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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

São Domingos II Hydroelectric Project

Version 04,
30/03/2010

A.2. Description of the project activity:

The project proposed by Santa Cruz Power Corporation Usinas Hidroelétricas Ltda. consists of the installation of a small hydroelectric plant with a capacity of 24.3 MW, located on the São Domingos River, in the city of São Domingos, Goiás State, in the central region of Brazil.

The São Domingos II hydroelectric project has the objective to provide renewable electricity to the Brazilian Interconnected Electricity system. Particularly, the project will be connected to this system through the sub-station CELG (Centrais Elétricas de Goiás) with a transmission line of 69 kV[1]. The electricity to be generated is already contracted to be sold to a pool of electricity distributors. The contract was formalized by a Purchase Power Agreement (PPA), and will be valid for 30 years from January 2009.

The proposed project activity reduces greenhouse gas emissions that would have occurred otherwise in the absence of the project by avoiding electricity generation by fossil fuel sources in the operating margin and build margin of the system. It is important to highlight that the future scenario shows an increase in the consumption of fossil fuels, mainly natural gas, based on the Brazilian government's intention of diversifying the energy supply.

The primary objective of the proposed project is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to social (job creation in the construction phase, and infrastructure enhancements in surrounding municipalities) and economic sustainability by increasing the share of renewable energy in the total Brazilian electricity consumption.

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[1] São Domingos II has filed for modifying Resolução Autorizativa 501 de 2001 in order to increase its connecting capacity through a 138 kV transmission line because of better technical performance

The participants of the project recognize that this project activity is helping Brazil to fulfill its goals of promoting sustainable development. Specifically, the project is in line with host-country specific CDM requirements due to the following reasons:

- It contributes to local environmental sustainability, since it decreases the dependence on fossil fuels, thus improving air quality.
- It contributes towards better working conditions and increases employment opportunities in the area where the project is located.
- It contributes towards better revenue distribution since it contributes to regional/local economic development.
- It contributes to regional integration and connection with other sectors. The project facilitates the increase of small hydroelectricity as a generating source in the region and therefore may encourage other similar companies that want to replicate this experience.

The São Domingos II hydroelectric project improves the supply of electricity with clean, renewable hydroelectric power while contributing to regional/local economic development.

Considering all the inherent benefits that the implementation of the project brings, it can be concluded that the proposed activity contributes to the sustainable development of the country.

A.3. Project participants:

Table 1: Party(ies) and private/public entities involved in the project activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Santa Cruz Power Corporation Usinas Hidroelétricas S/A	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Goiás

A.4.1.3. City/Town/Community etc:

São Domingos

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

São Domingos is a small town and municipality in northeastern Goiás state, Brazil. São Domingos is located in the Vão do Paraná Microregion and is 400 km from Brasília and 640 km from the state capital, Goiânia.

São Domingos has an estimated population of 9,201 inhabitants and has an area of 3,295 km^2.

The São Domingos II hydroelectric project activity will be located on the São Domingos River, Tocantins River Basin. The project activity coordinates are 13º 24’ 39’’ S and 46º 22’ 47’’ W São Domingos municipality, Goiás state.

