for the baseline determination is to calculate the baseline emission factor. This has been calculated as the weighted average of the emissions factor of the OM and the BM. The formula that has been used to calculate this weighted average emission factor is as follows (Equation 6):

$$EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$$

The emissions factors of the OM ($w_{OM)}$) and BM (w_{BM}) for Panama have been weighted equally (50% each). See equation 4.

Project Emissions

[4] NCV, OXID and EF numbers are from the 1996 IPCC Guidelines for national greenhouse gas inventories.

The Project has no project emissions.

The total emission reductions ER_y of the project activity during any given year *y* is the difference between the baseline emissions (BE_y in tCO_2) and leakage (Equation 7):

$$ER_y = BE_y - Leakage$$

For the proposed project activity:

$$ER_{1\text{-}7} = 24{,}878\ tCO_2e \text{ per year} - 0 = 24{,}878\ tCO_2e \text{ per year}$$

There is no leakage for the Project.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

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Emission reductions are achieved as seen in section E.1.2.4.

Emission reductions of project activity are (Equation 8):

0.71 tCO_2/MWh * 35,040 MWh/yr = 24,878 tCO_2/yr

E.2 Table providing values obtained when applying formulae above:

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Refer to Annex 3 for the plant grid table.

Calculation of Emission Reductions:

Output Calculations:

MW	Annual MWh	CEF	Annual Emission Reductions (tCO2e)
5	35,040	0.71	24,878

Based on assumptions about Paso Ancho and findings in the feasibility study, the installed capacity will be 5 MW. The Project will have an annual electricity generation of 35,040 MWh per year.

Based on the above formulas and collected data the baseline is determined as follows:

Approximate Operating Margin:

$<E>_{\text{operating margin}}$ = 0.8 tonne CO_2/MWh

Build Margin:

$<E>_{\text{build margin}}$ = 0.61 tonne CO_2/MWh

Baseline Emissions (Equation 9):

$$<E>_{baseline} = (<E>_{operating\ margin} + <E>_{build\ margin}) / 2$$

$$= (.80 + .61) / 2$$

$$= 0.71 \text{ tonne } CO_2/MWh$$

Therefore, the baseline emissions are:

0.71 tCO_2/MWh * 35,040 MWh/yr = 24,878 tCO_2/yr

Carbon Emission Factor Calculations

	MWh Produced	Tonnes CO_2	CEF (tCO_2/MWh)
Operating Margin	1,959,790	1,569,370	0.8
Build Margin	954,690	579,460	0.61
Baseline Emission Factor	2,914,480	2,148,830	0.71

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

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According to the Environmental Impact Assessment (EIA), during operation and generation, Paso Ancho will not diminish volume of water of Chiquiri Viejo River or contaminate it; waters downstream can still be used for other activities. The area where Paso Ancho will be built is characterized by geology that makes it highly suitable for a small dam. The surrounding area which will be affected is not abundant with flora; no endangered species are present. The flora that does exist in the immediate vicinity of Paso Ancho has already been largely degraded due to economic and development (infrastructure) activities. Existent fauna is dominated by 39 different types of species.

Both positive and possible negative impacts were identified in the EIA, with the negative impacts being higher in number, but also temporary and easily mitigated. The project developer will collaborate with the Panama National Environment Authority (ANAM) to mitigate the possible negative impacts of the Project as much as possible; mitigation measures were outlined in the EIA.

Construction phase

During the construction phase, a number of impacts may occur. These impacts will be mitigated or kept to a minimum by the following of programs and plans during construction. These plans and programs include: waste and residue management; fuel and lubricant management (including construction of walls around fuel tanks and where machinery/equipment is kept and recycling of fuels); periodic supervision of the plant; reforestation and forest management plans, which include removing vegetation only in strategic

areas, will be followed during construction to minimize negative impacts; and a monitoring and control plan for sedimentation. Changes in the landscape will be mitigated by reforestation after the construction. Soil degradation and loss will occur; this will be mitigated by the stabilization of land around the river bank, before construction commences. Local fauna will be relocated to account for habitat loss. To minimize noise pollution, construction will be primarily during daytime periods, from 6am to 6pm, with all raucous construction activities, such as the use of heavy machinery, during daytime periods. Additionally, the construction area will be surrounded by a noise protective material.

Operation phase

During the operation phase, possible negative impacts include damage to local property. Mitigation of this issue will be dealt with through discussions with the local people and authorities, prior to construction. Waste generation and disposal will be dealt with through waste management and public sanitation programs. To maintain the levels of water volume required by the ANAM, an ecological tube was designed to allow anytime the inflow of 0.6 m^3/s as ecological flow.

The EIA was approved by the Panamanian government and all necessary environmental permits have been acquired.

