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:

Bayano Hydroelectric Expansion and Upgrade Project in Panama

Project Design Document Version 1 – September 4, 2006.

A.2. Description of the project activity:

The project consist in Adding a new 86 MW turbine (Bayano 3) and upgrading two existing 75 MW units (Bayano 1 & 2) to 87 MW (each) at the preexisting Bayano Hydroelectric Project in Panama, offsetting thermal capacity. The upgrades of Bayano 1 and Bayano 2 include increasing the efficiency of the existing units by replacing the turbine runners and performing other related capital improvements. The new turbine runners will both increase the unit output as well as the unit efficiency. This project does not involve the construction of any new dams or increase in the reservoirs volume.

The increase in the energy generation will equate to 60 GWh per year from the additional capacity of 110 MW and increase in the firm capacity of 51 MW. The benefits associated with this project will include: 1) reactivation of the local economy as this investment represents the biggest investment in the electric sector in recent years, 2) generation of new employment, and 3) reduce the price of the energy to the end consumers.

The already operating Bayano hydroelectric plant is a reservoir-based hydro plant with an installed capacity of 150 MW. The facility comprises two 75 MW units with 105 MW of firm capacity. Bayano was commissioned in 1976 and utilizes the flows of the Bayano River. The plant consists of a main dam and a saddle dam, a spillway and a power station. The plant is part of Panama's National Interconnected Grid.

The primary objectives of this project are: 1) to inject additional clean, safe and reliable energy capacity to the Panamanian electric system, 2) to increase the efficiency of existing units and to optimize the use of water resources, 3) to contribute to the national efforts to reduce emissions globally, resulting in a cleaner environment, and 4) to reduce Panama's dependence of imported fossil fuels.

A.3. Project participants:

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)
Panama (host)	AES Panama S.A.	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.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party (ies):

Republic of Panama

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

Panama Province

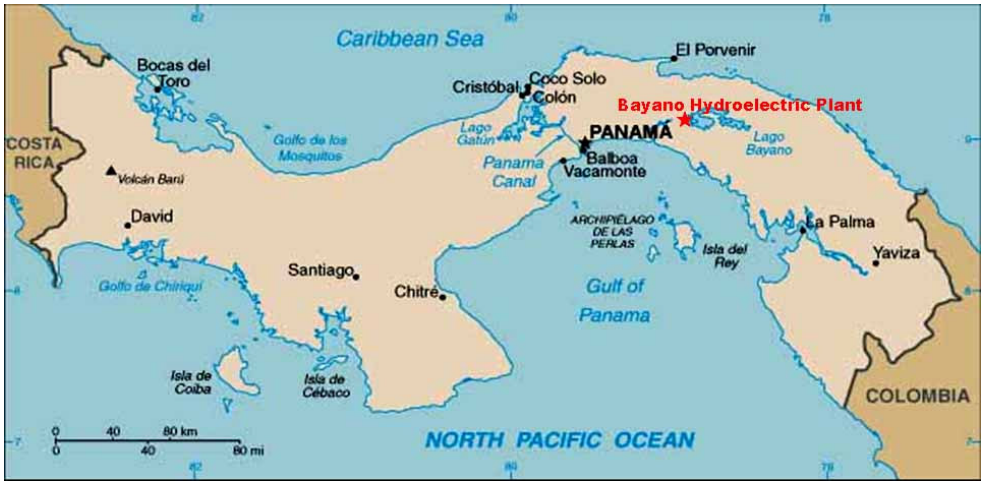
A.4.1.3. City/Town/Community etc:

La Nícora, Chepo District

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

The Bayano Hydroelectric facility is located in the La Nicora area in Chepo district, Panama province, about 85 kilometres east of Panama City. The coordinates of the Power Plant are:
9°10'7.00" N
78°47'50.11" W
The Republic of Panama is located in Central America.

Figure N°1 Project Location Map



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

According to the CDM modalities and procedures the project activity falls within category sectoral scope 1: Energy industries (renewable/non-renewable sources). The project activity is grid-connected renewable power generation.

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

The project consists in adding a third turbine and generator with an installed capacity of 86 MW *("Bayano Unit 3"*) and the rehabilitation and upgrade of the existing Bayano Unit 1 and Bayano Unit 2 turbines and generators units from 75 MW to 87 MW each. The Bayano Facility includes the following: a powerhouse containing three vertical-shaft Francis type turbine-generator units, two rated at 87 MW and one at 86 MW, under a net head of 50 m with a design flow of 184 m^3/s; without increase the existing reservoir volume.

To perform the project an EPC (Engineering Procurement & Construction) contract had been awarded to a consortium made up of Alstom Power Generation AB and GE Energy (Sweden AB); Alstom was responsible for the generator and electrical work, and GE Hydro was responsible for the turbine. The Bayano EPC agreement required the Contractor to provide for the activities associated with the Bayano Expansion/Upgrade, including: design, engineering, construction, commissioning, performance testing and other services and items required for completion of Bayano Unit 3, as well as for the retrofit of Bayano Unit 1 and Bayano Unit 2 on a fixed-price, turnkey basis. Both companies have been manufacturing equipment for hydroelectric facilities for decades and have improved the engineering and technology utilized in the design and fabrication of turbines and generators.

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

It is expected that the Project activities will generate on average a total annual amount of 31,584 tCO_2e emission reductions over the first seven (7) years period, with option of two renewal periods. Starting the first crediting period in 05/03/2004, the total estimated reductions in the first crediting period (2004-2010) are 221,085 tCO_2e. Estimated emission reductions are achieved by avoiding CO_2 emissions from electricity generation of those fossil fuel-fired power plants connected into Panama's National Grid.

Annual estimation of emission reductions

Years	Annual estimation of emission reductions in tonnes of CO_2e
2004	31,275
2005	31,635
2006	31,635
2007	31,635
2008	31,635
2009	31,635
2010	31,635
Total estimated reductions (tonnes of CO_2e)	**221,085**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**31,584**

A.4.5. Public funding of the project activity:

No public funding is provided for the 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:

Title of the approved consolidated baseline methodology applied to the project activity: ***"Consolidated baseline methodology for grid-connected electricity generation from renewable sources".*** This baseline methodology shall be used in conjunction with the approved monitoring methodology ACM0002 ***("Consolidated monitoring methodology for grid-connected electricity generation from renewable sources")***.

Reference of the methodology applied to the project activity: ***ACM0002 - Version 06 /19 May 2006***

The additionality of the project activity shall be demonstrated and assessed using the *latest version* of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board, which is available on the UNFCCC CDM web site.

Reference of Tool: ***Tool for the demonstration and assessment of additionality - Version 2 / 28 November 2005***

The methodology and tool are available on the following website:
http://cdm.unfccc.int/methodologies/PAmethodolgies/approved.html

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

Hydroelectric power generation technology is a renewable electricity generation technology to displace fossil fuel-fired power generation technology to supply electricity to the grid. Therefore the Project complies with the conditions stated in the consolidated baseline methodology ACM0002 approved by CDM EB to determine the project baseline and calculate GHG emission reductions achieved by Hydroelectric power generation, these conditions are:

- The project consists in electricity capacity additions from hydro power projects with existing reservoirs where the volume of the reservoir is not increased.
- The project is not an activity that involves switching from fossil fuels to renewable energy at the project site.
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

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

Referring to the description in the baseline methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 06), the spatial extent of the project

including the project site and other power plants connected to the National Interconnected Grid, therefore the methodology ACM0002 allows project participants to choose the emissions from the grid-connected thermal plants to be included in the project boundary, and to substitute the generation from thermal plants with the proposed project activity in order to obtain emission reductions. In addition, the project does not involve any expansion to the existing reservoir and no additional methane emissions will arise as a result of the project (in fact, it could be argued that the methane emissions per unit of electricity generated will go down as a result of the project, since more water will be used to generate electricity rather than spilled), the project emissions from the reservoir may be neglected.

	Source	Gas	Included?	Justification / Explanation
Baseline	Thermal plants	CO_2	Yes	Generation from fossil fuel thermal plants
		CH_4	No	Grid-connected renewable project
		N_2O	No	Grid-connected renewable project
Project Activity	Hydropower plant construction, fuel handling (extraction, processing, and transport), and land inundation	CO_2	Yes	The consumption of fuel related to transport is negligible because the required civil works are already in place in the existing facility. The emissions related to transport are thus estimated to be zero. The only leakage to be considered is the emissions originated by the use of cement during the upgrade of the Bayano plant.
		CH_4	No	The project doesn't involve any expansion to the existing reservoir and no additional methane emissions will arise as a result of the project
		N_2O	No	Grid-connected renewable project

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

According to the approved consolidated baseline methodology ACM0002 (Version 6), for the baseline determination, project participants shall only account for CO_2 emissions from electricity generation in fossil fuel fired power that are displaced due to the project activity. The **spatial** extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to. For the purpose of determining the build margin (BM) and operating margin (OM) emission factor, as described below, a (regional) **project electricity system** is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints.

Where the application of this methodology does not result in a clear grid boundary, given country specific variations in grid management policies:
(a) Use the delineation of grid boundaries as provided by the DNA of the host country if available; or
(b) Use, Where DNA guidance is not available, the following definition of boundary:

- In large countries with layered dispatch systems (e.g. state/provincial/regional/national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity;
- In other countries, the national (or other largest) grid definition should be used by default.