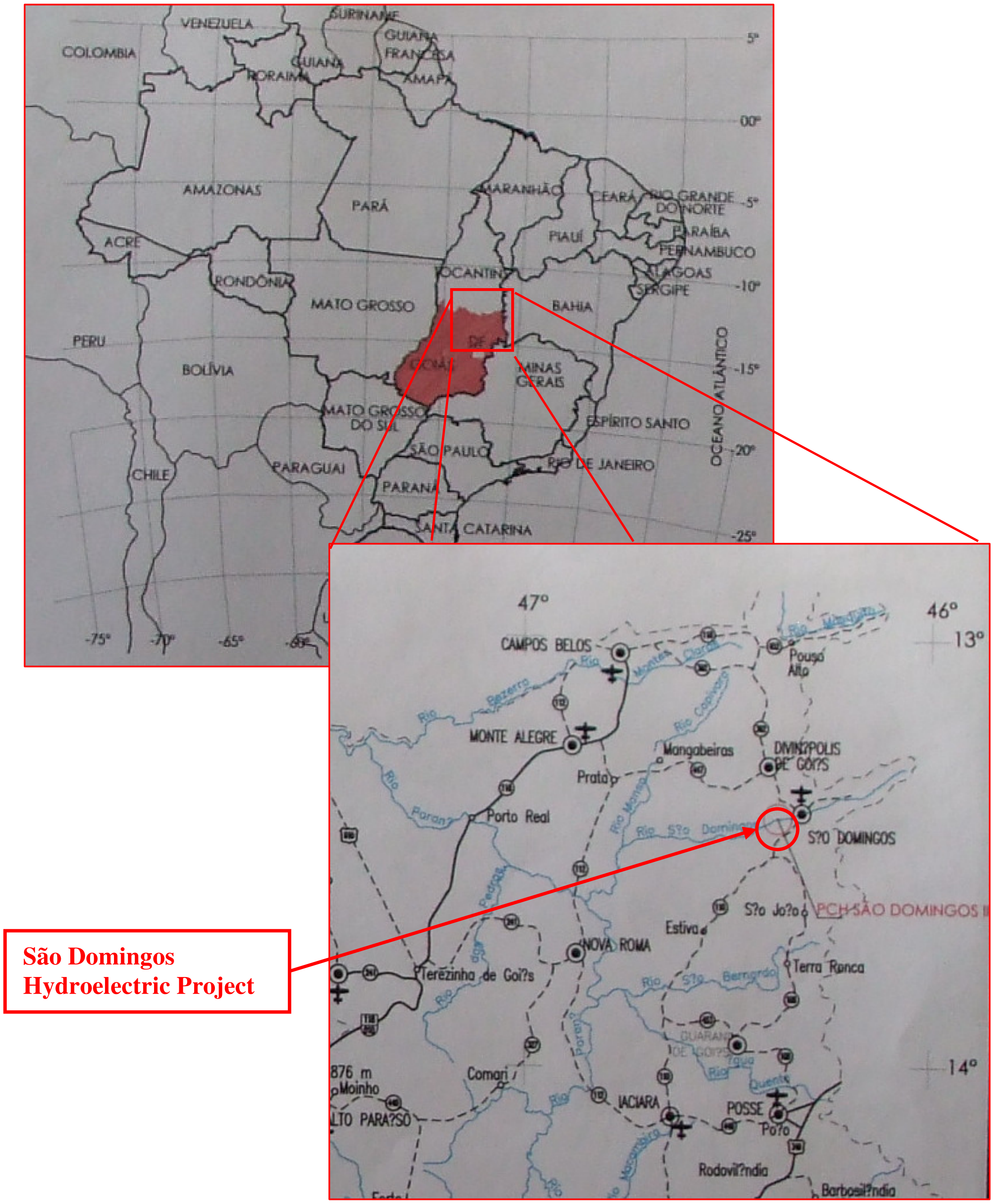


Figure 1: Brazil map showing project location

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

Sectoral Scope: 1 – Energy industries (renewable/non-renewable sources).

Category: Renewable electricity generation for a grid.

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

The project consists of a hydroelectric plant with earth-dam reservoir and installed capacity of 24.3 MW. The hydroelectric plant has a diversion dam to direct the water into the canal and an intake weir built of concrete. The diversion dam directs the water through the feeder canal into the forebay. A penstock will carry water from the forebay towards the powerhouse, located at a distance downstream from the intake, containing 3 Francis turbines, connected to horizontal-axle synchronous generators. The water passes through the turbines, spinning them with enough force to create electricity in a generator. Then the water flows back into the river via a tail race. The following figure shows a diagram of a typical small hydropower plant.

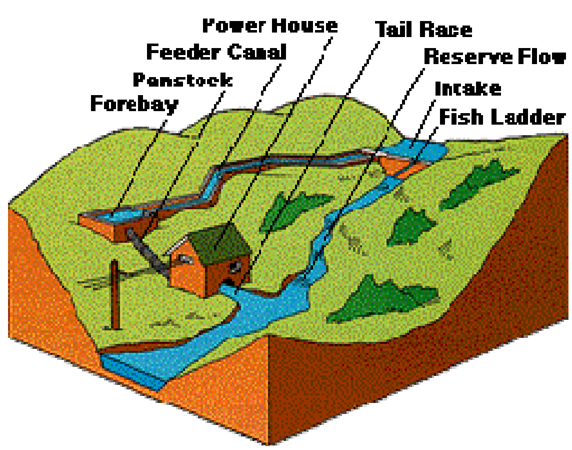


Figure 2: Small hydro project system schematic

The main components of the small hydro plant include the following:

Dam

Located 86 km away from the river's mouth, the dam will be built according to the following specifications:

Table 2: Dam characteristics

Type	Earth with intersection
Maximum height of dam	56 m
Length of dam	1,209.29 m
Maximum spillway flow	(TR-10000) 260.05 m^3/s
Maximum spillway flow in "ultimate capacity"	263.13 m^3/s
Material of construction	Earth
Total length of the spillway crest	5.00 +3.00 +3.00 m
Total earthwork volume	1,984,089.8 m^3
Total volume of concrete	9,540.97 m^3
Maximum normal level of the dam	613.00 m
Level of operation floor of gate	609.00 m

<u>Adduction system</u>

The São Domingos II small hydroelectric project consists of several structures and adduction works, specified as follows:

- ***Water intake***

The water intake will be located on the left bank of the river, placed in rock mass.

Table 3: Water intake characteristics

Gate type	Wagon
Number	1
Dimensions (free passage)	2 x (2.80 m width; 4.50 m height)
Activation	Manual hoist
Hoist capacity	15 t
Gate type	Stop-log
Number	1
Dimensions (free passage)	2 x (2.80 m width; 4.50 m height)
Activation	Chain hoist
Number of trash racks	1
Trash rack free section	10.70 m width; 4.15 m height
Maximum normal water level	613.00 m
Level of operation floor of gate	613.00 m
Level of gate threshold	609.00 m
Maximum pressure height on the stop-log	4 mwc (meters of water column)

- ***Feeder canal***

The feeder canal will be positioned at the left bank of the river, connecting the water intake to the forebay.

Table 4: Feeder canal characteristics

Length	1,840 m
Base width	6.50 m
Approximate excavation volume	193,122 m^3
Water level	4.00 m
Average water speed in the channel	0.57 m/s
Gradient of the cut slope	1:0.75
Gradient of the earthwork slope	1:1.15
Wet area	38.00 m^2
Wet perimeter	16.50 m
Hydraulic radius	2.30 m

- ***Forebay***

The forebay will be built out of structural concrete and will be located at the river's left bank, placed in rock mass.

Table 5: Forebay characteristics

Gate type	Stop-log with by-pass
Number	1
Dimensions (free passage)	3 x (2.012 m width; 2.012 m height)
Activation	Manual hoist
Hoist capacity	15 t
Number of grills	1
Free section of the grill	9.00 m width; 5.41 m height
Maximum normal water level	613.00 m
Level of operation floor of gate	614.00 m
Level of threshold of gate	606.75 m
Maximum pressure height on the stop-log	7.10 mwc

- ***Penstock***

The penstock, made of GRP (glass-reinforced plastic), will leave the forebay with a 1.70 m diameter and extension of 268 m. It will be supported by concrete cribs, and its deflections will be anchored by cyclopic concrete blocks dimensioned to counteract the forces which can cause undesired pipeline movement.