SECTION G. Stakeholders' comments:

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

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The National Environmental Authority (ANAM) made the EIA public to all officials, organizations, community representatives, and local inhabitants of the Volcan area in the District of Bugaba from 11 January 2000 to 20 January 2000. The document was publicly available at the documentation center of the ANAM and comments/recommendations were submitted to the General Administration of ANAM. An announcement of the consultation was posted on the Panamanian newspaper "La Estrella de Panama" on 11 January 2000; the invitation was from the General Secretariat of the ANAM. Key stakeholders were interviewed. Additionally, a public forum was held on 30 October 2000. This forum was announced in national newspapers and on the radio and personal invitations and general public invitations were sent.

G.2. Summary of the comments received:

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Overall, very positive comments and observations were provided by participants of the consultation and the public forum. The following list includes general comments and observations about the project from the participants (government representatives and community inhabitants) at the public consultation.

- New direct and indirect job creation (100% of participants agreed on this)
- New jobs should only be given to locals of the Chiriqui Province. Those who observed the latter noted that companies like Paso Ancho Hydropower Corporation often employ people from other areas, and not the one affected by the project.
- There will be more commercial and economic activity as a result of Paso Ancho; other new businesses will be opened.
- It is hoped that energy prices will go down.
- Concern about water contamination.
- Acknowledgement of potential noise pollution.

- Acknowledgement that the project will generate solid residues.
- Acknowledgement that this project could provide much technical know-how and engineering capacity to locals for building and operating hydropower plants.
- The company should support the local community and government; e.g. improving local education systems.
- Positive feedback regarding the improvement of roads that will come along with this project.
- Support for reforestation in the affected area.

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

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To address the concerns of the stakeholders, the EIA includes a plan for community participation to provide information about all aspects of Paso Ancho to the affected community, and to find the best alternatives to compensate the local community for any environmental and/or social disruptions during the construction and operation of the plant. The plan proposed the following programs and activities:

- Support to the local authorities, community and government during emergency situations.
- Development of reforestation programs.
- Improvement of local educational systems.
- Support to local health programs.
- Support ANAM and other entities involved in mitigation and protection programs in the Chiriqui Viejo River area.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Paso Ancho Hydro-Power Corp
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Represented by:	
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Middle Name:	
First Name:	Fernando
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NOT APPLICABLE

Annex 3
BASELINE INFORMATION

Panama Grid[5] (yellow indicates plants in the Build Margin)

	Fuel type	Installed Capacity	% of total Capacity	Began Operation	MWh/yr
Generation Facility		**(MW)**	**(%)**	**(year)**	
Esti	Hydro	120.00	8.14%	2003	83,220.00
Pedregal	Bunker C	50.00	3.39%	2002	136,900.00
Hidro Panamá	Hydro	1.80	0.12%	2000	8,500.00
Pan Am	Bunker C	96.00	6.51%	1998	722,930.00
Copesa	Diesel	46.00	3.12%	1996	3,140.00
Fortuna	Hydro	300.00	20.35%	1984	1,403,700.00
TG Panamá	Diesel	42.00	2.85%	1982	490.00
Los Valles	Hydro	48.00	3.26%	1979	268,010.00
La Estrella	Hydro	42.00	2.85%	1978	228,360.00
Bahia Las Minas	Diesel	285.00	19.34%	1978	756,560.00
Bayano	Hydro	248.00	16.83%	1976	497,780.00
Chitré	Diesel	5.00	0.34%	1968	260.00
La Yeguada	Hydro	7.00	0.47%	1967	41,300.00
Capira	Diesel	6.00	0.41%	1964	20.00
Dolega	Hydro	3.12	0.21%	1954	16,430.00
Macho de Monte	Hydro	2.40	0.16%	1945	12,050.00
Arkapal	Hydro	0.67	0.05%	1945	1,260.00
Miraflores	Diesel	111.00	7.53%	1921	339,490.00
Gatun	Hydro	24.00	1.63%	1908	90,300.00
Madden	Hydro	36.00	2.44%	1908	173,920.00
Total Generation 2004:		**1,473.99**	**100.00%**		4,784,620.00

[5] Energy Policy Commission, 2004

Annex 4
LETTER FROM INVESTOR

E+Co
ENERGY THROUGH ENTERPRISE

28 November 2005

To Whom It May Concern:

This letter is in reference to the Paso Ancho 5MW Hydro Power Plant (the Project), in the Chiriqui Province of Panama that is being developed by Intercarib, S.A.

Regarding the project's application as a Clean Development Mechanism (CDM) project, the purpose of this letter is to confirm the following statements.

1. E+Co is familiar with the CDM and is aware of the potential financial benefits that can result from CDM project registration.
2. E+Co considers carbon credits when making investment decisions.
3. E+Co views carbon credits as a potential additional revenue source in its financial analysis of projects.
4. CDM was recognized as an important component of the Paso Ancho financial structure. Specifically, the additional income to be provided by carbon credits was an assurance to E+Co in its review of the project finances.
5. Paso Ancho's participation in the CDM was critical in E+Co's decision to invest in the project.

If there are any questions, please feel free to contact E+Co. Thank you.

Christine Eibs Singer
Deputy Executive Director

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