In Panama the DNA does not provide grid boundaries delineation, due to the fact that Panama is a small country (approx. 78,000 Km^2) and under the electricity market regulations, Panama has a National Interconnected Grid (NIG) defined as the set of generation power stations, lines and communications nets and complementary distribution of electricity and facilities that are interconnected, in a single nationwide system.

Basic Information for the National Interconnected Grid as Baseline Scenario

Año	Installed Capacity - MW					Total Generation - MWh					Remarks
	Hydro	%	Thermal	%	Total	Hydro	%	Thermal	%	Total	
2000	613	49%	635	51%	1248	3,048,615	71%	1,243,085	29%	4,291,700	
2001	613	49%	647	51%	1260	2,253,865	49%	2,306,171	51%	4,560,036	
2002	701	49%	722	51%	1423	3,026,350	64%	1,717,838	36%	4,744,188	
2003	833	54%	722	46%	1555	2,449,270	51%	2,391,485	49%	4,840,756	
2004	846	56%	662	44%	1508	3,382,045	68%	1,578,713	32%	4,960,758	
2005*	847	56%	662	44%	1508	958,961	75%	325,868	25%	1,284,829	* Data available fo the 1st quarter only
Total						**15,119,106**		**9,563,161**		**24,682,267**	

Source: http://www.etesa.com.pa/en/mercadoFrm.htm
http://www.mef.gob.pa/cope/index.htm

From the description above, the system boundary for NIG can be clearly identified. Furthermore, information on its characteristics and the corresponding data is readily available in a transparent way from the official governmental agencies, the National Dispatch Center (CND, in Spanish) http://www.etesa.com.pa/en/mercadoFrm.htm; and the Energy Policies Commission (COPE, in Spanish) http://www.mef.gob.pa/cope/index.htm, which makes it suitable to select as the baseline scenario of the proposed project. Without the project activity, the unmet power demand would possibly be supplied by new-built fossil fuel power plants or continual operation of existing thermal plants. Generated electricity by the project will displace part of the electricity generated by fossil fuel power plants, and thus reduce GHG emissions from those power plants.

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):

The additionality of the proposed project activity is demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" (version 02) agreed by the CDM EB, as following steps:

Step 0: Preliminary screening based on the starting date of the project activity
Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
Step 2: Investment analysis.
Step 3: Barriers analysis
Step 4: Common practice analysis
Step 5: Impact of registration of the proposed activity as a CDM project activity.

Step 0. Preliminary screening based on the starting date of the project activity

The Bayano Expansion and Upgrade Project consist in adding a new 86 MW turbine (Bayano 3) and upgrading two existing 75 MW units (Bayano 1 & 2) to 87 MW (each) at the preexisting Bayano Hydroelectric Project in Panama, offsetting thermal and hydroelectric capacity. The upgrades of Bayano 1 and Bayano 2 include increasing the efficiency of the existing units by replacing the turbine runners and performing other related capital improvements. The new turbine runners will both increase the unit output as well as the unit efficiency. This project does not involve the construction of any new dams or reservoirs.

The Engineering Procurement and Construction (EPC) contract for The Bayano Expansion and Upgrade Project work was signed on March 30, 2001 (*a copy of the cover page of this document is available to the DOE for review*). During this time, AES Panama began to consider the CDM as one option to improve the financial viability of the project. This resulted in the submission of a Project Idea Note (PIN) to Senter International CERUPT Tender for CERs in late 2001 (Senter International confirmed receipt of this proposal. A copy of this letter is available to the DOE)[1]. Construction on the first phase of the project (installation of Bayano Unit 3, a third unit of 86 MW) was started in September of 2002 (*start date*), well after the required initiation date in the Marrakech Accords[2]. Thus, the implementation decision was taken only after considering CDM as an important contribution to the project.

Therefore the project is designated as a "prompt start", which is defined as projects that started after January 1, 2000 in which the CDM was considered a part of the project design but did not get register with the CDM Executive Board before breaking ground on project construction[3]. Based on this decision by the CDM Executive Board, emission reductions from this type of project will be retroactively awarded for the years between the project starting date and registration[4].

[1] It should also be noted that at this time, the CDM Executive Board was not able to evaluate projects as they had not yet developed the capacity within the Methodology Panel.

[2] of 1 January 2000

[3] This definition of the project start date is based on that presented by the CDM Executive Board in the document, "Glossary of terms used in the CDM project design document (CDM-PDD)."

[4] Decision -/CP.9 "(c) That a clean development mechanism project activity starting between the date of adoption of decision 17/CP.7 and the date of the first registration of a clean development mechanism project activity may, if the project activity is submitted for registration before 31 December 2005, use a crediting period starting before the date of its registration;" Decision -/CMP.1 – General "4. *Decides* that project activities that started in the period between 1

In any case, project participants wish to have the crediting period starting prior to the registration of the project. Hence step 0 is fulfilled for the project. It is concluded that the project is additional under step 0.

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

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

The project is an activity that generates electricity by using renewable sources and delivers it through the NIG. The identified realistic and credible alternatives available to the project participants that provide outputs or services comparable with the proposed CDM project activity are three:

1. Implement the project as a hydropower plant development without the CDM component.
2. Implement other plausible and credible alternatives with comparable quality, properties and application areas (e.g. fossil fuel fired power plant, natural gas power plant).
3. Do not implement any power generation project.

Sub-step 1b. Enforcement of applicable laws and regulations:

The alternatives listed in sub-step 1a are in compliance with all applicable legal and regulatory requirements in Panama, including environmental regulations.

Because none of the identified alternatives breaks any legal or regulatory requirement or are likely to do so in the future - including the fact that none of the three alternatives are likely to go against technical standards and current legal dispositions on environmental conservation and cultural heritage conservation, all 3 scenarios are in compliance with all applicable laws and regulations and are also realistic and credible alternatives available to the project participants. Meaning the project is additional under step 1.

According with the Tool for the demonstration and assessment of additionality - Version 2, after complying with step1, and then indicate:

→ Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)

Step 2. Investment analysis

Not applicable

Step 3. Barrier analysis

January 2000 and 18 November 2004 and have not yet requested registration but have either submitted a new methodology or have requested validation by a designated operational entity by 31 December 2005 can request retroactive credits if they are registered by the Executive Board by 31 December 2006 at the latest;

Sub-step 3 a. Identify barriers that would prevent the implementation of the type of the proposed project activity

Hydropower plants projects face barriers that prevent them from being carried out if they are not registered as CDM activities.

Investment Barrier

At the time that AES was developing this project and looking for capital, the company's stock value dropped drastically (it has since recovered substantially), severely limiting AES Panama's ability to access commercial financing. This led AES Panama to identify a short-term financing option that would allow them to develop the Bayano project and later restructure their debt once the project was operational.

While the project was able to get bridge financing without a secured revenue stream from the sale of CERs, the revenue was taken into consideration in the new financial package for the company. CERs (in part) contributed to the project's debt receiving a BBB- rating (investment grade) from Fitch Ratings Services. The sale of CERs is specifically reference in the rating document developed by Fitch. The proposed sale of CERs helped to secure this new financing package and extend loan tenors from eight to approximately ten to fifteen years. It specifically allowed the project to present a higher debt service coverage ratio (a key financial ratio used to determine a project's or company's ability to make timely debt payments).

While AES Panama is only partly owned by AES Corporation, new investment activities and usage of AES capital still must go through an internal corporate review against investment opportunities which meet a minimum financial hurdle rate. While internal hurdle rates for AES vary, for projects such as this, an incremental difference in the internal rate of return (IRR) of 0.67% is considered significant (financial return with and without CERs are shown below).

Bayano Project without CERs
IRR= 16.68%
NPV@12%= 3.469 million

Bayano Project with CERs
IRR= 17.35%
NPV@12%= 3.890 million

This additional financial return associated with the CER revenues helped in the investment decision-making process.

In addition, AES Panama values the GHG reducing attributes of this project not only for the additional revenue stream from the sale of CERs, but also for the intangible benefits, such as positioning AES Panama in the emerging carbon market through early participation in a learning-by-doing process, gaining public recognition

through national and international certifications, contributing to sustainability, and improving social conditions in a scantly developed rural region.[5]

Technological barrier

The upgrading of preexisting hydroelectric facilities with the equipment used by AES Panama at Bayano is not part of the baseline and thus additional due to the following technology barriers:

1) While hydroelectric generation technology makes up more than 50% of the installed capacity in Panama, the Bayano Expansion and Upgrade Project utilizes specific control technology not used in Panama. The upgrade project utilizes a SCADA control system that allows the facility managers to optimize the operation of the turbines and generators and improve the efficiency of the plant (and thus reducing waste).

2) While not a traditional technology barrier (nor the one defined in the Baseline Methodology), hydro-electric power plants are generally no longer the technology of choice in Panama. Most new capacity utilizes combustion turbines or internal combustion engines. These technologies have lower installed cost and less environmental regulations to meet before they can go into operation. Due to this, under a business as usual scenario, hydroelectric technology would not be implemented.

3) In addition, the newly installed capacity of 110 MW only generates 60 GWh per year. This is well below the amount of electricity generated by other hydroelectric projects of this size. Therefore the average cost to generate each KWh of electricity is substantially higher then other electricity generation projects.