Power station

The power station will be located on the left bank of the river and built of structural concrete. Water will be returned to the river through a tail race excavated in soil and rock. By this configuration, the power station's position will use a gross head of 131.70 m, and contain three Francis turbines and the synchronous generators within.

Table 6: Power station characteristics

Type	Sheltered
Power station area	456.86 m^2
Protection level against floods	485.39 m
Power station floor level	477.69 m
Control room floor level	485.39 m

- ***Turbines***

The chosen turbines are Francis type with a minimum nominal power of 8,291 kW under a net head of 127.60 m and 720 rpm. The turbines are designed and assembled to support all tensions resulting from the unit operation in nominal conditions and, in case of discharge, not to cause risks to the equipment. The turbine rotor is assembled from carbon steel, and the blades are of high-resistance steel, with stainless steel deposition into areas subject to cavitation.

Table 7: Turbine characteristics

Type	Francis simple spiral
Number	3
Minimum nominal power of each unit	8,291 kW
Minimum output of the turbine	92%
Net head	127.60 m
Nominal flow	7.20 m^3/s
Rotation speed	720 rpm
Local altitude	485 m
Axle position	Horizontal
Specific Rotation	178.19 rpm
Suction height	0.22 m

- ***Transformer***

Table 8: Transformer characteristics

Type	Three-phase oil transformer
Nominal power	8/10 MVA – ONAN/ONAF (1)
Hight tension	69 kV ± 2 x 2.5%
High-tension connection	Grounded star
Low-tension	6.9 kV
Low-tension connection	Delta
Frequency	60 Hz
Ventilation	1 stage
Number of transformers	3

(1) - 8 MVA with ONAN(Oil Natural Air Natural) and 10 MVA with ONAF (Oil Natural Air Forced)

- ***Generators***

Table 9: Generator characteristics

Number of generators	3
Generator type	Three-phase synchronous
Power per unit	9000 kVA
Output	96.5%
Nominal tension	6.9 kV
Frequency	60 Hz
Power factor	0.90
Number of poles	10
Axle position	Horizontal

<u>Mini-Central</u>

In order to use the sanitary flow of the river section between the dam and the powerhouse, a mini-central will be installed. This central consists of a Francis turbine and an asynchronous generator. In order to make water flow out after passing through the turbine a small powerhouse will be built on the diversion gallery. Therefore, an installed power capacity of 340 kW will be added without any increase of the flooded area or environmental impact.

<u>Tail race</u>

The used water is released through the *tail race* which is a channel which leads the water from the turbine back into the river.

Table 10: Tail race characteristics

Flow	21.60 m^3/s
Length	5 m
Number of stop-logs	1
Dimensions	5.00 m length; 35.00 m width
Gross head	131.70 m
Net head	127.60 m
Total turbine full-range discharge	21.60 m^3/s
Turbine full-range discharge per unit	7.20 m^3/s
Speed of water in pipe	3.5 m/s
Speed of tail race	0.62 m/s

Transmission lines

São Domingos II SHP will deliver power through a three-phase energy distribution grid in 69 kV. The plant will have a new 7-km-long transmission line interconnecting it with the São Domingos I substation, owned by CELG and later on through a 90 km long transmission line in 138 kV, connecting it to CELG's Iaciara substation.

Elevation substation

A 69-kV open-air substation will be built next to the powerhouse. The substation will comprise an elevator transformer, potential transformers and current transformer.

Table 11: Elevation substation characteristics

Total power	30 MVA
Low tension	6.9 kV
High tension	69 kV
Number of elevator transformers	1

In conclusion, the technology described above provides the means to generate the power that will lead to accomplishment of the project's objective, that is to say, to reduce GHG emissions through the displacement of other energy generation with fossil fuels from the grid.

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

The *ex-ante* emission reductions are estimated to be **363,675** tCO_2e for the chosen crediting period of 10 years[2]. Note that actual emission reductions will be based on monitored data may differ from the estimate shown below.

Table 12: Total emission reductions during the 10-year crediting period

Years	Annual estimation of emission reductions (tonnes of CO_2e)
2010	36,368
2011	36,368
2012	36,368
2013	36,368
2014	36,368
2015	36,368
2016	36,368
2017	36,368
2018	36,368
2019	36,368
Total estimated reductions (tonnes of CO_2e)	**363,675**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reduction (tonnes of CO_2e)	**36,368**

A.4.5. Public funding of the project activity:

No funds from public national or international sources are involved in any aspect of the proposed CDM project activity.

[2] The crediting period has been switched to a single 10-year crediting period. More details in section B.5.

SECTION B. Application of a baseline and monitoring methodology

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

The project activity uses an already existing consolidated baseline and monitoring methodology (ACM0002 – Version 08), which has been approved and made publicly available by the CDM Executive Board.

The methodology is designated ***"Consolidated baseline methodology for grid-connected electricity generation from renewable sources – Version 08".***

This methodology also refers to the latest approved versions of the following tools:

- Tool to calculate emission factor for an electricity system (Version 1.1)
- Tool for the demonstration and assessment of additionality (Version 5.2)

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

The approved methodology ACM0002 – Version 08 is applicable to grid-connected renewable power generation project activities that involve electricity capacity additions, under the following conditions:

- The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit; geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.
- In case of hydro power plants:
  - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir.
  - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than 4 W/m^2.

- The project activity results in new reservoirs and the power density of the power plant, as per definition given in the project emission section, is greater than 4 W/m^2.

- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.
- 5 years of historical data (or 3 years in the case of non-hydro project activities) have to be available for those project activities where modification/retrofit measures are implemented in an existing power plant.

