CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

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Papaloate Hydroelectric Project
Version 10
27 February 2010

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

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The Papaloate Hydroelectric Project (hereafter known as the "Project") consists of a 2 MW hydroelectric project located in the southwestern region of El Salvador. The Project will utilize the hydraulic potential of the Papaloate River by harnessing the energy from a deviation in a two kilometer section of the river that follows a natural fall. The Project activity will generate electricity from the Papaloate River which has a 1meter^3/second flow and a net head of 246.41 m. The approximately 9,931 MWh of energy produced by the plant will be sold to the national distribution grid of the Santa Ana Electrical Energy Company (AES-CLESA).

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

- By generating clean energy to be delivered to the grid of El Salvador.
- By providing more electricity to the Salvadoran grid, the project will help to stabilize supply, improve the quality of life of the affected households and increase productivity in the community.
- By increasing El Salvador's energy self sufficiency, and thereby reducing the import of fossil fuels from other countries. (Despite the country's great hydropower *potential*- 1,600 MW-, it relies heavily on imported crude oil to meet its energy demand.)[1]
- Through increased productivity, the project will allow for greater economic growth.
- By creating 135 temporary and 20 permanent jobs for the area.
- Through the strengthening of the national and local economy by contributing with additional employment, electricity and taxes from the Project.
- By introducing clean energy technology which can be replicated.
- By being one of the pioneers in using the Clean Development Mechanism to help fund clean energy projects in El Salvador[2].
- Through the reduction of greenhouse gas (GHG) emissions by displacing energy from thermal power plants.

The Project activity will reduce greenhouse gas emissions by an estimated 6,217 tons of CO_2e per year and 43,518 tons of CO_2e over 7 years.

A.3. Project participants:

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[1] LAC Policy Descriptions: El Salvador, REEEP, http://www.oas.org/dsd/reeep/formularios/el_salvador_pb_reeep.doc.

[2] There are only two registered projects in El Salvador: LaGeo, S. A. de C. V., Berlin Geothermal Project, Phase Two and Landfill Gas to Energy Facility at the Nejapa Landfill Site, El Salvador

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
El Salvador (Host)	Sociedad Hidroelectrica Papaloate S.A. de C.V.	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.		
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.		

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

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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El Salvador

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

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Department of Sonsonate

A.4.1.3. City/Town/Community etc:

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Juayúa-Nahuizalco

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

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The Papaloate Hydroelectric Project is located at the following coordinates -- 2.40 kilometers downstream front the head of the Papaloate River:
The coordinates are defined in Universal Transversal Mercator or UTM.

Intake Coordinates: UTM Latitude 299950 Longitude 1419408
Powerhouse Coordinates: UTM Latitude 298009 Longitude 1420564

A.4.2. Type and category(ies) and technology/measure 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 it comprises the installation of a new renewable energy unit with a nominal installed capacity below the 15 MW thresholds.

The Project is located on the Papaloate River in El Salvador. It is a run of river project with a capacity of 2 MW and will generate approximately 9,931 MWh of electricity annually. Electricity generated will be supplied to El Salvador's electricity grid and will be sold through a Power Purchase Agreement (PPA) with AES-CLESA.

Project data

Installed capacity	2 MW

Annual generation	9,931 MWh
Net head	246.41 m
Generator type	Synchronous
Voltage of generation	**13,200volts**
Design flow	**1** m^3/sec
Turbine type	Pelton (**1**)
Conduction tubes	**1,200 mts**
Pressure tank	**5.25 mts** x **18.46 mts**
Length of transmission line	**250mts**
Pressure tube	***1250mts***
Surge Tank	**5.63 mts x 16.15 mts**
Dam	**17 mts Long**

Table 1: Project Data

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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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.	
Period*	**Annual estimation of emission reductions in tonnes of CO2e**
1	6,217
2	6,217
3	6,217
4	6,217
5	6,217
6	6,217
7	6,217
*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)	43,518
Total number of crediting years	7*3=21

I. Annual Average over the crediting period of estimated reductions (tonnes of CO2e)	6,217

Table 2. Estimated amount of emission reductions
*Note: using 12 monthly periods from the start of the crediting period, not using calendar years

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

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Public funding from the State of the Netherlands is received, this does not result in a diversion of official development assistance and is separate from and not counted towards the financial obligations of the State of the Netherlands in that respect.

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

Based on the information provided in Appendix C, this Project is not a debundled component of a larger project activity because there is no application to another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

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

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Title: "Renewable electricity generation for a grid" as outlined in Annex B of the simplified modalities and procedures for CDM small-scale project activities.
Reference: Approved consolidated baseline methodology AMS-I.D Version 13, EB36.
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

According to AMS I.D (Grid connected renewable electricity generation) version 13 the emission factor of the electricity system is determined by applying the latest version of the *Tool to calculate the emission factor for an electricity grid*, Version 01.1, Annex 12, EB 35.

B.2 Justification of the choice of the project category:

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The Project conforms to the project category since it comprises the installation of a new renewable energy unit with a nominal installed capacity below the 15 MW thresholds, connected to the national grid.

B.3. Description of the project boundary:

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The project boundary is defined as the National 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 El Salvador. 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 Papaloate project. This involves emissions from displaced fossil fuel use at power plants.

B.4. Description of baseline and its development:

Baseline Estimation

As specified for project category Type I.D, the appropriate baseline methodology for the project category is detailed in paragraph 7-11 of the Approved small scale methodology AMS-I.D, version 13, EB36. The specifications for this project are seen in paragraph 9 stating the following:

(a) A combined margin (CM), consisting of the combination of operating Margin (OM) and Build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system Version 1 EB 35
(b) The weighted average emissions (in kg CO_2e/kwh) of the current generation mix. The data of the year in which the project generation occurs must be used.
Calculation must be based on data from an official source (where available) and made publicly available.

It has to be noted that in El Salvador, the baseline is calculated by MARN as the Designated National Authority, DNA (and this is the official data) and for year 2006 the option chosen by them for the baseline **c**alculation is: (a) A combined margin (CM), consisting of the combination of operating Margin (OM) and Build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" Version 1 EB 35. It can be confirmed that the publication of the baseline can be seen in the www.marn.gob.sv.

Note: The DNA (MARN) was in charge of obtaining generation data from each project developer and from Unidad de Transacciones S.A. or Transaction Unit from El Salvador[3]. This Institution is in charge of the information of the wholesale market in El Salvador. The SIGET (General Superintendence of Electricity and Telecommunications) is in charge of overseeing all operations of the UT.

In order to calculate the baseline a Simple Adjusted OM was applied as seen in section B.6.1 and *the following information was used to determine the baseline:*

[3] http://168.243.84.62/utweb/introduccion.htm

No.	Baseline information	Source of data/information
1	Electricity generation	Monthly Energy generation from power plants in the country taken from the data of the Salvadoran Wholesale market from Unidad de Transacciones S:A.(website. www.ut.gob.sv), SIGET and the DNA
2	Energy and fuel content information	Information was taken from default values from the 2006 IPCC fuel values. And EIA-annual Energy Outlook 2007 (Appendix G) Annual Energy Outlook 2008: With Projections to 2030-Appendixes[4]

Table 3

The default values were obtained from the 2006 IPCC fuel values, which were obtained for reference in the baseline calculations. Although it is important to state that all variables were verified by the DNA (MARN), and were published in the Ministry of Environment and Natural Resources (MARN) website[5].. The entire tabular data from the generation of the power plants in El Salvador can be seen in annex 3.

The baseline study was prepared in 2007.

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 small-scale CDM project activity:

The project is a 2 MW small scale hydroelectric plant which produces less than the limiting capacity of 15 MW and thus is eligible to use the small scale methodologies. The project reduces anthropogenic emission of greenhouse gases by source below those that would have occurred in absence of the registered CDM project activity.

As per decision 17/cp.7 Para 43, a CDM project is additional if anthropogenic emission of greenhouse gases by source are below those that would have occurred in the absence of the registered CDM project activity

ADDITIONALITY:

According to Attachment A to Appendix B of the Simplified Modalities and Procedures for CDM small-scale project activities and the tool for demonstration and assessment of additionality Version 4, evidence to why the proposed project is additional is offered under the following categories of barriers: (a) investment barrier, (b) technological barrier, (c) Barriers due to prevailing practice and d) other barriers.

Investment Barrier

[4] http://www.eia.doe.gov/oiaf/archive/aeo07/index.html/

[5] http://www.marn.gob.sv/?fath=&categoria=324

The project activity faces investment barriers due to the fact that the liberalization of the Salvadoran market places a great emphasis on short-term "spot market" prices and a premium on existing generation and new generation investments that have very short construction lead times and low initial capital cost, such as thermal plants[6]. This had led to high financial risks for projects such as the project activity.

Faced with such a barrier the Project developer considered the inclusion of CERs for the project activity in 2001, when a CDM and renewable energy small scale projects case study[7] was developed for the Project activity. The objective of this case study was to develop an opportunity for a reconversion of debt instrument for CERs for the project activity. It was an available option for a small scale project like Papaloate, which would help decrease the risk of investment for the project developer and give an optimist condition for the development of the project activity. Yet it is certain that because of the permit delays, the financing was not clear.

The main parameters used in the benchmark analysis are shown in the following table.

Assumptions	Value	Source
Benchmark (Discount rate)	10%	The application of the discount rate applicable to generation activities emerge with General electricity law article 68[8] and it is supported by correspondence between the Electricity management of SIGET and Project developer. For the Papaloate Hydroelectric Project, the decision of investment was taken on June 2005 based on the information available , considering that for 2004-2005 the SIGET recommended to apply the value of 10%
Assessment period	20 Years	This period is appropriate as established in the Guidance on the Assessment of Investment Analysis version 2.1
O&M	167,628	Feasibility study 2005[9]
Fair value	0	The capital expenditures have been fully devaluated in 20 years (in accordancewith local accounting regulations[10]

[6] *Policy Reform for Sustainable Energy in Latin America and the Caribbean, Policy Series #5.* Organization for American States, Unit of Sustainable Development and Environment.

[7] CDM case study for Papaloate Hydroelectric Project, December 2001f

[8] General electricity law article 68 and it is supported by correspondence between the Electricity management of SIGET and Project developer.

[9] As stated in the feasibility "The O&M is calculated as a percentage of the costs of the civil EPC, electromechanical EPC and transmission line.")