Sub-step 3b. Show how the identified barriers would not prevent the implementation of at least one of the alternatives:

The two identified barriers that the project faced will not prevent the alternative: "implement the project as fossil fuel fired power plant".

(a) Investment Barrier (Barrier 1):
Fossil fuel project developments are less strongly affected (Alternative 2) because of three reasons:

- The lower investment needed to build a fossil fuel fired power plant. A hydropower plant requires more investment financing than a fossil fuel fired power plant because of the much higher up-front investment cost associated with the former. The turnkey[6] cost per installed MW for a hydro project is around of the double for fossil fuel fired project on average.

[5]AES Panama Energy, an indirect subsidiary of AES, has adopted an internal environmental strategy to deal with all of its business activities and new investments. AES is also a pioneer in Panama in consideration of the CDM as a part of its decision-making process. Since 1999 the Designated National Authority (DNA) of Panama has been sponsoring seminars on the use of CDM for project development activities. Consequently, AES Panama Energy has paid a great deal of attention to the Clean Development Mechanism. In November of 2001, The Netherlands Minister of Housing, Spatial Planning and the Environment and the Panamanian DNA signed a Memorandum of Understanding on co-operation in the field of the CDM. At that time AES Panama Energy hired experts to use the CDM as a financial tool, based on the ongoing negotiations of the UNFCCC.

[6] Turnkey meaning the investment needed to put a power plant in operation.

- The shorter time it takes to put new engines in operation for a fossil fuel fired power plant, which exposes lenders to less risk.
- The shorter time it takes in recovering the initial investment made in a fossil fuel fired power plant, which also exposes lenders to less risk.

(b) Technological Barrier (Barrier 2):
Fossil fuel project developments are less strongly affected (Alternative 2) because of the following reasons:

- Hydroelectric power plants are generally no longer the technology of choice in Panama. Most new capacity utilizes combustion turbines or internal combustion engines. These technologies have lower installed cost and less environmental regulations to meet before they can go into operation. Due to this, under a business as usual scenario, hydroelectric technology would not be implemented.
- The newly installed capacity of 110 MW only generates 60 GWh per year. This is well below the amount of electricity generated by other hydroelectric projects of this size. Therefore the average cost to generate each KWh of electricity is substantially higher then other electricity generation projects.

Since the alternatives are affected less strongly/not prevented by the identified barriers that the project faced, they are both viable alternatives and should not be eliminated from consideration.

Having identified two barriers that affected the implementation of this type of proposed project activity, but did not prevent/affect less strongly at least one of the alternatives identified, the project is additional under Step 3.

Step 4. Common Practice Analysis

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

The investment barriers existing in Panama for hydroelectric projects are due to the fact that hydroelectric technology has been generally no longer the technology of choice in Panama since 1984. Most of the latest capacity utilizes combustion turbines or internal combustion engines (see table below).

Latest Thermal Facilities for National Interconnected Grid

Company	Unit	Type	Fuel	Capacity (KW)	Year of Commissioning
EGE BABIA LAS MINAS					
BLM	5	G	Marine diesel	33	1988

BLM	6	G	Marine diesel	33	1988
BLM	8	G	Marine diesel	34	1999
BLM	9	G	Marine diesel	60	2000
AES PANAMÁ S. A.					
Sub Estación Panamá	1	G	Diesel	21.4	1983
Sub Estación Panamá	2	G	Diesel	21.4	1983
Company	**Unit**	**Type**	**Fuel**	**Capacity (KW)**	**Year of Commissioning**
PANAM	1 - 6	I.C.	Bunker	96	1999
PEDREGAL	1 - 3	I.C.	Bunker	53.4	2002
COPESA	1	G	Diesel	46	1998
Autoridad del Canal de Panamá					
PCA	3	G	Bunker C	38	Rehab 2000
PCA	4	V	Bunker C	77	Rehab 2002

(V) = Steam, (D) = Diesel, (G) = Gas, (I.C.) = Interna Combustion.
Source: http://www.mef.gob.pa/cope/index.htm

During this period of time (i.e. from 1984-2002) no new hydroelectric power plant has been build in Panama. This shows that hydro development in Panama can not be considered anymore a common practice.

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

No similar activities (hydropower plants) in terms of access to financing, international investment climate or developed under the conditions prevalence when the Bayano Hydroelectric Expansion and Upgrade Project start (30/03/2001).

In conclusion, the project is not common practice in Panama. It is concluded that the project is additional under Step 4.

Step 5. Impact of CDM registration

The impact of the approval and registration of the Bayano Hydroelectric Expansion and Upgrade Project activity as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the barriers identified in Step 3. The investment barrier (Barrier 1) that impedes funding is alleviated when CDM registration is achieved. CERs revenues will allow the project to better compete with more efficient technologies available, and thus enable the project activity to be undertaken. Among the benefits and incentives can be achieving by the project are:

- Anthropogenic greenhouse gas emission reductions;
- The financial benefit of the revenue obtained by selling CERs,
- Attracting new players who are not exposed to the same barriers that project faced.
- Reducing the inflation /exchange rate risk affecting expected revenues and attractiveness for the investors.

Since the approval and registration of the project as a CDM activity alleviate the identified barriers (Step 3) to a reasonable extent, it is concluded that the project is additional under Step 5.

Because all of the above steps were satisfied, the CDM project activity is not the baseline scenario. That means the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project activity is grid-connected electricity generation from renewable energy sources, according to the approved consolidated baseline methodology ACM0002, the emission reductions of the proposed project are determined as following steps:

STEP1. Calculate the Operating Margin emission factor(s) ($EF_{OM,\ y}$) based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Each method is described below.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total grid generation. The proportions of the low-cost/must in Panama's National Interconnected Grid (NIG) which the project is connected are more than 50% from year 2000 to year 2004 (most recent five years) see table in section **B.4**, so the simple OM method can not be adopted.

Method (b) Simple adjusted OM

The simple adjusted OM needs the annual load duration curve of the grid. As the detailed hourly load data (disaggregated data) of NIG are not publicly available (just monthly summary), it is difficult to adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$).

Method (c) Dispatch data analysis OM

Dispatch data analysis should be the first choice in calculating the baseline emission factor of operating margin ($EF_{OM,\ y}$) according to the methodology ACM0002. But disaggregated data of NIG are not publicly available in details (just monthly summary), it is difficult to adopt Method (c) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$).

Method (d) Average OM

Method (d) can only be used when low-cost/must run resources constitute more than 50% of total grid generation. According to the proportions of the low-cost/must in Panama's National Interconnected Grid (NIG), it is suitable for the project (see table in section B.4) and using aggregated generation and fuel consumption data publicly available.

Thus, the method **(d) Average OM** can be used to calculate the baseline emission factor of operating margin ($EF_{OM,\ y}$) for the project and the average OM emission factors can be calculated using either of the two following data vintages for years(s) *y*:

(a) (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

(d) *Average OM*. The average OM emission factor ($EF_{OM,average,y}$) is calculated as the average emission rate of all power plants, using equation (1) below, but including low-operating cost and must-run power plants.

$$EF_{OM,average,y} = \frac{\sum\left(F_{i,j,y} \times COEF_{i,j}\right)}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where $F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, including low-operating cost and must-run power plants of the grid.

$COEF_{i,j\ y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i \quad (2)$$

Where: NCV_i is the net calorific value (energy content) per mass or volume unit of $fuel_i$
$OXID_i$ is the oxidation factor;
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the of $fuel_i$

Refer to description in version 6 of ACM002. Where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.

The average OM emission factor ($EF_{OM,average,y}$) is calculated as the average emission rate of all power plants for the most recent 3 years for which data are available at the time of PDD submission (*ex-ante*) as the $EF_{OM,average,y}$ of the proposed project activity.

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$) as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m}(F_{i,m,y} \times COEF_{i,m,y})}{\sum_{m} GEN_{m,y}} \quad (3)$$

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

Refer to the description in ACM0002, Project participants shall choose between one of the following two options. The choice among the two options should be specified in the PDD, and cannot be changed during the crediting period. We choose Option 1.

Option 1: Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[7]. Project participants should use from these two options that sample group that comprises the larger annual generation.

STEP 3. Calculate the baseline emission factor EF_y as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (5)$$

where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Step 4: The reduction of emissions in year *y*

The proposed project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year *y* is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \quad (6)$$

Where the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) calculated in Step 3, times the electricity supplied by the project activity to the grid (EG_y in MWh)

$$BE_y = EG_y \times EF_y \quad (7)$$

[7] If 20% falls on part capacity of a plant, that plant is fully included in the calculation.

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

Data and parameters required for assessment and demonstration of additionality and adopted to calculate ex-ante the emission factor that are available when validation is undertaken, they are not monitored throughout the crediting period but are determined only once and thus remains fixed throughout the crediting period.