The project activity is not applicable to the following:

- Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.
- Biomass-fired power plants.
- Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.

In addition, the applicability conditions included in the tools referred to above apply.

The project consists of grid-connected renewable power generation activity and meets the applicability criteria of ACM0002 version 08.

The proposed project activity is the installation of a hydroelectric power project with a new reservoir having power density (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2. The power density of the São Domingos II hydroelectric plant reservoir is equivalent to 16 W/m^2. The installed power generation capacity is equivalent to 24.3 MW and the surface area at the full reservoir level is equivalent to 1.5 km^2.

The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available, since the plant will be connected to the Brazilian Interconnected Electricity system. All data necessary to calculate the grid emission factor are available.

This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since the project consists of the construction of new hydroelectric plants; therefore no fuel switch is applicable.

As stated above, the project activity under consideration meets all applicability conditions of the methodology. This justifies the appropriateness of the choice of the methodology in view of the project activity.

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

As per ACM0002 version 08, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the following table:

Table 13: Emission sources included in or excluded from the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel-fired power plants that are displaced due to the project activity	CO_2	Yes	According to ACM0002 version 08 project participants shall only account CO_2 emissions from electricity generation in fossil fuel-fired power plant that is displaced due the project activity.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	As the project is a hydro power station with power density greater than 10 W/m^2 no project emissions have to be considered according to ACM0002 version 08.
		CH_4	No	
		N_2O	No	

For the baseline determination, project participants shall only account for CO_2 emissions from electricity generation in fossil fuel-fired power plants that is displaced due the project activity.

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

According to the approved consolidated baseline methodology ACM0002 version 08, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivery to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Therefore, the baseline scenario is described as the electricity supply from the Brazilian interconnected grid and the project sponsors not investing in the proposed project.

As stated in the approved consolidated baseline methodology ACM0002 version 08, the baseline emissions are the product of the baseline emission factor with the electricity supplied by the project activity to the grid. The baseline emission factor ($EF_{grid,\ CM\ y}$) is calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors.

For emission reduction calculation, the baseline emission factor ($EF_{grid,\ CM\ y}$) is 0.1842 tonnes of CO_2 equivalent per MWh of energy displaced, which was calculated for the electricity grid of Brazil. This value will be updated during monitoring.

The following table summarizes the key data necessary for the *ex-post* determination of baseline emissions:

Table 14: Key data

Data	Source
São Domingos II Hydroelectric Project Generation	Santa Cruz Power Corporation Usinas Hidroelétricas S/A
Combined margin emission factor for the Brazilian Interconnected Electricity System. .	Data provided by the Ministry of Science and Technology of Brazil. It was calculated according to the "*Tool to calculate the emission factor for an electricity system"*

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

According to the guideline for completing the PDD, if the starting date of the project activity is before the date of validation, it is necessary to provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. In such cases project proponents shall provide an implementation timeline of the proposed CDM project activity.

Since the starting date of Sâo Domingos II hydroelectric project was before project validation, the following paragraph describes the implementation timeline and the evidence that the incentive for the CDM was seriously considered in the decision to proceed with the project activity.

The starting date of the proposed project activity is 30th March 2007, which is considered as a date when a real action of the project activity has begun, and corresponds to the civil work contract signature.

Santa Cruz Power Corporation started the exploration of the hydraulic potential of São Domingos II in the year 2001 and then, in the year 2005, ARS bought a participation in the company which allowed financing of the Basic engineering studies of the project. Usually local development teams have good project ideas but the lack of financial close is a strong barrier to develop the project. The companies are technically strong but commercially and financially weak as well as undercapitalized. This problem has affected the project development.

Contour Global, a company interested in renewable energy generation projects eligible for Kyoto Protocol under the CDM Mechanism, was at that time looking for such projects in several countries and started showing interest in the São Domingos II Project;

The first due diligence performed by Contour Global in February 2006 was followed by some months of negotiation that ended when it, through the shareholder agreement signature in October 2006, bought a participation of the company, considering the possibility of the CDM revenues from a renewable energy project. As a consequence, in order to precede with the CDM issues, Contour Global hired personnel to be in charge of the issue and to contact several CDM consulting firms. In March 2007 Contour Global decided to accept the commercial proposal of MGM International to start with the PDD development and to provide support for the other activities corresponding to the CDM cycle.

Since the beginning of the Contour Global involvement in this project activity, CDM always had been taken into consideration during the evaluations and analysis performed, indicating the awareness and the importance of CDM incentive, which also was seriously considered in the final decision to proceed with the project activity. This evidence is based on the financial analysis carried out considering the CDM revenues, the due diligence performed during the year 2006, where the CDM incentive was considered and other actions mentioned in the timeline presented as part of this PDD.

The timeline for the DOE to assess the awareness and the serious consideration of the CDM in the project's decision making process and project implementation is stated in Annex 5 below.

According to the consolidated baseline methodology ACM0002 version 08, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "*Tool for the demonstration and assessment of additionality*" agreed by the CDM Executive Board, which is available on the UNFCCC CDM website.

This tool considers some important steps necessary to determine whether the project activity is additional and it is also important to demonstrate how the emission reductions would not occur in the absence of the São Domingos II Hydroelectric Project activity.

The following are the steps necessary for the demonstration and assessment of the proposed project activity additionality.

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

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

The realistic and credible alternatives identified, available to the project participants that provide outputs comparable with the proposed CDM project activity, are the following:

Alternative 1: The proposed project activity not undertaken as a CDM project activity.

Alternative 2: Continuation of the current trends of the Brazilian interconnected grid.

Alternative 3: Construction of a thermoelectric power plant.

Alternative 1 involves a 24.3 MW hydro power plant not undertaken as a CDM project. As is explained below, this alternative is not financially attractive and faces a prohibitive barrier that prevents its implementation.