Total Installed Capacity (MW)	2	Feasibility study 2005
Annual Power Supplied to grid (MWh)	9,931,412	Feasibility study 2005
Income tax (%)	25	Tax law of El Salvador [11]
Electricity tariff ($/MW)	68.95	Period January 2004 – December 2004 by request of the DOE to change the value of 64 US$/MW included in the Feasibility study 2005[12]
Total Investment	3,902,909	Feasibility study 2005

Table 4. Main parameters and assumptions for Project

The financial results are:

	Without CDM Revenue	With CDM Revenue
IRR	9.13%	9.50%
NPV	-$223,985	-$130,496

Table 5. Financial Indicators Results

Note: The calculation of Project IRR can be reproduced transparently in the Financial Spreadsheet made available to the DOE.

The application of the discount rate applicable to generation activities emerge from General Electricity Law,and it is supported by the correspondence between SIGET and Papaloate. This is based on the information available and considering that for 2004-2005 the SIGET recommended to apply the value of 10%.

Therefore for the Papaloate Hydroelectric Project in order to be conservative and consistent with the electricity tariff (January 2004-December 2004) as per DNV's request, it is has applied the value fixed in the mentioned Law..

Sensitivity Analysis

A sensitivity analysis was carried out in order to conclude whether the financial attractiveness is strong to reasonable variations in the critical assumptions. The parameters that were taken into consideration to prove the financial attractiveness were:

[10] (Tax Law of El Salvador, (Ley de impuestos sobre renta de El Salvador), page 18, Numeral 3 of Article 30)

[11] Tax Law of El Salvador, (Ley de impuestos sobre renta de El Salvador), page 23, Article 41, http://www.bancohipotecario.com.sv/Red_Hipotecario/Asesor_Legal/Ley_de_impuesto_sobre_la_renta_de_El_Salvador.pdf

[12] As stated in the feasibility study, the value used of 64US$was taken from current offers for the electricity made by commercial companies of the country"

- Capital Expenditures
- Generation variation
- Operating Costs[13]
  Price Variation[14]

Sensitivity Aanalysis	
Variable	**Turning point to "reach" the benchmark of 10%**
Investment Variation	-5.95%
Average Generation Variation	+4.95%
O&M Variation	-18.70%
Average price variation	+4.95%

Table 7. Diverse parameters for the Project IRR

Concerning the parameters analyzed in the sensitivity analysis, the investment costs were calculated since the feasibility study and if any variation this is more likely to increase; however in the financial analysis the increase due inflation has been already considered.

The generation variation depends directly on the hydrology of the resource, for the project, the feasibility study included the hydrology data of the last 39 years, and the demand of the energy according to the SIGET statistics is to increase the renewable energy and not to present a decrease in the demand.

The O&M costs are more likely to increase than present a decrease, due the fact that the costs considered in the feasibility study were the lowest market prices, as shown in the following table:

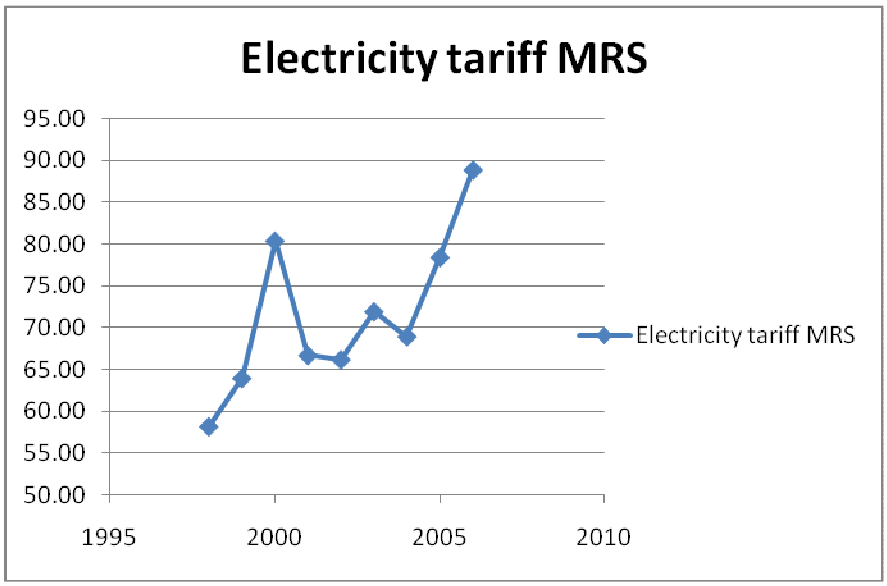
Year	Variation (Inflation rate)
2003	2,50%
2004	5,40%
2005	4,30%
2006	4,90%
Average	4,28%

Source: BCR (Central Bank of El Salvador) /
http://www.sieca.org.gt/Publico/CA_en_cifras/Boletin_Estadistico/16.1/Inflacion.pdf

The electricity tariff presents the following trend:

[13] The O&M costs represent approximately 27% which constitutes more than 20% of the total project revenues, therefore they are subject to reasonable variations.

[14] As stated in the feasibility study, the value used of 64US$was taken from current offers for the electricity made by commercial companies of the country"



As shown in the figure, the electricity tariff has presented during the last eight years a trend to increase; however the tariff presented two decreases from 2000 to 2001 and from 2003-2004.

In conclusion, as shown in the table of the financial results, the project without the CDM revenue is 0.87% below the benchmark and therefore is not financially attractive.

For a small project as the Papaloate Hydroelectric Project, and considering the results of the sensitivity analysis the CDM revenue will contribute to alleviate the forecasted costs and will contribute to secure the sustainability of the project.
In response to DNV request, financial results at the closure of 2008 are:

With CER's
Internal rate of Return:5.21%
Net Present Value: (1,529,366)

Without CER's
Internal rate of Return: 4.86%
Net Present Value: (1,630,493)

Barrier due to Prevailing Practice
Although the region of Central America historically had a large amount of hydropower, a number of factors have led to the increased use of fossil fuels over the last 20 years. The reason this happened was because of the liberalization of the power sector with an increased reliance on short term Power Purchase Agreements (PPAs) which has affected small scale project, the increased availability of resources and the reduced costs associated with fossil fueled facilities because of the low initial investment (As noted in the Document of Development of the System for promotion of Renewable Energy Small Scale Projects in El Salvador by the Energy and Environment partnership of Central

America, EEP and MARN[15]). Additionally, the competitive market that has resulted from the liberalization of the Salvadoran market places a great emphasis on short-term "spot market" prices and a premium on existing generation and new generation investments that have very short construction lead times and low initial capital cost, such as thermal plants. Therefore, renewable energy projects are inherently disadvantaged by the structure of the electricity markets[16].

The enactment of the General Electricity Law of 1996[17] has promoted the competitiveness of the electricity market in El Salvador by allowing the development of a wholesale electricity market. This law has led to the development of mainly fossil fuel fired power plants by large private companies due to the volatility of the spot market price and the shorter payback period (more electricity, sooner), lower cost per unit and lower risk of thermal projects. Other grid activities include the refurnishing of large scale hydroelectric facilities by the state owned *Comisión Ejecutiva Hidroeléctrica del Río Lempa* (CEL) and the installation of geothermal plants by La Geo, S.A. de C.V. At present it is important to state that AES Power Company plans to construct a 220 MW Greenfield coal-fired power plant, which will go online in 2009[18]; this project was in advanced stages of development[19].CEL has awarded the development of a new 50MW thermal facility to Wartsila (a Finnish power plant developer).[20] There is also the installation of 50 MW of fossil fuel generation from Talnique[21] thermal plant. Needless to say the 96 MW Acajutla thermal power plant from Duke Energy was installed in record time even though there are high fossil fuel prices, which beats any small scale hydroelectric process (this is stated in article from El Diario de Hoy)[22].
This prevailing practice of thermal facilities is further demonstrated by establishing that four of the most recently constructed facilities in the Salvadoran grid are fossil fuel plants further demonstrating the prevailing practice of thermal facilities[23] (the installation time for the thermal power plants (such as the one mentioned above) is not comparable to a Small Scale Hydro Power Plant because a small scale hydro does not manage a one site installation (meaning that there are diverse installation sites for infrastructures, which may take longer); only the equipment

[15] Document of Development of the System for promotion of Renewable Energy Small Scale Projects in El Salvador. From MARN and Energy and Environment Partnership, EEP, page 2.

www.sica.int/busqueda/busqueda_archivo.aspx?Archivo=odoc_3863_1_10112005.pdf

[16] *Policy Reform for Sustainable Energy in Latin America and the Caribbean, Policy Series #5.* Organization for American States, Unit of Sustainable Development and Environment. 2004

[17] *Ley General de Electricidad, Decreto Legislativo No 843 del 10 de Octubre de 1996. El Salvador* http://www.jurisprudencia.gob.sv/reformas/LeyGenElec/Decreto%20No%20405.htm

[18] Reference AES article on the construction of 220 MW coal fired plant Reference from local Newspaper Diario de Hoy, 2005

http://www.elsalvador.com/noticias/2005/08/22/negocios/neg8.asp

[19] *Annual Report*. AES Corporation, 2005, http://www.aes.com/aes/index?page=country&cat=SV

[20]Reference from local Newspaper Diario de Hoy, 2006
http://www.elsalvador.com/noticias/2006/01/25/negocios/neg1.asp

[21] Reference from local Newspaper, la prensa, http://www.laprensagrafica.com/lodeldia/6619.asp

[22]Reference from local Newspaper Diario de Hoy,2000

http://www.elsalvador.com/noticias/EDICIONESANTERIORES/2000/NOVIEMBRE/noviembre2/NEGOCIOS/negoc4.html

[23] General Superintendent of Electricity and Communication (SIGET), http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20072024.pdf page 60

installation, in the case of Papaloate, took up to two months and a half for only one Pelton turbine compared to the plant previously mentioned. Therefore it can be concluded that the installation time for a small scale project is higher than for a thermal power plant, which is a common practice. Therefore to maintain the current baseline scenario would lead to higher emissions. It can be concluded that to make the project activity a CDM project would help break barriers of prevailing practice, due to the fact that the project would be first small scale hydro CDM project to be registered in El Salvador.