Data / Parameter:	**OM**
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor(s) OM , y
Source of data used:	National Dispatch Center http://www.cnd.com.pa/publico/mostrararchivosbuquedaanual.php *and* *Energy Policies Commission* http://www.mef.gob.pa/cope/index.htm,
Value applied:	0.7621
Justification of the choice of data or description of measurement methods and procedures actually applied :	Issued official by Panama's National Dispatch Center. This data is publicly available, but is not disaggregated data, just monthly summary.
Any comment:	

Data / Parameter:	**BM**
Data unit:	tCO2/MWh
Description:	Build Margin emission factor(s) OM , y
Source of data used:	National Dispatch Center http://www.cnd.com.pa/publico/mostrararchivosbuquedaanual.php *and* *Energy Policies Commission* http://www.mef.gob.pa/cope/index.htm,
Value applied:	0.3478
Justification of the choice of data or description of measurement methods and procedures actually applied :	Issued official by Panama's National Dispatch Center. This data is publicly available, but is not disaggregated data, just monthly summary.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Based on the most recently data which are publicly available at the National Dispatch Center and base on the calculation for this project, the OM and BM emission factors, and according to formula B.5 to calculate the baseline emission factor (CM emission factor), the results are as follows:

Operating Margin EF	**Build Margin EF**	**Combined Margin EF**

(tCO2/MWh)	(tCO2/MWh)	(tCO2/MWh)
0.7621	0.3478	0.555

Comments： Based on the most recently data which are available in an open way (2002-2004)

The weights w_{OM} and w_{BM} , by default, are $w_{OM} = w_{BM} = 0.5$

This is a hydropower project with an already existing reservoir; according to approved baseline methodology ACM0002 the GHG emissions by sources from the project can be ignored.

GHG Emissions related to flooded area

The project does not involve any expansion to the existing reservoir and no additional methane emissions will arise as a result of the project (in fact, it could be argued that the methane emissions per unit of electricity generated will go down as a result of the project, since more water will be used to generate electricity rather than spilled).

Emissions related to transport

The consumption of fuel related to transport is negligible because the required civil works are already in place in the existing facility. The emissions related to transport are thus estimated to be zero.

Therefore, PE (Project Emissions) = 0

The Bayano project is a gird-connected renewable project, referring to the description in methodology ACM0002. The only leakage to be considered is the emissions originated by the use of cement during the construction of the project.

The emissions of the Bayano project (using an IPCC EF for cement production) are obtained as follows:

L = MC x CEF
Where:
L = Leakage due to cement used for project construction (tCO_2e);
MC = Mass of concrete used (t); and
CEF[8] = Concrete Emissions Factor = 0.4985 tCO_2/t cement

The concrete estimated to be used in the upgrade of the Bayano plant was 2,065 m^3 and the density conversion factor for cement is 0.35t/m^3, therefore:

L = 2,065 x 0.35 x 0.4985 = **360 tCO_2e**

[8] IPCC Guidelines for National Greenhouse Gas Inventories

Consequently, **L=360 tCO_2e**.

Then:
Project Emissions = PE + L = 0 + 360 = **360 tCO_2e**

Because the average annual generation of this project activity will be 57,000 MWh/yr, (EF_y) is calculated ex-ante above and equal to 0.555 tCO2/MWh, so the estimated baseline emissions BE_y are expressed in tCO_2 according the formula as follows:

$E_y \times F_y = EG_y \ BE_y$ =57,000 MWh × 0.555 tCO2/MWh=31,636 tCO_2

Finally, the emission reduction ER_1 by the project activity during the first year is calculated according to formula as follows:

$ER_1 = EF_y - EG_y - L_1 = PE_y \times BE_y - ER_y$ = 31,275 tCO_2

The emission reduction ER_y by the project activity during year y is calculated according to formula as follows:

$ER_y = EF_y - EG_y = PE_y \times BE_y - ER_y$ = 31,636 tCO_2

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

Year	Estimation of Project activity Emission (tonnes of CO2e)	Estimation of baseline emission (tonnes of CO2e)	Estimation of leakeage (tonnes of CO2e)	Estimation of ER (tonnes of CO2e)
2004	360	31,635	360	31,275
2005	0	31,635	0	31,635
2006	0	31,635	0	31,635
2007	0	31,635	0	31,635
2008	0	31,635	0	31,635
2009	0	31,635	0	31,635
2010	0	31,635	0	31,635
Total (t CO2e)	**360**	**221,445**	**360**	**221,085**

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

B.7.1 Data and parameters monitored:

The "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) requires monitoring of the following:

- Electricity generation from the proposed project activity;
- Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);
- Data needed to recalculate the build margin emission factor, if needed, consistent with Consolidated baseline methodology for grid-connected electricity generation from renewable sources"(ACM0002);

Because the proposed project calculates the baseline emission factor ex-ante, as described in B.6.1., the baseline emission factor for the proposed project equals to 0.555 tCO_2/MWh, which is calculated based on the open data available at the time of PDD submission and cannot be changed during the first crediting period. This value will be validated by the DOE before the registration. Detailed information on validation of baseline emission factor is already described in upper **B.6.2.** In the first crediting period there is no need to recalculate the OM and the BM, thus monitoring in not needed.

The electricity generated by the project activity will be supplied to the national grid NIG. The electricity supplied to the grid (EG_y)$_y$) is needed for calculating the emission reductions of the project activity, which will be measured hourly and recorded monthly by the electronic meters at the top and end of lines, and the two electronic meters double-checked each other. The metering system will be acquired from a recognized and 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 / Parameter:	Electricity (EG_y)
Data unit:	MWh
Description:	Annual electricity supplied to the NIG by the proposed project
Source of data to be used:	Records of metering system according to monitoring plan
Value of data applied for the purpose of calculating expected emission reductions in section B.5	31,636
Description of measurement methods and procedures to be applied:	Measurement of electricity output. Project electricity generation will be monitored through the use of on site metering equipment at the substation (interconnection facility connecting the facility to the grid). The Main Metering System equipment will be owned, operated and maintained by ETESA S.A. (National Dispatch Center), and the Backup Metering System equipment will be owned, operated and maintained by AES Panama. Both meters will have the capability to be read remotely through a communication line. Both meters will have the provisions to record on memory the accumulated kilowatt-hours. Both

	meters will be read.
QA/QC procedures to be applied:	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.
Any comment:	In order to operate and manage the CDM project activities, AES Panama had constituted detailed rules on CDM project management, and also set up a CDM project team, the team then will assign a qualified person to measure, compile, and archive the necessary data for the monitoring plan. The monitoring data will be compiled amenable to third party audit and delivered periodically to the DOE for verification and certification.

B.7.2 Description of the monitoring plan:

The Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the project are controlled and reported. This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

The Project monitoring plan is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the project. The monitoring plan will be used throughout the defined crediting period for the project (2004-2010) to determine and provide documentation of GHG emission impacts from the Project.

This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the Clean Development Mechanism have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

The Project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected Operational Entity to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs). The only significant emission source identified relates to the generation of electricity. Emission reductions will be achieved through avoided power generation of fossil-fuel based electricity in Panama due to the power generated by the project. The amount of electrical output from the Project is therefore defined as the key activity to monitor.

The monitoring plan provides the requirements and instructions for:

- Establishing and maintaining the appropriate monitoring systems for kWh generated by the project;
- Quality control of the measurements;
- Procedures for the periodic calculation of GHG emission reductions;
- Assigning monitoring responsibilities to personnel;
- Data storage and filing system;
- Preparing for the requirements of an independent, third party auditor/verifier.

Monitoring charge: Bayano Power Plant Operations Manager, AES Panama
Monitoring and recording frequency: hourly measurement and monthly recording
Approach of data achieved: both in electronic and paper
Monitoring parameter: annual electricity supplied to the grid in MWh
Period of monitoring data delivered to DOE: yearly from 2004 to 2010, at the beginning of following year deliver previous year's data Forms of monitoring data delivered to DOE: monthly records and invoice of electricity sales Comments: the project operator ensures the monitoring data punctually and truly, if there are any questions, they would give further clarification.

Data to be monitored

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	For which baseline method(s) must this element be included	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data kept	Comments
1. EG_y	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	Average OM BM	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Electricity supplied by the project activity to the grid. Double check by receipt of sales.
3. $EF_{OM,y}$	Emission factor	CO_2 Operating Margin emission factor of the grid	tCO_2 / MWh	c	Average OM	At the beginning of the crediting period	100%	Electronic	During the crediting period and two years after	Calculated as indicated in the relevant OM baseline method above
4. $EF_{BM,y}$	Emission factor	CO_2 Build Margin emission factor of the grid	tCO_2 / MWh	c	BM	At the beginning of the crediting period	100%	Electronic	During the crediting period and two years after	Calculated as $[?_i F_{i,y}*COEF_i] / [?_m GEN_{m,y}]$ over recently built power plants defined in the baseline methodology

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)

The baseline study was completed on 10/09/2006
Responsible entity is: Environmental Business Advisors (EBA), David Toyne, david.toyne@thecarboncentre.com,
The entity is not one of the Project Participants listed in Annex 1 of the document.

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:

30/03/2001 EPC contract signed

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

25y-0m

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:

15/03/2004

C.2.1.2. Length of the first crediting period:

The length of the first crediting period will be seven (7) years, with option of two renewal periods.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Environmental impacts

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

An Environmental Impact Assessment, under the Panamanian General Environmental Law, was approved by ANAM on June 1, 2001. This study indicated that the project did not represent a significant threat to the

environment. Thus the project was designated as Category I, which under article 19 of the Executive Decree Note 59 of 2000 is defined as only a minimal environmental impact.

As previously mentioned, this expansion and upgrade project does not result in any new dams or reservoirs. The project will utilize the existing infrastructure and reservoir in place for the main Bayano Hydroelectric facility. With the addition of the new turbine, the environmental impacts associated with each unit of electricity produced will be significantly reduced. As more water is used at the dam site, It is also likely that the total surface area of the reservoir will be reduced allowing the surrounding vegetation to reclaim this land.