The Brazilian interconnected electricity system will need to increase its electric capacity in a few years. According to the electric system regulation and market conditions, nowadays it is easier and faster to install a thermal power plant than a hydro power plant in Brazil. Therefore, Alternatives 2 and 3 mainly involve the installation of new thermal power plants in the Brazilian electricity system in order to supply the country's ever-increasing electricity demand (this fact is already contemplated in the approximate estimation given by the build margin calculation of baseline emissions). The alternative for the project participant would be not investing in the proposed project, probably looking for other opportunities like high-growth markets worldwide.

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

The alternatives named above are in compliance with all applicable legal and regulatory requirements in Brazil (Goiás).

Step 2. Investment analysis

Sub-step 2a. Determine the appropriate analysis method

According to the "*Tools for the demonstration and assessment of additionality"* three analysis methods are suggested, viz., simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III).

As the project activity generates other income than carbon credits due to the sale of electricity to the grid, simple cost analysis cannot be applied.

Investment comparison analysis method (option II) is applicable to projects whose alternatives are also investment projects. Only on such basis, comparison analysis can be conducted. The alternative baseline scenario of the project is the Brazilian Interconnected Electricity grid rather than new investment projects. Therefore option II is not an appropriate method for the decision-making context. Benchmark analysis (option III) is selected for this project activity.

Sub-step 2b. - Option III. Apply benchmark analysis

In order to conduct the benchmark analysis an evaluation of the project's cash-flow by the project internal rates of return (IRR) (with and without CDM financial incentives) will be done.

The benchmark analysis is made by comparing the project IRR with the more conservative opportunity cost in the Brazilian economy – SELIC Basic Interest Rate[3] (Sistema Especial de Liquidação e Custódia,

[3] SELIC rate is the weighted average of the rates traded in overnight repurchase agreements backed by government bonds registered in SELIC (Special System of Settlement and Custody).

that is, Special System of Clearance and Custody), set by the Banco Central do Brasil (Central Bank of Brazil) which represents the expected return of a low-risk investment fund[4].

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

Relevant data considered for analysis are:

- Revenues from electricity sale: These are estimated taking into account the power that will be sold to the grid and the electricity prices at which the power will be sold.
- Revenues from CERs: These are estimated taking into account the emission reduction estimation, the average selling price of carbon credits of 20 €/tCO_2 and a 21 years crediting period.
- Average exchange rate: 1.5 € / US$.
- IRR lifetime: 32 periods.
- Operating factor: 97%.
- Capital expenditure: 5.120 million BRL/MW.
- Operations & Maintenance costs (O&M): 5% of total revenues.
- The SELIC[5] basic interest rate for the second half of the year 2006 was the following:

Table 15: SELIC basic interest rate

Month	SELIC basic interest rate
July	15.17 %
August	14.66 %
September	14.17 %
October	14.16 %
Average	14.54 %

It is important to notice that direct comparison between the SELIC rate and the IRR is not accurate and the idea is not to introduce a benchmark analysis, but to set a parameter as a reference. Given that a

4 Central Bank of Brazil, http://www.portalbrasil.net/indices_selic.htm

5 Central Bank of Brazil, http://www.portalbrasil.net/indices_selic.htm

hydro power project is a much riskier investment than a government bond, it is necessary to have a much higher financial return, compared to the SELIC reference rate.

In the financial analysis decision making process, a crediting period of 21 year was considered. Some time later, however, in view of the modification of the grid emission factor in Brazil and the approval of the methodological tool to calculate the emission factor for electricity system (according to which different operating and build margin weightings have to be selected for the second and third crediting period), the project participant decided it would be more appropriate to change the selected crediting period for a single 10-year crediting period.

At the time of the investment evaluation, the sources for the main inputs values were the following:

Total Investment

The construction costs for each item are based on formal commercial proposals available at the time when Contour Global was analyzing the project feasibility. The most representative commercial proposals corresponding to the suppliers below were provided to the DOE:

Table 16: Inputs values

Item	Cost (BRL$ 000)	Supplier
EPC / Civil Engineering	69,484	Terram
Turbines	12,900	Alstom
Generators	6,500	Gevisa
Pipes	4,200	Moller
Floodgate & Rail	1,800	Moller
Control Panel / Electric / Substation	8,134	Areva
Executive Project	1,127	Rischbieter
Project Management	5,000	Bureau
Land	2,000	N.A.
Environmental Permits	3,000	CTC
Contingencies	8,732	Santa Cruz
SubTotal	122,877	
(+) EPC Inflation Adjustment	1,601	
Total	**124,478**	

On the other hand, as evidence of the major investments cost for the project, the most representative contracts signed for the purchase of the equipment and civil works were provided.

Table 17: Investment costs

ITEM	QUANT.	EQUIPMENT	COST BRL $	MANUFACTURER
1	4	TURBINES	5,000,000.00	HISA
2	1	PENSTOCK	2,824,497.15	PETROFISA, ASTJ
3	1	GATES	3,173,877.70	RIBASA
4	1	CRANES AND HOISTS	1,047,280.00	BREVIL, FEBA
5	1	AUXILIARY MECHANICAL EQUIPMENT	990,000.00	DIVERSOS
6	4	GENERATORS	3,300,000.00	WEG
7		TRANSFORMERS	1,086,433.00	WEG
8	1 1	AUXILIARY ELECTRICAL EQUIPMENT SUBSTATION	4,243,960.01	GRAMEYER
9	1	TRANSMISSION LINE	1,050,000.00	DENSITEL, ELMONT, OUTROS
10		CIVIL WORKS	75,366,322.00	CONSTRUCAP
TOTAL			BRL$ 98,082,369.86	