SUMMARY

As a result, the current and expected use of predominantly fossil fueled thermal sources to expand the country's generation capacity, the existence of only large scale hydro projects, as well as the combination of a lack of access to finance and perceived risks of the small-scale hydropower technology, clearly demonstrates that the Papaloate Hydroelectric Project is additional and therefore not the baseline scenario. The barriers for the implementation of hydropower technology that exist in El Salvador are confirmed by the observed trend in recent thermal capacity additions and the lack of small-scale hydropower in the total electricity generation in the country.

It is important to state that the CDM was always considered and was an intrinsic part in the development of the project. As can be seen in the following project time table, Papaloate had developed a case study for CDM financing since 2001, consequently the project was considered a CDM project throughout the 5 years of its development.

	Events	Date	Justification or Source
1	CDM case study for Papaloate Hydroelectric Project from Geoingeniería	December 1, 2001	The case study was developed in order to establish that Papaloate as a small scale project, would have dificulty in assigning funds for the CDM studies needed to register the CDM small scale project. CDM Case study from Geoingeniería S.A.
2	Papaloate is included in a study for Potential CDM projects in Central America by Central American Commission of Environment and Development, (CCAD)	July 1, 2002	The report states that papaloate has the potential to reduce Carbon emissions. Final Report , Potential of the Mesoamerican Biological Corredor in the Clean Development Mecanism by CCAD and UICN. page 25
3	Correspondence between Bank of El Salvador and Project Developers on CDM project scenario	February 16 2005	Bank of El Salvador sent an email that stated the banks worry about the low IRR of the Project, and the response stated from papaloate was that the IRR with CERs income changes the project scenario and establishes a positive change in the projects financ
			The source is the financial scenario with/without CERs presented to the bank
4	**Executive decision of Sociedad Papaloate for the approval of the investment**	**June 15, 2005**	**Certification of Board of Directors meeting where it was stated that CDM was esential for the approval of the project**
5	Validation offer from DOE	January 12, 2006	Project developer recieved and offer from DNV to Validate the CDM project
6	Correspondance from DNA about CDM opportunities	February 7, 2006	Email Memorandum from DNA to Project Developer which states that the DNA will support the small scale projects like Papaloate
7	Correspondance between DNA about the New baseline of El Salvador	February 8, 2006	Email Memorandum from the DNA sent the last official baseline at the time for small scale projects
8	Offer for the Sale And Purchase of CERs by CDM brokers	February 9, 2006	The offer was established with a Letter of commitment from CDM Brokers
9	**Start date of Project Activity**	**February 13, 2006**	**The starting date of the project is the date of purchase of the Turbines from WKV**
10	Sigining of Letter of Commitment with CDM Brokers	June 12, 2006	The project developers signed a termsheet with CDM brokers for the development of PDD, validation, and sale and purchase of CERs
11	Signing of Validation contract with DOE	August 10, 2007	Short Form Agreement signed with DNV Climate Change Services
12	Official Termination of Termsheet with CDM broker	August 23, 2007	Termination of the Termsheet with CDM Broker due to fallen negotiations
13	**Validation Site Visit**	**October 8, 2007**	**Validation site visit can be confirmed in the UNFCCC website**
14	Inssuance of Letter of Approval from DNA	October 22, 2007	DNA issued a Letter of approval signed by DNA
15	**Project Comissioning**	**February 1, 2008**	**Project commissioned upon the signing of the PPA on February 2008**
16	Signing of Letter of Intent with CAF CDM facility	June 27, 2008	The project Developer signed a letter of intent with CAF CDM facility for the purchase and sale of CERs
17	Signing of ERPA with CAF CDM facility	September 26, 2008	ERPA signed between Sociedad Papaloate and CAF CDM Facility

The approval of the CDM will help overcome the barriers mentioned for a small scale project such as this due to the fact that it will be the first small scale hydroelectric project from El Salvador registered in the CDM[24]. The CDM will help the development of the project financially which will consequently open way for new small scale hydroelectric technology thus breaking the technological barriers present and prevailing practice barriers. The Project Activity as a CDM Project will establish a precedent in the country and will help small scale renewable energy projects to develop.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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As specified for project category Type I.D (AMS-I.D), version 13 EB36, paragraph 9,for all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an

[24] This can be seen in www.unfccc.int, Project search; Host Country: El Salvador.

emission coefficient (measured in kg CO2e/kWh) calculated in a transparent and conservative manner as:

- A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'.

- The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Papaloate determines that the appropriate baseline is the average of the "operating margin" and the "build margin". Due to the fact that greater than 50% of the grid is from low cost/must run resources, the simple adjusted OM was calculated, as according to "Tool to calculate the emission factor for an electricity system", version 1, EB35.

The data vintage used is ex-ante, the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, which for Papaloate would be 2004, 2005, 2006. The Operating Margin emission factor is calculated *ex-ante* and fixed for the first crediting period. It will be up dated at the renewal of the crediting period. From "Tool to calculate the emission factor for an electricity system", a baseline emission factor (*EFy*) is calculated as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the following three steps:

Calculate the operating margin emission factor(s), **(EF_{OM})** based on one of the following methods:

a) Simple operating margin (OM)
b) Simple adjusted OM
c) Dispatch data analysis OM
d) Average OM

The first methodological choice should be dispatch data analysis(c) yet not enough information was obtained for this approach. The Simple operating margin (a) 'Simple OM' method is applicable to a project activity connected to the project electricity system (grid) where the low-cost/must-run resources[25] constitute less than 50% of the total grid generation, as can be seen in Annex 3 this cannot be applied for the Papaloate Hydroelectric project because it is not the case.

The average emission rate method or OM (d) can only be used when the methodological guidance as described under option (a) is not available, yet this method is oversimplified and does not reflect the correct scenario in the baseline.

Finally, the Simple adjusted OM (b) methods is applicable to the project activity connected to the project electricity system (grid) where the low-cost/must-run resources constitute more than 50% of the total grid generation[26]. Therefore Papaloate determines that the simple adjusted OM is adequate and should be used for the appropriate baseline calculation.

[25] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation "tool to calculate the emission factor for an electricity system ver 1 EB35

[26] See Annex 3, the Generation data for all plants in El Salvador, taken from baseline by DNA http://www.marn.gob.sv/?fath=&categoria=324 and the source is Unidad de Transacciones of El Salvador.

The data vintage used is ex-ante, the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission. The OM emission factor for Papaloate is fixed for the first crediting period and it will be updated in the renewal of the crediting period.

- **Calculate the Operating Margin (OM)**

***Simple Adjusted OM*.** This emission factor (EF_{OM},*simple adjusted,y*) is a variation on the previous method, Where the power sources (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*j*):

$$EF_{OM,simple\overline{a}djusted,y} = (1-\lambda_y).\frac{\sum_j FC_{i.j,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_j EG_{j,y}} + \lambda_y \frac{\sum_{i,k} FC_{i,k,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_k EG_{k,y}} \quad \text{(Equation 1)}$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
		The fossil fuel types consumed are Diesel and fuel oil no. 6
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
		Heat rate taken from Source: EIA - AEO 2007 (Appendix G)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
		The NCV and EF_{CO2} are taken from each fossil fuel type, being in El Salvador, Diesel and Fuel Oil number 6.
		Values taken from Source: IPCC Guidelines (2006)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
		Information is provided by Unidad de transacciones or Transaction Unit of El Salvador.(www.ut.gob.sv)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) 2004-2006
k		the *k* group of plants includes hydro, biomass, and geothermal stations, its fossil fuel consumption equals zero and therefore the entire second term in equation 1 one is null.

λ_y =	=	number of hours per year for which low-cost/must run sources are on margin/ 8760 hours per year ***Information is provided by Unidad de transacciones or Transaction Unit of El Salvador.(www.ut.gob.sv)*** and SIGET – *(*) Weights are defined, as per methodology, as the annual generation divided over the sum of the three year's generation.*

where lambda (λ_y) should be calculated as follows:

Step i) Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the year y, and sort the load data from the highest to the lowest MW level.

Step ii) Collect power generation data from each power plant / unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants / units (i.e. $\Sigma_k EG_{k,y}$).

Step iii) Fill the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low-cost/must-run power plants / units (i.e. $\Sigma_k EG_{k,y}$).

Step iv) Determine the "Number of hours for which low-cost/must-run sources are on the margin in year y". First, locate the intersection of the horizontal line plotted in step (iii) and the load duration curve plotted in step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, then one may conclude that low-cost/must-run sources do not appear on the margin and λ_y is equal to zero.

- **Calculate the Build margin emission factor**

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{(Equation 2)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

		The accumulated generation delivered to the grid is 1,200,115 Mwh, and the information is provided from UT, SIGETand DNA
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
		In order to calculate the CO_2 emission factor of each power unit, the Net Calorific Value and the CO_2 emission factor of fossil fuel type had to be obtained, as stated before from the IPCC 2006 default values and values from EIA-AEO 2007.
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available , which would be 2006

- **Calculate the combined margin emissions factor**

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = (EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}) \quad \text{(Equation 3)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

For the Papaloate Hydroelectric project the following values apply: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period unless otherwise specified in the approved methodology which refers to this tool[27].

Baseline ***emissions***

$$BE_y = (EG_y - EG_{baseline}) * EF_y \quad \text{(Equation 4)}$$

[27] Established by the "Tool to calculate the emission factor for an electricity system" for this type of projects

The estimated anthropogenic emissions by sources of GHG of the baseline are the product of the electricity supplied by the project to the grid (*EGy* in *MWh*) times the baseline emission factor (*EFy*).

Based on assumptions about Papaloate and findings in the feasibility study, the installed capacity will be 2 MW. The Project will have an annual electricity generation of 9,931 MWh per year.

Emission Reductions

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:

$$ER_y = BE_y - Leakage \quad \text{(Equation 5)}$$

Leakage

- As per methodology AMS-ID states: If the generating equipment is transferred from another activity leakage is to be considered.

For the Papaloate Hydroelectric Project, the generating equipment is not transferred from another activity.
Therefore:

- LEy = 0

(

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

Data / Parameter:	**Electricity by generating units**
Data unit:	MWh
Description:	Annual energy produced by the plants connected to the grid during 2004, 2005 and 2006
Source of data used:	SIGET (www.siget.gob.sv) and Unidad de Transacciones, UT (Transaction Unit) of El Salvador.www.ut.gob.sv
Value applied:	Please see annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electricity generated by the plants data is used to calculate the apparent fuel consumed per plant and Operating Margin and Build Margin. The data used is ex-ante, the full generation-weighted average for the most recent 3 years for which data are available. Electricity is measured trough equipment measurement installed in each plant.
Any comment:	The data shall be archived electronically and kept at least 2 years after the end of the last crediting period.