The following permits and approvals have been obtained for the Bayano Project.

Bayano Permits and Approvals

Permit	Comment
Water concession 038-98	Issued by IRENARE (precursor to ANAM) on June 30, 1998.
Generation Concession	Awarded on December 20, 1998
Industrial License 1998-2746	Issued by the Ministerio de Comercio e Industrias on May 27, 1998, and amended to transfer the license from EGE Chiriquí to AES Panama on October 25, 1999
Construction and Fire Protection Permit	Issued by the Chepo Municipalty and Fire Department on July 12, 2001
Environmental Impact Approval	Approval of Category I EIA by ANAM on June 1, 2001
Environmental audit for compliance with upgrades program and environmental management	Approval by ANAM as per resolution DINAPROCA-PAMA-006-2201

In addition to the power generation project AES Panama has implement a forest preservation, restoration, and reforestation plan for the area surrounding the plant and the reservoir. The project will promote soil and water conservation, native fauna restoration, and help local communities in the project's watershed training and educational services related to water and forest conservation. The project will include the planting of several fast growing species (Acacia mangium, Tectona grandis, and Pinnus). The trees will be harvested in a period cycle of 20 years. The project goals are:

- To conserve 186,322 hectares of native forest in the Bayano watershed and to reforest 3,240 hectares (162 hectares/year).
- The project will convert pastures and marginal farmland to commercial and protecting tree plantations by promoting the planting al least 3,240 hectares near the Bayano project.

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:

Given that the plant is already constructed and in operation, and the upgrading of the two existing units and the installation of the third unit will have a minimal impact on the water regime downstream of the plant, a

Category I environmental impact assessment was deemed all that was required for the upgrading project. This assessment identified only three impacts and mitigation measures to be addressed during the construction phase, as follows:

Bayano Environmental Impacts and Mitigation Measures

Environmental Impact	Mitigation Measures
Impact on vehicular traffic	Movement of heavy loads to be done under appropriate permits and escorts, and schedule to be done out of peak traffic hours
Water turbidity	Work of preparing river crossings (fords) to be done as quickly as possibly, and to minimize movement of river bed materials
Contamination by Solid Waste	Wastes to be properly disposed of in sanitary landfill on AES lands, or where possible recycled

SECTION E. Stakeholders' comments

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

A complete stakeholder participation review process was not required by the current environmental legislation of Panama for this kind of project. This was based upon the EIA which stated that the project would not constitute a major change to the environment and thus did not adversely impact the local community.

AES Panama did endeavor to ensure that the local community would benefit from this project. Specifically: AES Panama requested that all contractor hired to upgrade or install equipment used local workers whenever possible. In addition, the upgrading and expansion of this facility at a resulted in the community not seeing an increase in the price of electricity to the need for installation of new combustion turbines or internal combustion engines technology.

E.2. Summary of the comments received:

The comments received as well as the letters of invitation for comments are presented in Annex 5

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

Not applicable, because according with the current environmental legislation of Panama a complete stakeholder participation review process was not required, the project activity was just an expansion and upgrade project at a pre-existing AES Panama facility.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AES PANAMA S.A.
Street/P.O.Box:	Nicanor de Obarrio avenue (50 street) and Aquilino de la Guardia
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Represented by:	
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Salutation:	Eng.
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Middle Name:	John
First Name:	David
Department:	General Manager
Mobile:	
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Personal E-Mail:	dave.sundstrom@aes.com;

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is not public funding in the Bayano Hydroelectric Project

Annex 3

BASELINE INFORMATION

Gross Generation by Type and Power Plants of the System

Years: 2000 - 2004 Units: GWh

Type & Power Plant	Installed Capacity (MW)	Year Commercial Operation	Type of Fuel	2000	2001	2002	2003	2004
Total of System				**4,820.01**	**5,101.63**	**5,258.95**	**5,561.77**	**5,756.90**
Total - National Interconnected Grid (NIG) (1a+2a+3a+4a+5+6)	**1,263.20**			**4,351.31**	**4,605.03**	**4,813.95**	**4,922.07**	**5,040.50**
Total - Panama Canal Authority - PCA (1b+2b+3b+4b) /c/	**175.00**			**452.20**	**469.70**	**415.70**	**603.70**	**680.70**
Total - Total - Isolated System(7)	**19.00**			**16.50**	**26.90**	**29.30**	**36.00**	**35.70**
1. Total Hydro	**735.00**			**3,398.11**	**2,478.36**	**3,367.05**	**2,794.47**	**3,764.95**
1a. NIG Hydro	**675.00**			**3,100.81**	**2,295.46**	**3,092.35**	**2,530.27**	**3,461.05**
Arkapal - /auto-edechi/	0.68	-	Hydro	1.50	1.40	2.00	2.80	1.80
Ascanio Villalaz (Bayano) ***	150.00	1976	Hydro	754.25	330.86	574.84	481.18	476.52
Dolega - /edechi/	3.12	1937 Rehab 2001	Hydro	10.70	7.30	12.60	16.40	14.70
Edwin Fábrega (Fortuna)	300.00	1984	Hydro	1,816.46	1,483.73	1,943.30	1,380.85	1,776.33
Estí	120.00	2003	Hydro				89.98	611.11
Hidro Panamá - /indep-edemet/	1.80	2000	Hydro	7.20	5.00	7.10	8.50	11.30
La Estrella	42.00	1978	Hydro	228.86	236.06	247.01	232.49	239.85
La Yeguada - /edemet/	7.00	1967	Hydro	31.70	26.00	34.60	41.20	39.50
Los Valles	48.00	1979	Hydro	249.05	203.22	261.20	264.76	278.20
Macho Monte - /edechi/	2.40	1938 Rehab 2002	Hydro	1.10	1.90	9.70	12.10	11.70
1b. Panama Canal Authority - PCA /c/	60.00	-	Hydro	297.30	182.90	274.70	264.20	303.90
2. Steam (Bunker)	**179.00**			**293.15**	**830.61**	**327.93**	**464.36**	**580.89**
2a. Steam Power Plant in NIG	**120.00**			**138.75**	**544.71**	**198.73**	**255.86**	**325.39**
Central 9 de Enero No 2	40.00	1969	Bunker C	37.90	203.57	29.20	49.37	98.84
Central 9 de Enero No 3	40.00	1972	Bunker C	71.87	170.96	92.61	129.17	155.13
Central 9 de Enero No 4	40.00	1974	Bunker C	28.98	170.17	76.92	77.33	71.42
2b. Panama Canal Authority - PCA /c/	59.00	-	Bunker C	154.40	285.90	129.20	208.50	255.50
3. Internal Combustion (Bunker/Diesel)	**227.40**			**784.40**	**1,001.47**	**738.88**	**1,501.84**	**1,123.18**
3a. Internal Combustion in NIG	**209.40**			**784.40**	**1,001.47**	**727.38**	**1,370.94**	**1,001.98**
Panam	96.00	1999	Bunker/Diesel	636.95	728.83	639.59	701.82	606.43
Pedregal Power	53.40	2002	Bunker/Diesel			2.90	384.91	391.44
Petroelectrica	60.00	1997	Bunker/Diesel	147.45	272.64	84.88	284.20	4.11
3b. Panama Canal Authority - PCA /c/	18.00	-	Bunker/Diesel			11.50	130.90	121.20
4. Gas Turbine (Light Diesel)	**126.80**			**28.34**	**13.90**	**6.30**	**3.60**	**1.50**
4a. Gas Turbine in NIG	**88.80**			**27.84**	**13.00**	**6.00**	**3.50**	**1.40**
Copesa	46.00	1996	Light Diesel	25.70	10.71	4.87	2.95	0.57
Subestación Panamá	42.80	1983	Light Diesel	2.14	1.58	0.66	0.49	0.19
4b. Panama Canal Authority - PCA /c/	38.00	-	Light Diesel	0.50	0.90	0.30	0.10	0.10
5. Gas Turbine (Marine Diesel)	**160.00**			**290.20**	**750.39**	**789.10**	**761.20**	**250.59**
Central 9 de Enero (JB) **	160.00		Marine Diesel	290.20	750.39	789.10	761.20	250.59
6. Sub-Total (Light Diesel)	**10.00**			**9.30**	**0.00**	**0.40**	**0.30**	**0.10**
Capira - /edemet/	5.50	-	Light Diesel	0.00	0.00	0.20	0.00	0.00
Chitré - /edemet/	4.50	-	Light Diesel	0.00	0.00	0.20	0.30	0.10
Petroterminales		-	Light Diesel	9.30	0.00	0.00	0.00	0.00
7. Isolated Systems	**19.00**			**16.50**	**26.90**	**29.30**	**36.00**	**35.70**
Petroterminales (Light Diesel)	6.70	-	Light Diesel		11.50	11.80	12.80	12.60
Other Isolated Systems		-		16.50	15.40	17.50	23.20	23.10
Light Diesel	8.46	-	Light Diesel		15.40	17.50	17.80	12.70
Bunker C	3.84	-	Light Diesel				5.40	10.40

Notes:

/c/ The PCA, just can transfer to the NIG 40 MW due physical restriction on intercotection system

/edemet/ Power Plant owned by Edemet and gives energy direct to Edemet

/edechi/ Power Plant owned by Edechi and gives energy direct to Edechi

/indep-edemet/ Independet Generator to gives energy direct to Edemet.