<u>Electricity Tariff</u>

When the project was first evaluated (early 2006) energy price of BRL 117/MWh was assumed for the base case. This price was chosen observing the market conditions and the previous auction which took place in 2005. The following figure shows that the price for the A-5 auctions in 2005 was BRL 116/MWh:

Empreendimento	Produto	Custo Marginal de Referência (R$/MWh)	Direito de Participação	Preço do Último Lance (R$/MWh)
UHE Baguari	2010-H30	116.00	BAGUARI	116.00
UHE Foz do Rio Claro	2010-H30	116.00	ALUSA	108.20
UHE Passo São João	2010-H30	116.00	ELETROSUL	113.30
UHE Paulistas	2010-H30	116.00	FURNAS	114.72
UHE Retiro Baixo	2009-H30	116.00	ORTENG	115.37
UHE São José	2010-H30	116.00	ALUSA	115.80
UHE Simplício	2010-H30	116.00	FURNAS	115.88

Source: CCEE

Figure 3: 2005 Energy auction results for hydroelectrical projects

Therefore, the price was chosen observing the market conditions and the previous auction, because at the moment of analysis there was not a PPA available

The São Domingos II Hydroelectric Project's cash flow shows that the IRRs for the project activity development with and without considering CER revenues were the following:

Table 18: IRR of project

With/without CER revenues	IRR
With CER revenues	15.78 %
Without CER revenues	12.75 %

In the spreadsheet, which will be presented to the DOE during the validation process, it is possible to see that the project activity's IRR results in 12.8 %, and with the income generated by the CERs results in 15.78%.

The result of the analysis shows that the project IRR is lower than the Brazilian interest rate; therefore, the project without CDM incentives is financially unattractive. After considering the CDM financial incentives in the project's cash flow; the project IRR will be improved.

This section permits us to conclude that the project considered as a CDM project activity, and the attendant benefits and incentives derived from the CER revenues, will alleviate or will overcome the financial hurdles described.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

- Electricity sale price
- Exchange rate
- Capital expenditure
- Operations & Maintenance costs (O&M).

These parameters were selected as being the most likely to fluctuate over time. Financial analyses were performed altering each of these parameters and assessing what the impact on the project IRR would be.

<u>Electricity sale price</u>

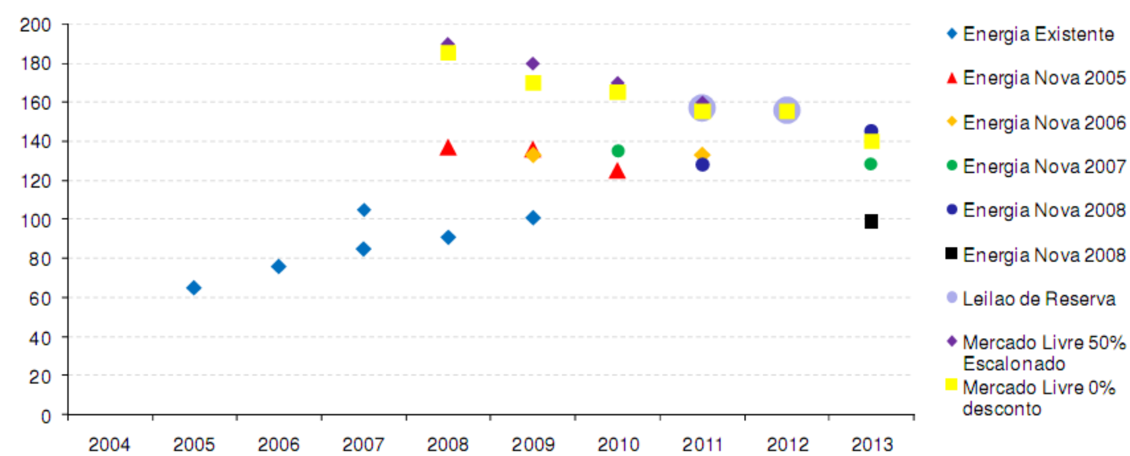
When the project was first evaluated (early 2006) an energy price of BRL 117/MWh was assumed for the base case. This price was chosen observing the market conditions and the previous auction that took place in 2005. The following figure shows that the price for the A-5 auctions in 2005 was BRL 116/MWh:

Empreendimento	Produto	Custo Marginal de Referência (R$/MWh)	Direito de Participação	Preço do Último Lance (R$/MWh)
UHE Baguari	2010-H30	116.00	BAGUARI	116.00
UHE Foz do Rio Claro	2010-H30	116.00	ALUSA	108.20
UHE Passo São João	2010-H30	116.00	ELETROSUL	113.30
UHE Paulistas	2010-H30	116.00	FURNAS	114.72
UHE Retiro Baixo	2009-H30	116.00	ORTENG	115.37
UHE São José	2010-H30	116.00	ALUSA	115.80
UHE Simplício	2010-H30	116.00	FURNAS	115.88

Source: CCEE

Figure 4: 2005 Energy auction results for hydroelectrical projects

The energy price fluctuation range for all the technologies for the A-5 and A-3 auction in 2005 was between 120 and 135 BRL/MWh, as shown in the following figure (red triangles):



Source: CCEE and Diferencial.

Figure 5: Auction and free market prices 2005-2008 (BRL / MWh in real terms)

Considering the market conditions, the chosen range to perform the sensibility analysis starts at BRL 117/MWh and increased to BRL 135/MWh. The price of BRL 117/MWh was the lowest price at which the investor was willing to sell the energy and obtain an attractive return.

Table 19: IRR sensitivity to electricity sales price (without CER revenues)

Electricity sales price variation (BRL/MWh)	Electricity sales price variation (%)	I.R.R. (%)
117.00	0	12.75
120.00	+3	12.99

123.00	+6	13.23
126.00	+9	13.47
129.00	+12	13.71
132.00	+15	13.94
135.00	+18	14.18

The benchmark is reached when the electricity sale price is increased from 117 BRL/MWh to 139 BRL/MWh.