Electricity generation

Data / Parameter:	Fuel consumption of each generating unit
Data unit:	Gal
Description:	Fuel used by the units connected to the grid
Source of data used:	MARN (Ministerio del Medio Ambiente y Recursos Naturales, in English: "Ministry of Environment and Natural Resources"), El Salvador.

Value applied:	Data for the 2004-2006 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values obtained by the DNA, MARN are used to calculate CO2 emissions produced for the operating and build margins. FC will be monitored once for each crediting period ex-ante using the most recent three historical years for which data is available at the time of submission of CDM-PDD.
Any comment:	The data shall be archived electronically and kept at least 2 years after the end of the last crediting period.

Fuel Consumption

Data / Parameter:	NCV of fuel oil
Data unit:	MMBtu/000 gal
Description:	Net calorific Value (energy content) of fuel no 6
Source of data used:	Annual Energy Outlook, EIA-AEO 2007 appendix G Appendix G (available at: www.eia.doe.gov/oiaf/archive/aeo07/index.html)
Value applied:	149.690
Justification of the choice of data or description of measurement methods and procedures actually applied :	Obtained in order to calculate the carbon emission factor No local or regional data is publicly available. EIA values have been used since they do not require previous conversion from volume to mass units.
Any comment:	Obtained in order to calculate the Simple adjusted OM. This information can also be provided by the DNA. The data shall be archived electronically and kept at least 2 years after the end of the last crediting period.

Net calorific Value of Fuel Oil

Data / Parameter:	NCV of diesel
Data unit:	MMBtu/000 gal
Description:	Net calorific Value of diesel
Source of data used:	Annual Energy Outlook, EIA-AEO 2007 appendix G
Value applied:	138.071
Justification of the choice of data or description of measurement methods and procedures actually applied :	Obtained in order to calculate the carbon emission factor No local or regional data is publicly available. EIA values have been used since they do not require previous conversion from volume to mass units
Any comment:	Obtained in order to calculate the Simple adjusted OM. The data shall be archived electronically and kept at least 2 years after the end of the last crediting period.

Net calorific Value of diesel

Data / Parameter:	$EF_{CO2,m,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type i in year y, (fuel oil and Diesel)
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National Greenhouse Gas Inventories. (available at http://www.ipccnggip.iges.or.jp/public/2006gl/index.html)
Value applied:	Fuel Oil: 0.079652273 Original value: 75,500 $KgCO_2/TJ$ Diesel: 0.076592782 Original value: 72,600 $KgCO_2/TJ$
Justification of the choice of data or description of measurement methods and procedures actually applied :	The OM will be monitored once for each crediting period ex-ante using the most recent three historical years for which data is available at the time of submission of CDM-PDD. The BM will be monitored the first crediting period, once ex-ante. For the second and third crediting period, only once ex-ante at the start of the second crediting period.
Any comment:	Obtained in order to calculate the Simple adjusted OM. The data shall be archived electronically and kept at least 2 years after the end of the last crediting period. Conversion from TJ to MMBtu was made considering 947.87 MMBtu/TJ (from unit-converter.org).

Emission Factor for fuel type

Data / Parameter:	$EF_{Grid, OM-adj\ 2004-20061}$
Data unit:	tCO_2/Mwh
Description:	Operating margin emission factor (Simple adjusted OM)
Source of data used:	Calculated using data from MARN, SIGET and IPCC according to the equations presented in "Tool to calculate the emission factor for an electricity system" ver 1 EB35
Value applied:	0.6747
Justification of the choice of data or description of measurement methods and procedures actually applied :	All input data is from official sources
Any comment:	Obtained in order to calculate the Simple adjusted OM. The data shall be archived electronically and kept at least 2 years after the end of the last

	crediting period.

Data / Parameter:	$EF_{Grid, BM-adj 2006}$
Data unit:	tCO_2/Mwh
Description:	Build margin emission factor
Source of data used:	Calculated using data from MARN, SIGET and IPCC according to the equations presented in "Tool to calculate the emission factor for an electricity system" ver 1 EB35
Value applied:	0.5780
Justification of the choice of data or description of measurement methods and procedures actually applied :	All input data is from official sources
Any comment:	Obtained in order to calculate the Simple adjusted OM. The data shall be archived electronically and kept at least 2 years after the end of the last crediting period.

Data / Parameter:	$EF_{Grid, CM-adj 2004-2006}$
Data unit:	tCO_2/Mwh
Description:	Combined margin emission factor
Source of data used:	Calculated using data from MARN, SIGET and IPCC according to the equations presented in "Tool to calculate the emission factor for an electricity system" ver 1 EB35
Value applied:	0.626
Justification of the choice of data or description of measurement methods and procedures actually applied :	All input data is from official sources
Any comment:	Default weights were used (0.5 for each EF)

B.6.3 Ex-ante calculation of emission reductions:

>>

The baseline emissions factor is calculated as in AMS I.D. Ver. 13 which refers to "Tool to calculate the emission factor for an electricity system" ver 1 EB35. According to the Tool,the

baseline emission factor (*EFy)* is calculated as a combined margin (*CM*), consisting of the combination of operating margin (OM) and build margin (BM) factors. For the purpose of determining the build margin and the operating margin emission factors, the project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Similarly, the connected electricity system is defined as the electricity system that is connected by transmission lines to the project electricity system and in which power plants can be dispatched without significant transmission constraints.

From "Tool to calculate the emission factor for an electricity system", a baseline emission factor (*EFy*) is calculated as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the following three steps:

***Step 1: Simple Adjusted OM*.** This emission factor ($EF_{OM,simple\,adjusted,y}$) is a variation on the previous method, Where the power sources (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*j*):

$$EF_{OM,simple\,adjusted,y} = (1-\lambda_y).\frac{\sum_j FC_{j,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_j EG_{j,y}} + \lambda_y \frac{\sum_{i,k} FC_{i,k,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_k EG_{k,y}}$$

(Equation 1)

EF_{om} (2004-2006) = 0.6747

Complete calculation can be seen in Annex3 of this document named, Baseline Information.

Step 2: Calculate the build margin emission factor (*EFBM,y*) as the generation weighted average emission factor (tCO2e/MWh) of a sample of power plants *m*, as follows:

$$EF_{grid,BM,y} = .\frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

(Equation 2)

Results:

EF_{BM} = 0.5780

Complete calculation can be seen in Annex3 of this document.

Step 3: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{gridCM,y} = EF_{grid,OM,y} * w_{OM} + * EF_{grid,BM,y} * w_{BM}$$ (Equation 3)

Where:

All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period

$$EF_{gridCM,y(2006)} = 0.6747*0.5+*0.5780*0.5 = 0.626$$

Summary of calculations:

	CEF (tCO2/MWh)
Operating Margin	**0.6747**
Build Margin	**0.5780**
Combined Margin	**0.626**

Step 4: Baseline emissions

$$BE_y = (EG_y - EG_{baseline})* EF_y \text{ (Equation 4)}$$

The estimated anthropogenic emissions by sources of GHG of the baseline are the product of the electricity supplied by the project to the grid (*EGy* in *MWh*) times the baseline emission factor (*EFy*).

Based on assumptions about Papaloate and findings in the feasibility study, the installed capacity will be 2 MW. The Project will have an annual electricity generation of 9,931 MWh per year.

Therefore, the baseline emissions are:

9,931 MWh/yr* * 0.626 *tCO$_2$/MWh* = 6,217 *tCO$_2$/yr

Step 5: Leakage

Leakage

As per methodology AMS-ID, states:

- If the energy generating equipment is transferred from another activity, leakage is to be considered.

For the Papaloate Hydroelectric Project, there generating equipment is not transferred form another activity.

Therefore:

$LE_y = 0$

Step 6: ***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:

$$ER_y = BE_y - Leakage \text{ (Equation 5)}$$

For the proposed project activity:

$$ER_Y = 6{,}217\ tCO_2e \text{ per year} - 0 = 6{,}217\ tCO_2e \text{ per year}$$

Summary of Output Calculations:			
MW	**Annual MWh**	**CEF**	**Annual Emission Reductions (tCO2e)**
2	9,931	0.626	6,217

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

>>Refer to Annex 3 for further information about the grid.

Period*	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
1	0	6,217	0	6,217
2	0	6,217	0	6,217
3	0	6,217	0	6,217
4	0	6,217	0	6,217
5	0	6,217	0	6,217
6	0	6,217	0	6,217
7	0	6,217	0	6,217
Total Tonnes CO2e		43,518	0	43,518

*Note: using 12 monthly periods from the start of the crediting period, not using calendar years. It is expected to start the crediting period on May 2010, or the date of registration whichever occurs later.

Table 9. Annual estimated emission reductions

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**Electricity generated**
Data unit:	MWh/yr
Description:	Electricity generation

Source of data to be used:	Grid electricity meter
Value of data	9,931
Description of measurement methods and procedures to be applied:	The electricity generated by the Project will be supplied to the Salvadoran grid. To measure exact generation, a metering instrument will be installed. The metering system will be acquired from a recognized experienced manufacturer that will provide installation and operation guarantees. This generation data will be used for the calculation of the certified emission reductions (CERs).
QA/QC procedures to be applied:	The meter will be subject to periodic auditing as per grid operator requirements. The readings on this meter will be compared with actual invoices received by the grid operator. In the event of a malfunction in the metering system, a back-up meter available on the project site will be used to track the amount of electricity being generated. Sales records to the grid and other records, e.g. maintenance and plant shut-down records, will be 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:	The information will be kept for 2 years after the last crediting period.

Table 10. Electricity generation

B.7.2 Description of the monitoring plan:

>>

The Monitoring Plan (MP) for the Papaloate Hydroelectric Project. The MP presents a plan to meet the requirements for the collection, processing and auditing/verification of data required to fulfill the requirements in decision 17/CP.7; document FCCC/CP/2001/13/Add.2 of the Kyoto Protocol.