/auto-edechi/ Self-generator who give energy excedent directly to Edechi.

*** Bayano Power Plant in November 2003 began used of Unit 3 (85 MW); Replaced Units 1 began in year 2003 and Unit 2 began in year 2004

** Central 9 de Enero (JB) Unit 8 (100) began in 1988 Unit 9 (60 MW) began in year 2000

Sources: "Compedio Estadistico Energetico 1970-2004 – Generacion Electrica" http://www.mef.gob.pa/cope

http://cdm.unfccc.int/UserManagement/FileStorage/IVYSA8ECF4V4WHEPBMCN6SEKGBQ4YA - page 30

http://www.prismaenergy.com/businesses/blm.html

http://www.cnd.com.pa/publico/mostrararchivosbuquedaanual.php

Project Heat Rate Estimation

Plant /Unit	2004Generation	Fuel		Energy Content		Heat Rate
		Type	Consumption			
	(MWh)		(10^3 Gallons)	(Btu/Gallon)	GJ/10^3 Gallons	(GJ/MWh)
[1]	[2]	[3]	[4]	[5]	[6 = 5*0.0010551]	[7 = 6*4/2]
Bunker C & Light Diesel						
Central 9 de Enero No 2	98,843.58	Bunker C	8,688.00	152,500.00	160.90	14.14
		Light Diesel	261.00	135,000.00	142.44	0.38
						14.52
Central 9 de Enero No 3	155,127.21	Bunker C	12,491.00	152,500.00	160.90	12.96
		Light Diesel	375.00	135,000.00	142.44	0.34
						13.3
Central 9 de Enero No 4	71,415.93	Bunker C	6,042.00	152,500.00	160.90	13.61
		Light Diesel	181.00	135,000.00	142.44	0.36
						13.97
Panama Canal Authority - PCA #6	121,200.00	Bunker C	6,695.00	152,500.00	160.90	8.89
		Light Diesel	201.00	135,000.00	142.44	0.24
						9.13
PANAM	606,428.03	Bunker C	36,512.00	152,500.00	160.90	9.69
		Light Diesel	1,095.00	135,000.00	142.44	0.26
						9.95
Pedregal	391,441.56	Bunker C	18,536.00	152,500.00	160.90	7.62
		Light Diesel	556.00	135,000.00	142.44	0.2
						7.82
Petroelectrica	4,109.77	Bunker C	250.00	152,500.00	160.90	9.79
		Light Diesel	7.00	135,000.00	142.44	0.24
						10.03
Bunker C (BC)						
Panama Canal Authority - PCA #3,4	255,500.00	Bunker C	19,762.00	152,500.00	160.90	**12.45**
Isolated System (Other BC Plants)	10,400.00	Bunker C	742.00	152,500.00	160.90	**11.48**
Light Diesel (LD)						
Panama Canal Authority - PCA #1,2.5	100.00	Light Diesel	15.60	135,000.00	142.44	**22.22**
Subestación Panamá	189.40	Light Diesel	20.00	135,000.00	142.44	**15.04**
COPESA	565.05	Light Diesel	88.00	135,000.00	142.44	**22.18**
Isolated Systems (Other LD Plants)	25,300.00	Light Diesel	2,208.00	135,000.00	142.44	**12.43**
Marine Diesel						
Central 9 de Enero (JB)	250,593	Marine Diesel	20,322.00	100,000.00	105.51	**8.56**

Table 1 - Calculation of Approximate Operation Margin

Thermal Plants in NIG in 2004	Installed Capacity (MW)	Type of Fuel	Heat Rate (GJ/MWh)	Energy CO2 EF (tCO2/GJ)	Oxidation Factor (%)	CO2 EF (tCO2/MWh)	Average of Generation 2002 - 2004 (MWh/yr)	Average of CO2 Emission (tCO2/yr)	NIG Average Emission (tCO2/MWh)
Central 9 de Enero No 2	40.00	BC/LD	14.52	0.0774	99.0	1.1126	59,137.54	65,796.42	
Central 9 de Enero No 3	40.00	BC/LD	13.30	0.0774	99.0	1.0191	125,634.80	128,034.43	
Central 9 de Enero No 4	40.00	BC/LD	13.97	0.0774	99.0	1.0705	75,219.16	80,522.11	
Panama Canal Authority - PCA #3,4	59.00	BC	12.45	0.0774	99.0	0.954	197,733.33	188,637.60	
Panama Canal Authority - PCA #6	18.00	BC/LD	9.13	0.0774	99.0	0.6996	87,866.67	61,471.52	
PAN AM	96.00	BC/LD	9.95	0.0774	99.0	0.7624	649,278.64	495,010.04	
Pedregal	53.40	BC/LD	7.82	0.0774	99.0	0.5992	259,752.10	155,643.46	
Isolated System (Other BC Plants)	3.84	BC	11.48	0.0774	99.0	0.8797	5,266.67	4,633.09	
Petroelectrica	60.00	BC/LD	10.03	0.0774	99.0	0.7686	124,400.91	95,614.54	
Sub-Total 1	**410.24**						**1,584,289.82**	**1,275,363.21**	**0.8050**
Central 9 de Enero (JB)	160.00	Mar Diesel	8.56	0.0748	99.5	0.6371	600,297.23	382,449.36	
Sub-Total 2	**160.00**						**600,297.23**	**382,449.36**	**0.6371**
Subestación Panamá	42.80	LD	15.04	0.0741	99.0	1.1033	449.02	495.40	
Panama Canal Authority - PCA #1,2.5	38.00	LD	22.22	0.0741	99.0	1.63	166.67	271.67	
COPESA	46.00	LD	22.18	0.0741	99.0	1.6271	2,809.50	4,571.33	
Isolated Systems (Other LD Plants)	25.20	LD	12.43	0.0741	99.0	0.9119	28,400.00	25,897.96	
Sub-Total 3	**152.00**						**31,825.18**	**31,236.36**	**0.9815**
TOTAL	**722.24**						**2,216,412.22**	**1,689,048.93**	**0.7621**

Sources: "Compedio Estadistico Energetico 1970-2004 – Generacion Electrica" http://www.mef.gob.pa/cope

The SDDP (Stochastic Dual Dynamic Programming) model was used to generate an initial estimate of the increase in generation due to the project. The estimated annual electric energy generation after the Bayano plant is expanded was estimated to be 636 GWh/year. The historical annual generation of the existing Bayano plant is 576 GWh. Thus, the average annual electric energy generation attributable to the expansion of the Bayano plant is estimated in the table below

In order to be conservative, we apply a 95% safety factor to the 60 GWh of expected annual generation to arrive at an assumed annual generation attributable to the plant expansion which serves as the basis for estimating emissions reductions:

Project Energy Generation (MWh)

$EG_{projected}$	$EG_{historical}$	Difference	Estimating Emissions Reductions
636,000.00	576,000.00	60,000.00	**57,000.00**

Source: AES Panama, S. A.

Option 1a - Five Most Recently Power Plants Build at the time of PDD submission

Thermal Plants in NIG in 2004		Start Year of Operation	Installed Capacity (MW)	Technology	2004 Generation MWh/yr
1	PEDREGAL	2002	53.4	Internal Combustion	391,441.56
2	Panama Canal Authority - PCA #3,4	2000-2002	59.0	Steam Turbine	255,500.00
3	Central 9 de Enero (JB) Unit 9 *	2000	60.0	CCycle Gas Turbine	78,763.00
	Sub-Total Thermal		**172.4**		**725,704.56**
	Hydro Plants in NIG in 2004				
4	HPP Esti	2003	120.0	Hydropower	611,109.82
5	Bayano Expansion**	2003-2004	110.0	Hydropower	182,784.49
	Sub-Total Hydro		**230.0**		**793,894.31**
	TOTAL		**402.4**		**1,519,598.87**

Option 1b - Power Plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently at the time of PDD submission

Thermal Plants in NIG in 2004		Start Year of Operation	Installed Capacity (MW)	Technology	2004 Generation MWh
1	PEDREGAL	2002	53.4	Internal Combustion	391,441.56
	Sub-Total Thermal		**53.4**		**391,441.56**
	Hydro Plants in NIG in 2004				
2	HPP Esti	2003	120.0	Hydropower	611,109.82
3	Bayano Expansion**	2003-2004	110.0	Hydropower	182,784.49
	Sub-Total Hydro		**230.0**		**793,894.31**
	TOTAL		**283.4**		**1,185,335.87**