The electricity sale price of 139 BRL/MWh is not a possible value and this can be justified through the following documental evidences:

1. The first one is the guidelines for the energy auction (edital de leilão no 002/2006-ANEEL). In this document in page 11, the starting price for the auction for hydro projects is BLR 125/MWh and BLR 140/MWh for thermal projects. Energy auction is a reverse style auction; this means that every time the investor bids a price, it has to be lower than the previous price. Therefore the probability that the price would reach BLR 139/MWh is zero in this case.

2. The second piece of evidence is the historical spot price (or PLD) from 2002 until October 2006 (taken form CCEE website), which was around the time of the analysis for the auction. Attached is a spreadsheet (PLD Prices) with the spot prices corresponding to the region where Sao Domingos II is located. The maximum spot price for the analyzed period was BLR 135/MWh. This maximum was reached only during 2 weeks, in January 2002. The probability of reaching BLR 139/MWh was very low.

Exchange rate

Exchange rate BRL/USD forecast was taken from the Central Bank survey. The Central Bank provides 5 years projections for the main Brazilian macroeconomic variables.

In the case of the exchange rate USD/€, based on the available information at the time of the analysis, the assumption made for the exchange rate was 1.5 USD/€.

As the exchange rate is related to the carbon credits sale, the sensitivity analysis considers the IRR variation with CER revenues. That is, the IRR is not sensitive to the variation of the exchange rate without considering the CER revenues.

Table 20: IRR sensitivity to exchange rate (with CER revenues)

Exchange rate variation (€/ US$)	Exchange rate variation (%)	I.R.R. (%)
1.20	-20	15.15
1.28	-15	15.31
1.35	-10	15.47
1.43	-5	15.62
1.50	0	15.78
1.58	+5	15.94
1.65	+10	16.10
1.73	+15	16.26
1.80	+20	16.42

Capital expenditure

According to local consultants, the small hydro facilities construction cost varies between BRL 4,000 and BRL 5,000 per installed kW as shown the following figure.

Technology	Dispatch	Investment Cost (R$ / kW)			Energy Price (R$ / MWh)		
Large hydro	59%	$2,800	--	$3,300	$116	--	$132
Small hydro	63%	$4,000	--	$5,000	$122	--	$135
HFO (high rotation)	12%	$1,260	--	$1,340	$135	--	$140
HFO (low rotation)	14%	$2,160	--	$2,340	$155	--	$159
CCGT (Bolivian gas)	84%	$1,800	--	$2,160	$211	--	$219
CCGT (LNG)	20%	$1,260	--	$1,620	$176	--	$186
Coal (local)	83%	$3,600	--	$4,140	$145	--	$159
Coal (imported)	60%	$3,600	--	$4,140	$140	--	$152
Bagasse	50%	$3,000	--	$3,000	$108	--	$137
Wind	36%	$4,000	--	$4,500	$217	--	$239

Source: PSR

Figure 6: Construction cost by technology (BRL / kW in real terms)

The sensitivity analysis was performed by increasing 10% the construction cost and considering a reduction of 20% of the preliminary indicative price of the capital expenditure (5.120 million BRL/MW). Considering this range, the analyzed sensitivity construction cost range was set between BRL 4,096 and BRL 5,631 per installed kW.

For conservative purpose, a price increase of 10% was analyzed in the sensitivity analysis; usually this percentage corresponds to contingencies in the budget construction.

Table 21: IRR sensitivity to capital expenditure (without CER revenues)

Capex per kW (BRL/kW)	Capex per kW – variation (%)	I.R.R. (%)
4095.90	-20	14.43
4351.89	-15	13.92
4607.89	-10	13.49
4863.88	-5	13.11
5119.88	0	12.75
5375.87	+5	12.40
5631.86	+10	12.09

The benchmark is reached when the capital expenditure is reduced from 5.120 million BRL/MW to 4.035 million BRL/MW, that is to say, when the capital expenditure is reduced a 21%.

The capex used in the financial analysis corresponds to 5.120 million BRL/MW. This value is equivalent to the initial budget presented based on the preliminary quotations obtained from the equipment manufacturer and civil works contractor and it can be seen that no contingency is included in the budget. The latter means that the budget is very optimistic because it assumes that there will be no over costs. Based on previous experience with other projects usually a 20% contingency has to be added to the total budget. In addition to this, the budget presented included only the power plant and a local transmission line for connecting to the grid. After a thorough analysis, it was decided that additional capex was required (and not estimated in the preliminary budget presented) for constructing a substation and a longer transmission line that would get a more reliable connection than the initial one. This is why a value of 4.035 million BRL/MW was a non probable value for the construction parameter.

Operations & Maintenance costs (O&M)

The sensitivity analysis for O&M shows that the impact on the IRR is very low because the amount of O&M for hydroelectric projects corresponds to a small portion of total revenues. The results from running the sensitivity are the following:

Table 22: IRR sensitivity to operation & maintenance costs (without CER revenues)

O&M (% of revenues)	O&M - variation (%)	I.R.R. (%)
3.5	-1.5	12.91
4.0	-1.0	12.86
4.5	-0.5	12.80
5.0	0.0	12.75
5.5	0.5	12.70

6.0	1.0	12.64
6.5	1.5	12.59

The sensitivity analysis for O&M shows that the impact on the IRR is very low because the amount of O&M for hydroelectric projects corresponds to a small portion of total revenues.

If the O&M costs are eliminated, that is to say, when the O&M costs are reduced from 5% to 0% the IRR is 13.28%, and continue being lower than the benchmark.