The Monitoring Plan is a document that details the monitoring set up for the project (equipment, data and organization). The manual provides specific details of the equipment (type, make, model, serial number, calibration requirements, maintenance requirements etc.), data (the data collected and the flow of this data from the instrument through to the CER calculation) and the organization (roles and responsibilities in the process, covering staff etc.). The Monitoring Plan will detail the onsite procedures that will be followed for monitoring (existing procedures will be detailed, or else the MM will detail new procedures that the staff will follow, developed with staff input).

Main elements to be monitored

1. Electricity generation.

All monitoring equipment will be subject to regular maintenance, testing and calibration, following instructions in the equipment manuals.

Organization

In order to ensure the successful operation of the project and the credibility and verifiability of the emission reductions achieved, the project must have a well-defined management and operational system. It is the obligation of the operator to put such a system in place. It must include the operational procedures and responsibilities associated with the monitoring activities and adequate record keeping of the described variables in the Monitoring Plan. The table below provides an overview of key tasks, indicating who is responsible for their implementation and day-to-day management.

Operational Procedures and Responsibilities

The Operational Manager at the Papaloate Hydroelectric Project has overall responsibility for the proper implementation and upkeep of the required tasks and their adequate management.

Moreover, if an update of the Monitoring plan is deemed necessary to meet operational requirements e.g. if there are changes in the personnel structure or in the type of equipment used, it is the responsibility of the Operational Manager to suggest such adjustments.. Once such adjustments have been approved, the Operational Manager will distribute the updated version of the Monitoring Manual to all parties and ensure that all old versions are no longer in use.

Operational procedures and monitoring responsibilities

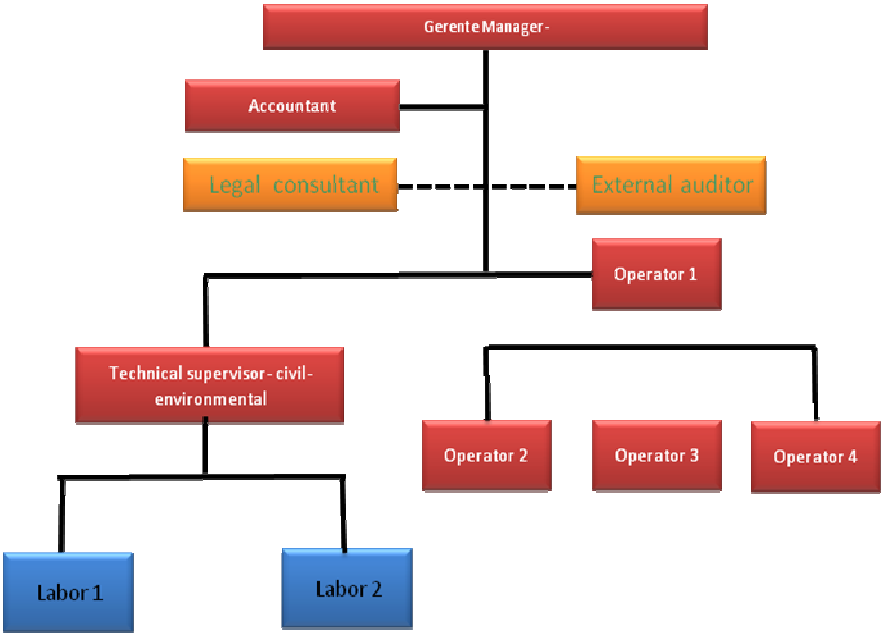
Task	Operation Team Personnel	Operator 1	General Operational Manager	Equipment Supplier/ External Company
Collect Data	E	R	N/A	N/A
Enter data into Workbook	N/A	E	R	N/A
Archive data & reports	E	N/A	R	N/A
Calibration/ Maintenance; Rectify faults	N/A	N/A	I	E

E = Executive responsibility
R = Responsibility for overseeing and assuring quality
I = To be informed

Operation and management of the Papaloate project will be carried out by the Sociedad Hidroeléctrica Papaloate SA de CV. Support will be given by Grupo Terra, an operator with experience with more than 400 MW of renewable energy plants in Honduras.

Project Operation

The authorities of project management are distributed in the preceding organization structure as follows:



The shift operator in charge of the Project will record the net generation of the Papaloate 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. In the case of any setbacks the meter has 2 back up meters and the computer also registers the data automatically. The data will be kept in storage for two year after the end of the last crediting period. Leakage will not be considered because the energy generating equipment will not be transferred from another activity.

Quality Assurance and Quality Control

- If abnormalities are detected than the operation manager will repair, recalibrate or replace the meter.
- It is clear that the government entity responsible for the monitoring of data of the project is also Private entity AES- CLESSA, which has a remote control to carry out verification of the data generated from its offices.
- It is important to state that the Operating manager shall be informed.

The steps in order to verify the generation are:

- Read both backup meters directly
- Obtain data from the computer logs
- AES- CLESSA may also verify in there office logs.

An internal audit will also be developed by the project developer in order to assure accurate completion of the monitoring report. This audit will carry out inspection in order to develop reports for the future verifications.

The complete monitoring plan structure is specified in Annex 4.

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

>>

The baseline and monitoring methodology was completed by Sociedad Hidroeléctrica Papaloate 01/02/08 (contact: Jose Ramon Miralda, +504 236-8788, email jmiralda@terra.hn

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:

>>

13/02/2006 (confirmed with the purchase of the electromechanical equipment)

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

>>

50y-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:

>>

01 May 2010or the date of registration of the CDM project activity, whichever occurs later.

C.2.1.2. Length of the first crediting period:

>>

7 y-0 m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

N/A

C.2.2.2. Length:

>>

N/A

SECTION D. Environmental impacts

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

>>

In accordance with the Environment and Natural Resources Ministry of El Salvador, an Environmental Impact Study was prepared for the Papaloate Hydroelectric Project.[28]

Through the analysis and evaluation of the environmental impacts, most of the adverse impacts that the development of the project will bring occur during the construction phase. It was found that most impacts are related to the reduction of the volumes of coffee produced, the movement of significant volumes of soil for the foundation of the structures and the deviation of a part of the river in a 2.5 km long section from which the maximum of 1.2 m3/s will be used.

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

>>

The study proposes a series of measures that intend to prevent major adverse impacts to the ecosystem and mitigate any negative affects that may occur during the development of the project. The appropriate application of these measures will assure that the adverse impacts will be of a low magnitude. Mitigation measures are planned for the following areas:

- Soil
- Water
- Vegetation
- Fauna
- Agriculture
- Economics (regarding re -establishment of local coffee plantations after construction)
- Infrastructure (construction of a foot bridge to cross the river).

In conclusion, considering the small size of the project and the very low volume-1.2 m^3/s- of water that will be utilized, it is considered that the negative impact to the zone of the project will be minimal.

SECTION E. Stakeholders' comments

>>

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

>>

Information about the Papaloate Project was published on 20 December 2001 in two Salvadorian newspapers, *La Prensa Grafica* and *El Diario de Hoy*. A description about the project activity was

[28] The DNA (MARN) does not requiere the monitoring of social environmental indicators as it would be stated in the Environmental Resolution (DNV has a copy) and it is confirmed by the DNA in correspondence to Papaloate stating that in the framework of CDM, the DNA does not monitor social and environmental indicators.

given and stakeholders were invited to provide their comments and questions. (this has been shown to the DOE)

E.2. Summary of the comments received:

>>

No comments were received.

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

>>

As no comments were received, no action was necessary.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sociedad Hidroelectrica Papaloate S.A. de C.V.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

As stated in the Letter of Approval from the State of the Netherlands Ref. IZ/2009030650 dated April 23rd, 2009, the Public funding received for the project does not result in a diversion of official development assistance and is separate from and not counted towards the financial obligations of the State of the Netherlands in that respect.

Annex 3
BASELINE INFORMATION[29]