** In this calculation is included the CDM project activity: Bayano Hydroelectric Expansion and Upgrade Project

Sources: "Compendio Estadistico Energetico 1970-2004 – Generacion Electrica" http://www.mef.gob.pa/cope

http://www.prismaenergy.com/businesses/blm.html

Build Margen Emission Factor

	Thermal Plants in NIG in 2004	Start Year of Operation	Installed Capacity (MW)	Technology	Type of Fuel	Heat Rate (GJ/MWh)	Energy CO2 EF (tCO2/	Oxidation Factor (%)	CO2 EF (tCO2/MWh)	Generation 2004 (MWh/yr)	CO2 Emission (tCO2/yr)	NIG Emission (tCO2/MWh)
1	PEDREGAL	2002	53.4	Internal Combustion	BC/LD	7.82	0.0774	99.0	0.5992	391,441.56	234,551.78	
2	Panama Canal Authority - PCA #3,4	2000-2002	59.0	Steam Turbine	BC	12.45	0.0774	99.0	0.954	255,500.00	243,747.00	
3	Central 9 de Enero (JB) Unit 9 *	2000	60.0	CCycle Gas Turbine	Mar Diesel	8.56	0.0748	99.5	0.6371	78,763.00	50,179.91	
	Sub-Total Thermal		**172.4**							**725,704.56**	**528,478.69**	**0.7282**
	Hydro Plants in NIG in 2004											
4	HPP Esti	2003	120.0	Hydropower						611,109.82	0.00	
5	Bayano Expansion**	2003-2004	110.0	Hydropower						182,784.49	0.00	
	Sub-Total Hydro		**230.0**							**793,894.31**	**0.00**	**0.0000**
	TOTAL		**402.4**							**1,519,598.87**	**528,478.69**	**0.3478**

Project Leakeage

Project Emission

CONCRETE

Project	Concrete					Emission
	m3	Kg/m3	Kg	Tonne	EF tCO2/tCement	t CO2
BAYANO	2,065.00	350.00	722,750.00	722.75	0.4985	360
					Bayano Project	360

CEF[1] = Concrete Emissions Factor = 0.4985 tCO2/t cement

[1] IPCC Guidelines for National Greenhouse Gas Inventories

Project Activity Emissions Reduction

Operating Margin EF (tCO2/MWh)	Build Margin EF (tCO2/MWh)	Combined Margin EF (tCO2/MWh)	Project Generation (Mwh/yr)	Baseline Emissions (tCO2/year)	Project		
					Emissions in first year (tCO2/yr)	Emission Reduction in first year (tCO2/yr)	Emission Reduction (tCO2/yr)
0.7621	0.3478	0.555	57'000	31'635	360	31'275	31'635

Project Emission Reduction for various Crediting Periods

Credit Period (years)	Emissions Reduction (tCO_2e)	Period (years)
7	221'085	2004 - 2010
10	315'990	2004 - 2013
14	442'530	2004-2014
21	663'975	2004-2024

Notes:

[1] Project emissions will occur only during first year

[2] Project emissions calculation for leakeage resulted in 360 tCO2/year (cement use during the upgrade of the Bayano plant.)

[3] Baseline will be renewed at the start of each seven (7) year crediting period as emission reductions for the new seven (7) year crediting periods may change due to changes in the national grid configuration.

* Baseline must be renewed for these cases. Values may vary according to national electric generating mix composition.

Annual estimation of emission reductions

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2004	31,275
2005	31,635
2006	31,635
2007	31,635
2008	31,635
2009	31,635
2010	31,635
Total estimated reductions (tonnes of CO_2e)	**221,085**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**31,584**

Annex 4

MONITORING INFORMATION

MONITORING PLAN

This Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the project are controlled and reported. This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

The Project monitoring plan is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the project. The monitoring plan will be used throughout the defined crediting period for the project (2004-2010) to determine and provide documentation of GHG emission impacts from the Project.

This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the Clean Development Mechanism have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

Managers of the Project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected Operational Entity to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs). The only significant emission source identified relates to the generation of electricity. Emission reductions will be achieved through avoided power generation of fossil -fuel based electricity in Panama due to the power generated by the project. The amount of electrical output from the Project is therefore defined as the key activity to monitor.

The monitoring plan provides the requirements and instructions for:

a) Establishing and maintaining the appropriate monitoring systems for kWh generated by the project;
b) Quality control of the measurements;
c) Procedures for the periodic calculation of GHG emission reductions;
d) Assigning monitoring responsibilities to personnel;
e) Data storage and filing system;
f) Preparing for the requirements of an independent, third party auditor/verifier.

AES Panama, who is developing the Project, will use this document as guide in monitoring of the project emission reduction performance and will adhere to the guidelines set out in this monitoring plan. This plan is designed to be used in parallel with the monitoring (i.e. metering) of the kWh, according with the standard procedures used in the Electrical Market in Panama.

Main Definitions

The monitoring plan will use the following definitions of monitoring and verification

- **Monitoring:** the systematic surveillance of the Project's performance by measuring and recording performance-related indicators relevant in the context of GHG emission reductions.
- **Verification:** the periodic ex-post auditing of monitoring results, the assessment of achieved emission reductions and of the project's continued conformance with all relevant project criteria by a selected Operational Entity.

Project Basic Information

The project consist in Adding a new 86 MW turbine (Bayano 3) and upgrading two existing 75 MW units (Bayano 1 & 2) to 87 MW (each) at the preexisting Bayano Hydroelectric Project in Panama, offsetting thermal capacity. The upgrades of Bayano 1 and Bayano 2 include increasing the efficiency of the existing units by replacing the turbine runners and performing other related capital improvements. The new turbine runners will both increase the unit output as well as the unit efficiency. This project does not involve the construction of any new dams or increase in the reservoirs volume.

The increase in the energy generation will equate to 60 GWh per year from the additional capacity of 110 MW and increase in the firm capacity of 51 MW. The benefits associated with this project will include:

1. Reactivation of the local economy as this investment represents the biggest investment in the electric sector in recent years,
2. Generation of new employment, and
3. Reduce the price of the energy to the end consumers.

The already operating Bayano hydroelectric plant is a reservoir-based hydro plant with an installed capacity of 150 MW. The facility comprises two 75 MW units with 105 MW of firm capacity. Bayano was commissioned in 1976 and utilizes the flows of the Bayano River. The plant consists of a main dam and a saddle dam, a spillway and a power station. The plant is part of Panama's National Interconnected Grid.

The monitoring plan follows the project boundaries as defined in the PDD according with ACM0002 – Version 6.

Crediting Period

The crediting period for the Project is 7 years, starting 2004 and ending in 2010. At the end of each calendar year annual electricity sales will be monitored. The monitoring results and subsequent emission reductions will be verified on an annual basis as well by the selected Operational Entity.

CO_2 emissions reduction calculation estimation

This section presents the method for calculating CO_2 emission reductions. The emission reductions from the project are generated due to the displacement of electricity generated from existing grid energy technologies by electricity generated by the Project.

The CO_2 emission reductions from the project will be calculated as follows:

1. Determine the net electric output measured in GWh for the period from the Project by accumulating the monthly results from the measurements made by the Project and ETESA, S. A.
2. Multiply this by the average carbon emissions factor as defined in the Baseline and validated by the Operational Entity (tCO_2 / GWh).
3. The Net annual CO_2 emissions displaced by the project (tonnes CO_2e).
4. Deduct emissions from project (CEF project multiplied by net monitored electric output project). For the project this is nil, as agreed in the baseline.
5. Total CERs generated by the project for the period.

Measurement of Electricity Output

Project electricity generation will be monitored through the use of on site metering equipment at the project's electrical substation (interconnection point to the grid). The Main Metering System equipment will be owned, operated and maintained by ETESA, and the Backup Metering System equipment will be owned, operated and maintained by the project. Both meters will have the capability to be read remotely through a communication line. Both ETESA and AES Panama have the right to read either meter. Both meters will have the provisions to record on memory the accumulated kilowatt-hours. Both meters will be read. The results from the Main Meter will be supplied by ETESA to AES Panama on a monthly basis. The monitoring tasks are to measure Project's electric output, and steps to derive the emissions reductions are:

- ETESA reads main meter and records result - monthly - within 3 working days of month end
- ETESA supplies reading to AES Panama
- AES Panama supply reading and file for Verifier
- AES Panama accumulates readings for payment period and calculates CERs for sale, and invoice Buyer
- AES Panama file paperwork for Verifier

The meter reading records will be readily accessible for auditors, Calibration tests records will be maintained for the auditors.

Calibration of Meters

According with the establish procedures by ETESA defines the metering calibration and the required quality control procedures to ensure accuracy. Some of those are described below:

- The metering equipment will be properly calibrated and checked annually for accuracy. The metering equipment shall have sufficient accuracy so that any error resulting from such equipment shall not exceed +0.5% of full-scale rating.
- Both Meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.
- All the meters installed shall be tested by ETESA within 10 days after (a) the detection of a difference larger than the allowable error in the readings of both meters, (b) the repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications, and/or each anniversary of the Commercial operations date. If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.
- The Net Energy Output registered by the Main Meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the Main Meter is within the permissible limits.

Calibration is carried out by ETESA with the records being supplied to AES Panama, and these records will be maintained by AES Panama at power plant.

Data Management Systems

This system provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified. Below follows an outline of how project related records will be managed.

Proposed information management system for emissions reduction monitoring

Overall responsibility for monitoring of GHG emissions reduction will rest with AES PANAMA, and which will be located at AES Panama central office, located at Nicanor de Obarrio Ave. and Aquilino de la Guardia, Continental Bank Tower 25th floor Panama City, Panama. The following section sets out the procedures for tracking information from the primary source to the end-data calculations, in paper document format. AES PANAMA will provide the CERs and necessary data to allow it to transfer to the Buyer.

Paper-based Documentation

Physical documentation such as paper-based maps, diagrams and environmental assessments will be collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to Project and AES Panama Company, the project material and monitoring results will be indexed. All paper-based information will be stored by at the AES Panama main office in Panama City.