A. Generation and Emission Rates by Unit for the Most Recent 3 Years

Owner	Unit	Technology	Starting Year	Installed capacity (MW)	Type of Fuel	YEAR 2 (2006) Net Generation (MWh)	YEAR 2 (2006) Fuel Consumption (000 gals)	YEAR 1 (2005) Net Generation (MWh)	YEAR 1 (2005) Fuel Consumption (000 gals)	2004 Net Generation (MWh)	2004 Fuel Consumption (000 gals)
Duke Energy	Acajutla Unit 1	Steam Turbine	1967	30.0	Fuel Oil No. 6	152,597	14,247	123,390	11,389	9,212	863
Duke Energy	Acajutla Unit 1	Steam Turbine			Dies.						
Duke Energy	Acajutla Unit 2	Steam Turbine	1970	33.0	Fuel Oil No. 6					10,133	949
Duke Energy	Acajutla Unit 2	Steam Turbine			Dies.						
Duke Energy	Acajutla Unit 3	Gas Turbine	1992	-	FO						
Duke Energy	Acajutla Unit 3	Gas Turbine			Diesel	72,726	7,850	19,856	2,362		
Duke Energy	Acajutla Unit 5	Gas Turbine	2001	82.1	FO						
Duke Energy	Acajutla Unit 5	Gas Turbine			Diesel					5,661	677
Duke Energy	Acajutla ICE 1	Internal Combustion	2001	99.0	Fuel Oil No. 6	776,457	46,533	782,491	46,110	508,077	29,579
Duke Energy	Acajutla ICE 1	Internal Combustion			Dies.						
Duke Energy	Acajutla ICE 2	Internal Combustion	2001	51.0	Fuel Oil No. 6					261,737	15,238
Duke Energy	Acajutla ICE 2	Internal Combustion			Dies.						
Acajutla Power Plant					FO	**1001,780**	**60,780**	**925,736**	**57,499**	**794,819**	46,629
					Dies.		7,850		**2,362**		677
Duke Energy	Soyapango Unit 1	Gas Turbine	1972	18	Dies.	48,890	3,572	25,408	1,878		
Duke Energy	Soyapango Unit 2	Gas Turbine	1972	18	Dies.						
Duke Energy	Soyapango Unit 3	Gas Turbine	1974	22	Dies.						
Duke Energy	Soyapango Unit 4	Internal Combustion	1974	15	Dies.					34,720	2,566
Soyapango Power Plant					FO						
					Diesel	**48,890**	**3,572**	**25,408**	**1,878**	**34,720**	**2,566**
Duke Energy	San Miguel 1	Gas Turbine	1985	25.3	FO					0	0
Duke Energy	San Miguel 2	Internal Combustion	1992	6.6	Dies.					0	0
San Miguel Power Plant					Fuel Oil No. 6					**0**	0
San Miguel Power Plant					Diesel						
Total Duke Ener						**1050,670.00**	**72,201.69**	**951,144.32**	**61,738.27**	**829,539.59**	**49,872.58**
Nejapa Power	Nejapa ICE 1	Internal Combustion	1995	91.0	Fuel Oil No. 6	808,747	52,161	766,032	49,696	564,939	36,733
Nejapa Power	Nejapa ICE 2	Internal Combustion	1998	53.5	Fuel Oil No. 6					332,134	21,596
Nejapa Power Plant						**808,747**	**52,161**	**766,032**	**49,696**	**897,073**	**58,329**
CESSA	CESSA ICE 1	Internal Combustion	2001	19.2	Fuel Oil No. 6	176,623	10,791	179,292	11,133	116,831	7,235
CESSA	CESSA ICE 2	Internal Combustion	2001	13.4	Fuel Oil No. 6					81,538	5,049
CESSA Power Plant						**176,623**	**10,791**	**179,292**	**11,133**	**198,369**	**12,285**
TEXTUFIL	TEXTUFIL ICE1	Internal Combustion	2000	44.1	Fuel Oil No. 6	227,621	13,495	243,458	14,653	281,827	17,809
Textufil Power plant						**227,621**	**13,495**	**243,458**	**14,653**	**281,827**	**17,809**
LaGeo	AHUACHAPAN	Geothermal water-dominated system	1975 - 1980	95.0	Geothermal	622,600		554,300		514,156	
LaGeo	BERLIN	Geothermal water-dominated system	1992 - 1999	100.2	Geothermal	440,300		427,800		433,928	
LaGeo Geothermal Power Plants						**1062,900**		**982,100**		**948,084**	
CEL	GUAJOYO	Storage	1964	19.8	Hydro	86,900		65,200		36,650	
CEL	CERRON GRANDE	Storage	1979	192.0	Hydro	653,700		578,300		389,715	
CEL	5 DE NOVIEMBRE	Run of River	1956	99.4	Hydro	548,360		541,800		473,309	
CEL	15 DE SEPTIEMBRE	Run of River	1983	180.0	Hydro	668,600		481,700		482,774	
INE	Talnique	Internal Combustion	2006	51.2	Fuel Oil No. 6	14,300	857				
CEL Hydroelectric Power Plants						**1971,860**		**1667,000**		**1382,448**	
CASSA	CASSA (CDM)	Cogenerator	2003	20.0	Baagasse	92,000		54,100		62,420	
CASSA power plant						**92,000**		**54,100**		**62,420**	
CLESA		Distributed generation			Hydro, bagasse	900					
CLESA						**900**					
Total Net Generation					**TOTAL**	**5391,321**		**4843,127** MWh		**4537,341**	
Imports						**11,100**		**322,100**		**466,000**	MWh

Source: Information is obtained by SIGET and MARN.

[29] Ministry of Environment and Natural Resources, *Ministerio de Medio Ambiente y Recursos Naturales and SIGET www.siget.gob.sv*

Operating Margin Value Calculation (Equation 1)

Fuel Coefficients

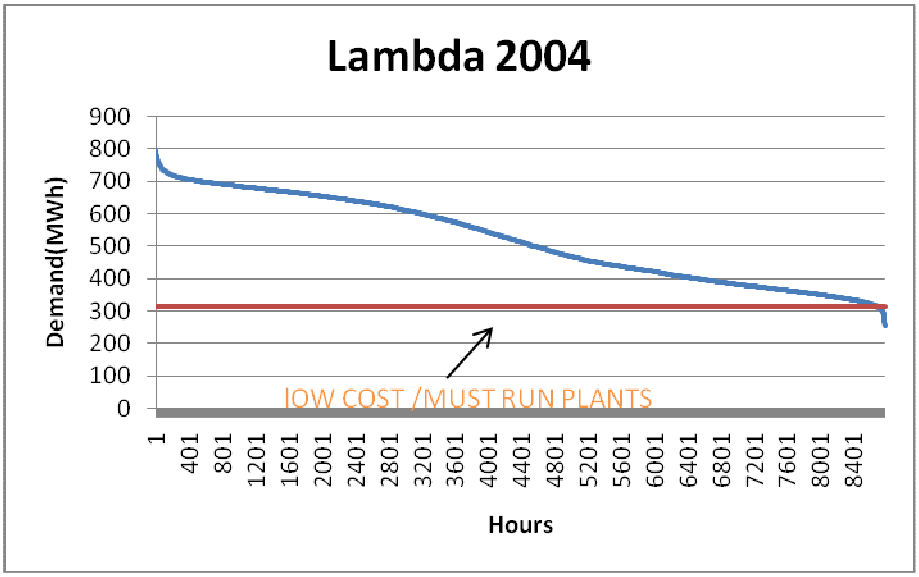
	Fuel Oil	Diesel	
NCV	149.690	138.071	MMBtu/000 gal
EF	0.07965	0.07659	tCO2/MMBtu
	11.923187	10.575275	tCO2/000 gal

Source: IPCC default values

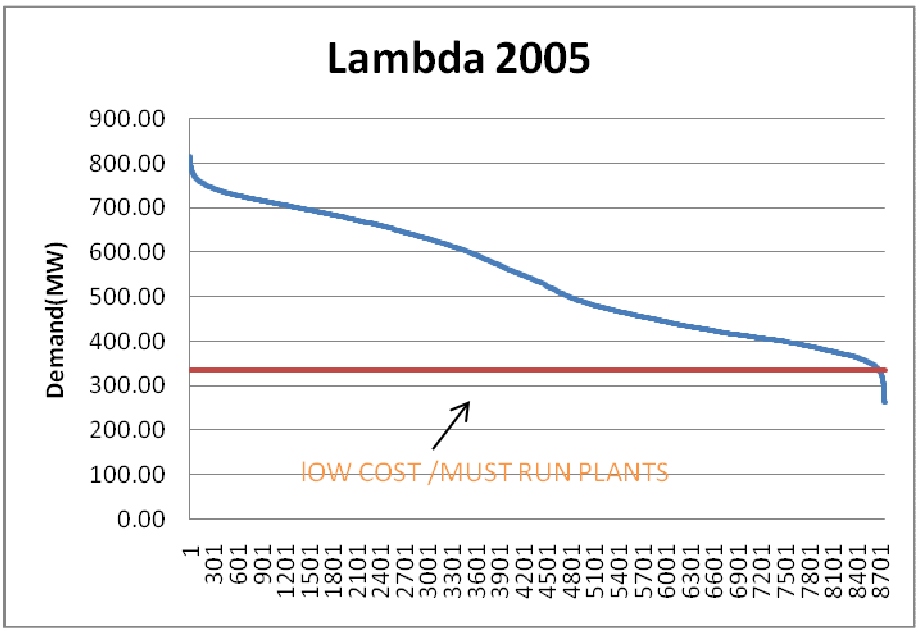
Fuel Type	Generation (MWh)		
	2004	2005	2006
Fuel Oil No. 6	2166,428	2094,663	2156,345
Diesel	40,381	45,264	121,616
Imports	466,000	322,100	11,100
Total	**2672,809**	**2462,027**	**2289,061**

Source: Information is obtained by SIGET and MARN.

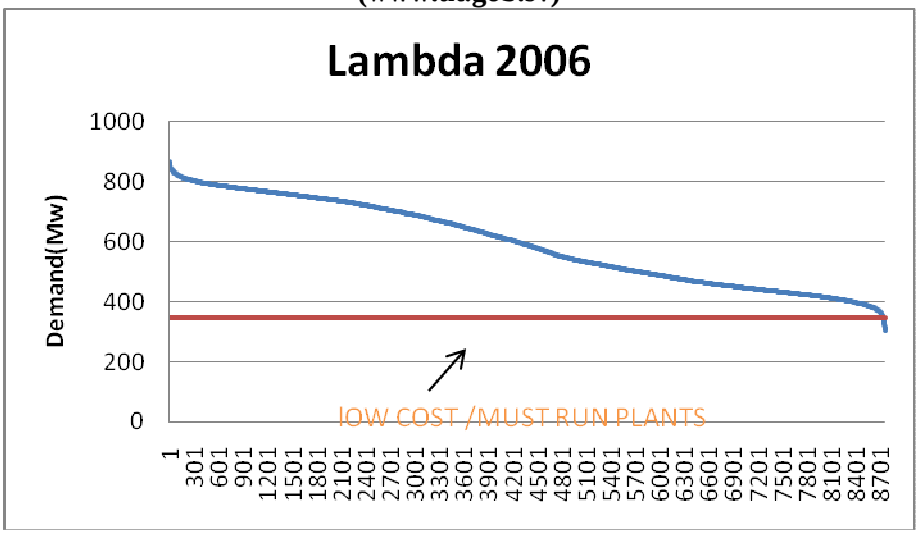
Load Duration Curve 2004
Information provided by Unidad de Transacciones or Transaction Unit of El Salvador (www.ut.gob.sv)



Load Duration Curve 2005
Information provided by Unidad de Transacciones or Transaction Unit of El Salvador (www.ut.gob.sv)



Load Duration Curve 2006
Information provided by Unidad de Transacciones or Transaction Unit of El Salvador (www.ut.gob.sv)



Summary of lambda calculation

Variable	2004	2005	2006	Average
λ	0.010046	0.008219	0.002055	
1-λ	0.989954	0.991781	0.997945	
generation weight	0.307163	0.327863	0.364974	
λ x weight	0.003086	0.002695	0.000750	0.006530
(1-λ) x weight	0.304077	0.325168	0.364224	0.993470

Fuel Type	Volume (000 gals)			COEF	tCO_2		
	2004	2005	2006	(tCO_2/000 gal)	2004	2005	2006
Fuel Oil No. 6	135.052	132.981	138.084	11.923187	1,610	1,586	1,646
Diesel	3.243	4.240	11.422	10.575275	34	45	121
				Total	**1,644**	**1,631**	**1,767**

Generation from fossil fuel powered plants			
Source	**Generation (MWh)**		
	2004	**2005**	**2006**
Domestic	2,206.809	2,139.927	2,277.961
Imports	466	322.100	11.100
Total	2672.809	2,462.027	2,289.061

EF (OM)	**0.6747**	(adjusted with 1-lambda)