Data storage Table

Document index reference number	Document title	General description of document	Individual or Departmaent submitting this information	Date entered
	PDD, including the electronic spreadsheets and supporting documentation (assumptions, data estimations, measurement methods, etc.)			
	CO_2 ER Calculations & Monitoring Plan			
	Validation Report			
	Dispatch Meter calibration Reports.			
	Documentation related to assessments and any site visits carried out by Operational Entity for			

	Monthly Meter reading reports			
	Records on CO_2 emission reductions (CERs)			
	Records on project management, including data collection and management systems			

Verification and Monitoring Results

The verification of the monitoring results of the Project is a mandatory component, which is required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done on an annual basis.

AES Panama has the following responsibilities for the Verification and Monitoring

- Contract an Operational Entity and agree a time schedule for carrying out verification activities throughout the crediting period in accordance with the Buyer and the CDM Executive Board requirements.
- AES Panama will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.
- The selected Operational Entity must be an Accredited Entity with a proven track record in environmental auditing and verification, experience with CDM projects and work in developing countries. The Operational Entity should be accredited by the CDM Executive Board.
- AES Panama will facilitate the verification through providing the Operational Entity with all the required necessary information, before, during and, in the event of queries, after the verification.
- AES Panama will fully cooperate with the Operational Entity and instruct its staff and management to be available for interviews and respond honestly to all questions from the Operational Entity.

Annex 5

09/20/02 FRI 10:56 FAX 2989180 AES Bayano - Fin. & Adm. 007

DE : MEDIO AMBIENTE BAYANO NO. DE TEL : 2985318 04 JUN. 2001 09:28AM P1

REPUBLICA DE PANAMA
AUTORIDAD NACIONAL DEL AMBIENTE
ADMINISTRACIÓN REGIONAL DE PANAMA-ESTE

Chepo, 01 de Junio de 2001
ARAPE-NOTIF-01-01-2001

Para: David Sundstrom
De: D. Dominguez E.
Atte. Lily

Señor
David John Sundstrom
Presidente y Representante legal.
AES-PANAMA, S.A.
E. S. D.

Estimado Señor Sundstrom:

Por medio de la presente le comunicamos que el Estudio de Impacto Ambiental, Categoría I, presentado el día 18 de Mayo del 2001, por la Empresa, AES-PANAMA S.A., correspondiente al proyecto "INSTALACION UNIDAD 3 Y REHABILITACION UNIDADES 1 Y 2 DE LA HIDROELECTRICA BAYANO", ubicado en el corregimiento del Llano, Distrito de Chepo, Provincia de Panamá, ha sido acogido por esta Institución en cumplimiento de lo establecido en el Artículo 53 párrafo segundo del Decreto Ejecutivo Nº.59 del 16 de marzo de 2000, que a la letra dice:

...Tratándose de un Estudio de Impacto Ambiental Categoría I, la notificación por escrito favorable certificará que se cumple con todos los requisitos ambientales aplicables; que el proyecto no genera riesgos ambientales significativos, que se cumple con la normativa de carácter ambiental y que el proyecto no conlleva riesgos ambientales".

En razón de lo anterior La Autoridad Nacional del Ambiente de Panamá-Este, a través del Departamento de Evaluación y Ordenamiento Ambiental Regional, dará el seguimiento y monitoreo a las actividades del proyecto.

Igualmente, se le recuerda que para la realización del proyecto, deberá obtener los permisos necesarios de las autoridades pertinentes, además de cumplir con las normas jurídicas y de seguridad que rijan tal actividad. Además, el promotor deberá colocar un letrero dentro del área del proyecto, de acuerdo al formato adjunto.

Atentamente,

Lic. Darío Arrue
Administrador Regional
ANAM-PANAMA-ESTE

Autoridad Nacional del Ambiente
ADMINISTRACION REGIONAL DE PMA. ESTE

c.c. Departamento de Evaluación y Ordenamiento Ambiental.

Figure [redacted] – Letter from the National Environmental Authority

09/20/02 FRI 11:00 FAX 2989180 AES Bayano - Fin. & Adm. 011

Panamá, 12 de julio de 2001

Mayor
Francisco Pedroza
Jefe de la Compañía
Cuerpo de Bomberos de Chepo
E. S. D.

Estimado Señor:

Mucho le agradezco me extienda el ***Permiso de Construcción Final*** para realizar trabajos en la propiedad de la empresa de AES Panamá, S.A., Finca No. 200115, Código 8402, Documento 196335, ubicada próxima a la población de Cañota, Corregimiento de El Llano, Distrito de Chepo.

Los trabajos a realizar son: la instalación de la Unidad No. 3 en la Central Hidroeléctrica de Bayano, de conformidad con la descripción del Proyecto elaborada por el Ing. Roderick Lee y que aparece en el documento adjunto.

La construcción descrita tiene un monto aproximado de B/.1,595,100.00. Estos trabajos son llevados a cabo por el Consorcio ALSTOM-G.E y las Obras Civiles serán ejecutadas por la empresa Celmec, S.A., como subcontratista del Consorcio antes mencionado. y el Profesional Residente es el Ing. Luis Hurtado con cédula No. 8-502-198, Licencia de Idoneidad Profesional No. 82-006-009.

Atentamente,

CELMEC, S.A.

Enersto Richa V.
Presidente
Cédula No. 8-164-560

COMPAÑIA DE BOMBEROS DE CHEPO
DISCIPLINA HONOR ABNEGACION

Rcdo: Sgto. 2º [illegible]
01'16: Jueves 12 de julio 200 ,R.P

Figure [redacted] – Letter requesting the Final Construction License

09/20/02 FRI 10:58 FAX 2989180 AES Bayano - Fin. & Adm 009

República de Panamá

Municipio de Chepo

Nº 7589

PERMISO PARA CONSTRUCCION

Se le concede permiso al Consorcio ALSTOM-G.E, para que previa inspección instale un Generador y una Turbina Francis de 75 Magawatts, dentro de la Casa de Máquinas existente en la Hidroeléctrica de Bayano.

Se le deja claro a los interesados que deben pagar los impuestos Municipales por adelantado, los cuales se pagarán a razón del 1% del valor de la obra el cual es de B/ 1,595.100.00.

De igual modo se le deja claro que deben pasar a las oficinas de Seguridad de la Cía. de Bomberos a fin de que se le indique el reglamento a seguir.

Chepo, 12 de julio de 2,001

SR. ALVARO A. DE LEON V.
ALCALDE MUNICIPAL.

REPUBLICA DE PANAMA ALCALDIA MUNICIPAL DISTRITO DE CHEPO

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FECHA / DATE 30/8/02	Nº DE PAGINAS / # OF PAGES 3		
PARA/TO Clemencina	DE/FROM R. Campos		
COMPAÑIA/CO. AES Panamá	COMPAÑIA/CO. AES Bayano		
DEPARTAMENTO/DEPT.	TELEFONO/PHONE 298-9172		
FAX 206-2612	FAX 298-9181		

CON, PRELIM/2001/0

Figure [ ] – Permit from the Chepo Municipality allowing the 75 MW turbine installation

09/20/02 FRI 10:57 FAX 2989180 AES Bayano - Fin. & Adm. 008

Compañía de Bomberos de Chepo

OFICINA DE SEGURIDAD CONTRA INCENDIO

Chepo, 12 de Julio de 19 2001.

Permiso para Alstome C.J.E.

El que suscribe, Inspector de seguridad hace constar que el

Sr. Kim Erik Bjork

le ha sido concedido permiso para Expansión de la Hidro Electrica del Bayano

Lugar Dist. de Chepo. Día 12 de Julio 2,001.

NOTA: Queda advertido que dicha persona se hace responsable de daños.

Nº 178

Insp. M. Herrod.

Inspector de Seguridad

Figure [redacted] – Permit from Chepo Fire Department allowing Bayano Expansion Plan

09/18/02 MON 11:25 FAX 2989180 AES Bayano - Fin. & Adm. 001

PANAMÁ
La Compañía Global de Energía

September 19, 2001
AES-PB-TUR-061-01

Alstom Power Generation AB
Lugna Gatan, SE-721 76
Västerås, Sweeden
Attention: **Mr. Arne Klang**
Tel. +46-21-326000
Fax. +46-21-136856

Subject: Employment Policy

Dear Mr. Klang:

AES is particullary intrested in your employment policy regard the participation in the Project of local workers from the towns surrounding the Bayano Plant (Chepo, Cañita, La Nicora, El Llano, etc). Please consider to include in your work force people from the mentioned communities.

Best regards,

Ricardo Campos
Project Manager
AES Bayano Project

c.c. Mr. David J. Sundstrom
Mr. Mario E. Herrera
Mr. Kim Björk

Post-it™ Transmisión por Fax 7671

PARA/TO		FECHA/DATE	9/19/01
COMPAÑÍA/CO.	AES Panamá	DE/FROM	R. Campos
DEPARTAMENTO/DEPT.	Adm.	COMPAÑÍA/CO.	AES Bayano
FAX	206-2639	TELÉFONO/PHONE	298-9172-73-74
		FAX	298-9180

Nº DE PÁGINAS/# OF PAGES 1

Torre Banco Continental, Piso 25, Avenida Nicanor de Obarrio (Calle 50) y Calle Aquilino de la Guardia,
Apartado Postal 6429 Zona 5, Panamá Tel.: (507) 206-2600 • Fax: (507) 206-2612

Figure [redacted] – Letter from AES asking for Alstom to consider the use of local work force people