Build Margin (Equation2)
Net generation by plant

Units	Technology	Starting Year	Net Generation (MWh)
Talñique	Internal combustion	2006	14,300
15 de septiembre Unit	Hydro	2006	167,106
Cerrón Grande unit 2	Hydro	2005	56,926
CESSA ICE 1 & 2	Internal combustion	2001	179,292
Acajutla ICE 2	Internal combustion	2001	0
Acajutla ICE 1	Internal combustion	2000	782,491
		Total	**1,200,115**

CO_2 emission factor of power unit m in year y- 2006

Fuel Type	2006 Volume (000 gals)	COEF (tCO_2/000 gal)	tCO_2
Fuel Oil No. 6	58,181	11.9232	693,709
Diesel	0	10.5753	0
		Total	**693,709**

Summary Build Margin Calculation	
EFEL	693,709
EG (2007 generation)	1,200,115
EFBM	0.5780

Combined Margin Emission Factor (Equation 3)

BM	0.5780	tCO2/MWh
OM	0.6747	tCO2/MWh
WBM	0.5	-
WOM	0.5	-
CM	0.626	tCO2/MWh

Annual Emission Reductions

CM	0.626	tCO2/MWh
EGy	9,931	MWh/year
BEy	6,217	tCO2
PE	0	tCO2
ER	6,217	tCO2/year

Annex 4

MONITORING INFORMATION

THE MONITORING PLAN

Structure of the MP

This MP consists of the following sections:

- ***Section 1*** *provides an introduction to the MP and defines the objectives of the MP.*
- ***Section 2*** *explains the key concepts and principal assumptions applied in monitoring and calculating the performance of the Papaloate Project in terms of ERs.*
- ***Section 3*** *presents instructions with regard to operational and monitoring obligations of the project operator;*
- ***Section 4*** *explains the contents of the MP electronic workbook. The workbook consists of four Excel spreadsheets consisting of several data tables and is an important and integral part of the MP;*
- ***Section 5*** *contains requirements and instructions regarding the monitoring and verification of the projects compliance with the CDM's sustainable development objectives;*
- ***Section 6*** *describes the management and operational system that it is necessary to put in place in order to ensure consistent and high-quality monitoring of the project.*
- ***Section 7*** *informs the audit and verification system for the project and introduces the Validation and Verification Manual (CCVM), which is to be used for this purpose.*
  Section 8 *Defines the Emergency Start Up procedures for the project*

1. Introduction of the Monitoring Plan

This document serves as the Monitoring Plan (MP) for the Papaloate Hydroelectric Project. The MP presents a plan to meet the requirements for the collection, processing and auditing/verification of data required to fulfill the requirements in decision 17/CP.7; document FCCC/CP/2001/13/Add.2 of the Kyoto Protocol.

The rules of the Clean Development Mechanism (CDM) require that proposed emission reductions of a project activity are monitored over the crediting period. Monitoring entails collecting and archiving data used to determine the baseline, measuring anthropogenic emissions by sources of greenhouse gases (GHG) within the proposed project boundary, and if necessary determining leakage. According to the CDM rules, monitoring should be performed based on an approved monitoring methodology described in the Project Design Document (PDD). The monitored and archived data are then verified, defined as a periodic independent review and ex post determination of monitored reductions of anthropogenic emissions by sources of GHG over a defined period, by an accredited Operational Entity. Once emission reductions are verified they can be issued by the CDM Executive Board.

The Papaloate Hydroelectric Project consists of a 2 MW hydroelectric project located in the southwestern region of El Salvador. The Project will utilize the hydraulic potential of the Papaloate River by harnessing the energy from a deviation in a two kilometer section of the river that follows a natural fall. The Project activity will generate electricity from the Papaloate River which has a 1meter^3/second flow and a net head of 246.41 m. The objective of Papaloate Hydroelectric Project is to generate 9,931 MWh energy and sell it to national distribution grid of the Santa Ana Electrical Energy Company (AES-CLESA).

Since the project has an installed capacity of 2 MW, the monitoring plan follows the rules under Appendix B, Simplified Baseline and Monitoring Methodologies for Small-scale CDM Project Activities. In the event that the total amount of installed capacity exceeds 15 MW, CERs will only be issued up to the maximum value, and an assessment will be conducted in the following crediting period to determine if the project still qualifies as a Small-scale CDM project.[30]

Managers of the Papaloate Project must develop and maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to record 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, as required in international standards developed by the UNFCCC. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs). The MP is the document that lays out how this will be achieved.

The MP must become part of the routine administrative procedures of the project. The requirements of this MP are in line with the kind of information routinely collected by an electric power generator so internalizing the procedures should be simple and straight forward. If necessary, the MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by an Operational Entity during the process of verification.

The MP provides the requirements and instructions for:

- Assigning monitoring responsibilities to personnel;
- Establishing and maintaining the appropriate monitoring systems for the CO_2 emissions reduction estimation;
- Preparing the necessary measurement and management operations;
- Calculating emission reductions;
- Data storage and filing system; and

[30] The amount of 15 MW was established by decision 17/CP.7, paragraph 6 (c) (i), as the maximum output capacity of a project to be included as a small-scale renewable energy activity.

- Preparing for the requirements of an independent, third party audit and verification.

The MP was developed by Sociedad hidroeléctrica Papaloate S.A de C.V., the project sponsor, in February 2007.

2. CONCEPTS AND PRINCIPAL ASSUMPTIONS

a. Emission Reductions from the Papaloate Project

It is expected that the Papaloate Project will displace generation from one or more plants operating on the margin of the national grid in El Salvador .

The baseline emission rate should be computed by applying the approach defined for category I.D. projects ("Renewable Electricity Generation for a Grid" in the simplified M&P for small-scale CDM project activities.

The baseline emission rate is computed *ex-ante* by applying the approach defined in "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

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b. Geographic and System Boundaries for the MP

El Salvadors' national grid defines the geographic and system boundary of the project for the purpose of identifying potential emissions and emission reductions during the project's lifetime. The project is not expected to have an impact on emissions outside of these boundaries. According to the methodology AMS ID Version 13 (considering the generating equipment is not transferred from another activity) leakage estimation is not required for the Papaloate Hydroelectric Project. Therefore the MP does not adjust the calculated emission reductions to account for leakage.

c. Time Boundary and Baseline Review Protocol

The algorithms for calculating baseline emissions and emission reductions are expected to remain in place for 21 years, subject to the renewal of the 7-year crediting period after year 7 and year 14. This reflects the crediting lifetime preferred by the project developer. The actual baseline emission rate for the second and third crediting period will be calculated at the beginning of the second and third crediting period – in years 8 and 15, respectively – using the formulae provided in this MP and official information and data. The confirmation by a DOE of the recalculated emission factor and the project's continued compliance with the relevant Salvadoran environmental and other regulations, including

possession of necessary permits and licenses, is expected to satisfy the requirements for renewal of the crediting period, unless the simplified M&P and/or CDM EB guidance require otherwise.

3. OPERATIONAL AND MONITORING OBLIGATIONS

The project operator must fulfil the following operational and data collection obligations in order to demonstrate the credibility of the ERs claimed from the project and ensure successful verification of these ERs.

The project operator shall ensure that:

- *All reasonable steps are taken to maximize the credibility of CERs from the Papaloate Project facility and thereby ensure the credible demonstration in a transparent manner of emissions reductions;*
- *Sufficient information is collected to calculate ERs in a transparent manner and to allow for a successful verification of these ERs.*

The project operator shall comply with the data collection, testing and analysis, and data management obligations contained in this MP. The data required by this MP is in line with the information usually collected by an electric utility and by government authorities in El Salvador. The following key parameters define the performance of the Papaloate Project; and the operator shall integrate the data collection requirements below into the company's data base and information collection policies. The data shall be collected from the indicated sources and quality assurance and control activities shall be applied to ensure the quality of this data:

- The operator will electronically record the net generation of the Papaloate Project at least every month. This data shall be obtained from the metering system of the Papaloate 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.

- Before the start of the crediting period and for each renewal of the crediting period, information on generation and fuel consumption of all fossil fuel power plants in the grid as provided by Unidad de Transacciones (UT) of El Salvador. This data 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.

The project operator shall create and maintain data records that constitute the "paper trail" for the information collected. The MP workbook is the principle record for the purpose of the MP, but the workbook shall be supported with other relevant records that are created in the process of collecting the required information.

4. THE PAPALOATE HYDROELECTRIC PROJECT WORKBOOK

This section explains and illustrates the steps required by the operator to enable the CO_2 emission reductions to be calculated on an annual basis using the Papaloate Hydroelectric Project workbook. It presents the two general and four project specific worksheets contained in the workbook and defines their use. The section is intended as a user manual for the workbook. The assumptions and principles used in the workbook have been explained in the previous sections. The electronic workbook is an Annex to the MP and an integral part thereof.

The operator is responsible for entering the required data into the electronic workbook and completing the workbook at least monthly, starting with the month the Papaloate Project enters into operation, as required by the monitoring methodology and the data input templates in the electronic workbook.

The operator must retain a copy of every year's workbook. Each year's workbook must be saved under a unique name reflecting the year for which monitoring has been carried out and hard copies of the workbook shall be printed out, signed in accordance with company procedures, and stored in a safe location. In addition, after each data entry and/or modification of the workbook, electronic copies of the workbook shall be saved under a new name, and hard copies shall be signed and stored safely. Likewise, all other data collected and used for the purpose of this MP shall be safely stored, preferably with offsite backups in case of loss of originals.

The monthly workbooks together with the operator's database and monitoring records form the 'paper trail' which is essential for auditing purposes through verification. The annual workbooks will be a transparent record of electricity generation and ERs generated by the Papaloate Project. All data required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

4.1. Summary of the Workbook

The MP for the Papaloate workbook contains the following six worksheets:

Sheet	Title	Description
One	*Instructions*	Introduction and instructions for MP worksheet use.
Two	*Monthly Generation Papaloate*	Sheet 2 is the monthly record of the net generation output of the Papaloate Project
Three	*Annual Papaloate Generation*	Sheet 3 presents an annual record of the net generation output from the Papaloate project;

Four	*Calculation of ERs*	Sheet 4 calculates the CO_2 emission reductions due to the Papaloate Project.

Table 1: Summary of workbook

Table 2: Key to cell colors

Key to cell colors	
Title field	
Unit field	
Input field	
Calculation field	

4.2 Monthly Generation of Papaloate

Sheet 2 and 3 records the amount of net electric-energy output monthly and annually generated by the Papaloate Project for the seven year crediting period. The sheet is repeated for each following crediting period. The annual net generation of the Papaloate Project is obtained by the project operator from the metering system of the plant.

Sheet two - Net Generation of Papaloate Project

Month	kWh
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
Total	0

Sheet three: Net energy generation output from Papaloate

Energy Generation by the Papaloate Project, First Crediting Period

Year		MWh
2010	Energy generation	
2011	Energy generation	
2012	Energy generation	
2013	Energy generation	
2014	Energy generation	
2015	Energy generation	
2016	Energy generation	
2017	Energy generation	

Energy Generation by the Papaloate Project, Second Crediting Period		
Year		**MWh**
2017	Energy generation	
2018	Energy generation	
2019	Energy generation	
2020	Energy generation	
2021	Energy generation	
2022	Energy generation	
2023	Energy generation	
2024	Energy generation	

Energy Generation by the Papaloate Project, Third Crediting Period		
Year		**MWh**
2024	Energy generation	
2025	Energy generation	
2026	Energy generation	
2027	Energy generation	
2028	Energy generation	
2029	Energy generation	
2030	Energy generation	
2031	Energy generation	

4.3 Calculation of ERs from Papaloate

Sheet 4 computes automatically the annual ERs from the Papaloate project by multiplying the baseline emission rate, provided in Sheet 2, with the annual net generation from Sheet 3.

Calculation or ERs, Crediting Period No. 1										Total
		2010	2011	2012	2013	2014	2015	2016	2017	
Project Name: Papaloate										
Metered Electricity Supply	MWh	0	0	0	0	0	0	0	0	
Baseline Emission Rate	tCO_2/MWh	0.626	0.626	0.626	0.626	0.626	0.626	0.626	0.626	
Emission Reductions (ERs)	tCO_2	0	0	0	0	0	0	0	0	

Calculation or ERs, Crediting Period No. 2										Total
		2017	2018	2019	2020	2021	2022	2023	2024	
Project Name: Papaloate										
Metered Electricity Supply	MWh	0	0	0	0	0	0	0	0	
Baseline Emission Rate	tCO_2/MWh	TBD[31]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
Emission Reductions (ERs)	tCO_2	0	0	0	0	0	0	0	0	

Calculation or ERs, Crediting Period No. 2										Total
		2024	2025	2026	2028	2027	2028	2029	2030	
Project Name: Papaloate										
Metered Electricity Supply	MWh	0	0	0	0	0	0	0	0	
Baseline Emission Rate	tCO_2/MWh	TBD[32]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
Emission Reductions (ERs)	tCO_2	0	0	0	0	0	0	0	0	

[31] To Be Determined (TBD) based on baseline recalculation at the beginning of the second 7-year crediting period.

[32] To Be Determined (TBD) based on baseline recalculation at the beginning of the third 7-year crediting period.

5. SUSTAINABLE DEVELOPMENT MP

For this small-scale project, the project operator is not required to monitor the project's environmental and social performance. In this regard, it shall be sufficient for the project operator to demonstrate to the DOE verifying the project that the project continues to comply with the relevant Salvadoran environmental and social regulations and possesses the necessary permits and licenses to operate legally. This shall be confirmed by the DOE before the project begins to generate ERs and at the time of the renewal of the crediting period.

In order to comply with this obligation, the project operator will obtain and maintain at all times such valid permits and licenses necessary to legally operate the project. Further, the operator will collect information on the project's compliance with environmental and social regulation in El Salvador. This obligation shall, however, not exceed the respective obligations under Salvadoran law.

6. MANAGEMENT AND OPERATIONAL SYSTEMS MP

In order to ensure the successful operation of the Papaloate Project and the credibility and verifiability of the ERs achieved, the project must have a well-defined management and operational system. It is the obligation of the operator to put such a system in place. It must include the operation and management of the monitoring and record keeping described in this MP. The proper functioning of the Papaloate Project management and operational system shall be monitored by the operator and will be subject to independent verification. The project management responsibilities regarding the MP are detailed in this section.

6.1 Allocation of Project Management Responsibilities

The management and operation of the project is the responsibility of the project operator. Ensuring the environmental credibility of the project through accurate and systematic monitoring of project implementation and operation for the purpose of achieving credible ERs is the key responsibility and accountability of the operator as far as this MP is concerned.

Independent verifiers will periodically audit the operator and its management systems in order to ensure credibility and transparency of the reported ERs and other performance indicators of the Papaloate Project.

6.2 Management and Operational Systems

It is the responsibility of the operator to develop and implement a management and operational system that meets the requirements of the project and of this MP. The MP can only offer general guidance in this regard. This includes:

Data Handling

- The establishment of a transparent system for the collection, computation, and storage of data, including adequate record keeping and data monitoring systems. The operator shall develop and implement this MP and develop specific protocols that provide for these critical functions and processes, which must be adequate for independent auditing.
- For electronic and paper-based data entry and record keeping systems, there must be clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made so that compliance with requirements can be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, must be outlined and used in the event of, and to provide for, the possibility of system failures. The record keeping system must provide a paper trail that can be audited, this collected data must be kept for 2 years from the end of the crediting period.

Quality Assurance and Quality Control

- The operator shall designate a competent manager who will be in charge of and accountable for the generation of ER calculations and monitoring reports, including record keeping, computation of ERs, audits and verification. The manager shall officially sign off on all data collection and emissions reduction worksheets.
- Well-defined protocols and routine procedures, with good, professional data entry, extraction and reporting procedures will reduce costs and time needed, while making it considerably easier for the auditor and verifier to do their work. The better organized and transparent the organization, the easier it is to monitor, audit, and verify.
- The operator shall keep proper management processes and systems records as the auditors will request copies of such records to judge compliance with the required management system. Auditors will accept only one set of official information, and any discrepancies between the official, signed records and on-site records will be questioned.

The steps in order to verify the generation are:

- Read both backup meters directly
- Obtain data from the computer logs
- AES- CLESSA may also verify in their office logs.

An internal audit will also be developed by the project developer in order to assure accurate completion of the monitoring report. This audit will carry out inspection in order to develop reports for the future verifications.

In the case of the quality assurance of the Meter readings:

- If abnormalities are detected than the operation manager will repair, recalibrate or replace the meter.
- It is clear that the government entity responsible for the monitoring of data of the project is also Private entity AES- CLESSA, which has a remote control to carry out verification of the data generated from its offices.
- It is important to state that the Operating manager shall be informed of al abnormalities.

Reporting

- The operator shall report regularly to the Salvadoran authorities as required by them.
- The operator shall prepare reports as needed for audit and verification purposes.
- The operator shall prepare a brief annual report which should include: information on overall project performance, ERs generated and verified, comparison with targets of ERs achieved, compliance with relevant Salvadoran regulations and standards, and information on adjustment, if any, to the MP, such as assumptions and concepts, calculation methods and other amendments of the MP and the monitoring system. These reports can be combined with the periodic verification report.

Training

- It is the responsibility of the operator to ensure that the required capacity and internal training is made available to the operational staff to enable them to undertake the tasks required by this Monitoring Plan. Initial staff training must be provided before the project starts to implement this Monitoring Plan.

Initial Verification

- The management and operational system and the capacity to implement this MP must be put in place before the project can start generating ERs.
- This will be verified (initial verification) before the project can generate any ERs.

6.3 Summary of Responsibilities

The following table summarizes the roles and responsibilities of the project developer with regard to the monitoring and verification system.

Table 8: Management and Operation System: Roles of Project Developer

	Implementer of the Papaloate Project
Monitoring system	• Review MP and suggest adjustments if necessary • Develop and establish management and operations system • Establish and maintain monitoring system and implement MP • Prepare for initial verification and project commissioning

	Implementer of the Papaloate Project
Data Collection and Provision	• Establish and maintain data measurement and collection system and collect data for all MP indicators and inputs as required • Maintain valid permits and licenses and collect information on compliance with relevant Salvadoran regulations
Data computation	• Enter data in MP worksheets • Use MP worksheets to calculate ERs
Data storage systems	• Implement record maintenance system • Store and maintain records (paper trail) • Implement sign-off- system for completed worksheets • Complete brief annual report
Performance monitoring and reporting	• Analyze data and compare project performance with project targets • Analyze system problems, recommend and implement improvements (performance management) • Prepare and forward periodic reports
MP Training and Capacity Building	• Develop and establish MP training, skills review and feedback system • Ensure that operational staff is trained and enabled to meet the needs of this MP
Quality assurance, audit and verification	• Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification • Prepare for and facilitate audits and verification process

7. AUDITING AND VERIFICATION PROCEDURES

The validation, auditing and verification process for the project shall follow the procedures and requirements laid down in the latest version of the Validation and Verification Manual (VVM) available at the time of the validation or verification activity. The DOE for the project shall follow the VVM in conducting all validation and verification activities for the project, and the project operator shall consult the VVM in order to properly prepare for validation, audits and verification activities. The VVM is available online at http://www.VVManual.info or http://www.ieta.org/VVM/VVM.htm.

8. EMERGENCY START UP PROCEDURES

In the case of an event of interruption of the units from CLESSA the procedure will be the following:

- Inform the CLESSA Operation Center through radio communication about the event, stating the time and power supply that the unit had at the moment in which the event happened.
- Verify in the feeder protection relay MIF II, the nature of the event and check whether the event was a product of a failure in the grid such as under/over voltaje, over/under frecuency, vector surge.
- Annotate the event in the paper –based data storage
- Proceed to the start up of the auxiliary generator.
- Connect the generator through the breaker with interlock 3Q2 in the AC panel.
- Verify the start-up of all services in the Power House, contro panel and crane.
- Monitor through the automatic synchronizer ASG410 the tension in the CLESSA grid

During the monitoring through the synchronizer ASG410, it can be verified whether the frequency values and nominal tension are present therefore the next step would be to continue with the following procedure to reestablish the power plant to a start up condition.

- Stop the auxiliary generator
- Proceed to connect the 3Q1 Breaker on the AC Panel.
- Verify that the service has restarted in the control panel, crane and Power house..
- Inform the Operational Center of CLESSA in order to receive authorization for the entrance of the power plant back into the grid.
- Annotate in the paper –based data storage that the unit is ready to restart.