Electricity output

The benchmark is reached when the electricity output is increased to 225.5 GWh per year. This is not a possible value since it corresponds to a capacity of 26.66 MW working at 100% of capacity factor for 8.746 hours/year. As the capacity of the proposed project activity is 24.3 MW there is no way to generate an electricity output which would produce a project IRR that reaches the benchmark.

On the other hand, the variation of electricity generation was not possible since the price and the generation was already established in the PPA. From the financial point of view, the revenues are considered fixed and the only possible variation is with a revision of the Assured Energy granted.

According to the sensitivity analysis the project is unlikely to be financially attractive due to its IRR remaining lower than the benchmark. The average SELIC for the period July 2006 – October 2006 (financial project analysis) was 14.54%.

The results of the impact on the project IRR shows that the conclusion regarding the financial attractiveness is robust to the variation in the critical assumptions.

Step 3. Barrier analysis

This step aims at demonstrating that the project activity faces barriers that:

(a) Prevent the implementation of the proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives (the baseline).

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

The main barrier identified for the implementation of the “São Domingos II Hydroelectric Project” is:

Barrier due to prevailing business practice

The prevailing business practice in Brazil is a barrier to investment in renewable energy projects in the country. Given the various programs and incentives which were considered during the last few years but never successfully implemented, it is possible to notice the difficulty and barriers to implement small hydro projects in the country.

By legal definition of the Brazilian power regulatory agency (ANEEL – *Agência Nacional de Energia Elétrica*), Resolution n° 652, issued on December 9th, 2003, to be considered a small hydro project, the utility must have installed capacity greater than 1 MW, but not more than 30 MW, and have a reservoir area less than 3 km², which is the case with São Domingos II Hydroelectric Project. According to ANEEL resolutions, the plant is considered a small hydro power plant.

The prevailing business practice in Brazil has been to construct large-scale hydroelectric plants and, more recently, natural gas based thermal plants. This common practice has become a barrier to investing in small renewable energy projects which fund important barriers.

The creation of several programs is strong evidence that renewable energy projects are not feasible in the Brazilian context. Although the various programs and incentives were launched along the last years, the fact that they were never successfully implemented indicates the difficulty and barriers found to implement small hydro projects in the country.

This barrier can be exemplified by a Program called PCH-COM[6] that was structured by the end of 2000 and began in 2001. In 2001, Eletrobrás (Brazilian Electric Company), in partnership with BNDES (National Bank for Social and Economic Development), launched the PCH-COM program, whose main goal was to support and encourage construction of small hydropower plants. This program consisted on financing of the project by BNDES and the commercialization of the power by Eletrobrás. In case the project was approved, two contracts were to be signed: the financing with BNDES and the Power Purchase Agreement (PPA) with Eletrobrás. The program was not successful because of the types of guarantees required and the clauses in the contracts (i.e., the project was not considered on a project finance basis and, therefore the lender demanded guarantees directly from the project owner and not the project itself), low fixed price value, etc; this many times, constituted a barrier for the project sponsors.

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[6] *PCH-COM - http://www.eletrobras.gov.br/EM_Programas_PCH-COM/conceituacao.asp*

After PCH-COM, the government created in 2002 the PROINFA[7] program, which foresaw to raising the share of renewable energy generation by adding 3,299.40 MW of installed capacity while offering long-term contracts with special conditions, lower transmission costs, and smaller interest rates from the local development banks. The Program attracted the attention of several potential investors but others had not demonstrate interest due to, among others, the price offered for the electricity sell to the grid.

In 2005, BNDES presented the final version of its financing incentive line to PROINFA[8], different from the first one and on top of that, Government established that the CDM benefits eventually obtained from projects under PROINFA would pertain to Eletrobrás[9]. The final perception of many entrepreneurs was to consider these programs not sufficiently attractive.

Nowadays, there is a specific type of auction for the commercialization of renewable energy, called Alternative Energy Auction (Leilão de Energias Alternativas). General comments regarding the outcome of the auction concluded that the energy sold fell below the expected values. Even after setting a specific category, the auction system was not successful in promoting renewable sources. This is mainly due to the low price ceiling established by the government, which should have been higher in order to attract more investments.

At the end, these incentives constituted a loss of money and time trying to submit projects to these programs and realizing that, after some time, they would not serve to overcome the barriers.

The fundamental aspect for the prevailing business practice analysis is related to the marginal participation of small hydro power plants (SHP) in the Brazilian electric portfolio, an analysis based on data available on September 2006, shows that[10]:

a) There were 214 small hydropower plant projects approved in Brazil between 1998 and 2005, which have not started construction yet.

b) Small hydropower plants in operation correspond to less than 1.46 % of the total electric power generated in the country.

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[7] *http://www.eletrobras.com/elb/main.asp?ViewID={ABB61D26-1076-42AC-8C5F-64EB5476030E}&params=itemID={4CD80A9D-8141-489C-AE9A-9A81D0E177E0};&UIPartUID={D90F22DB-05D4-4644-A8F2-FAD4803C8898}*

[8] *http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2005/20050323_not059_05.html*

[9] http://www.aneel.gov.br/cedoc/dec20045025.pdf

[10] *Source: http://www.aneel.gov.br/area.cfm?idArea=15 (Capacidade Geração Brasil, September 2006)*

c) 74.65% and 21.54 % of the total power generated in Brazil is being generated respectively by large hydro and thermal plants.

Due to all that was exposed above, and despite all the government incentives, it is possible to conclude that:

1) Common practice in Brazil has been to construct large-scale hydroelectric plants and, more recently, natural gas based thermal plants.

2) The construction of thermal power plants has been more attractive than the construction of small hydropower plants.

The graphic below illustrates the total electric power generation in Brazil:

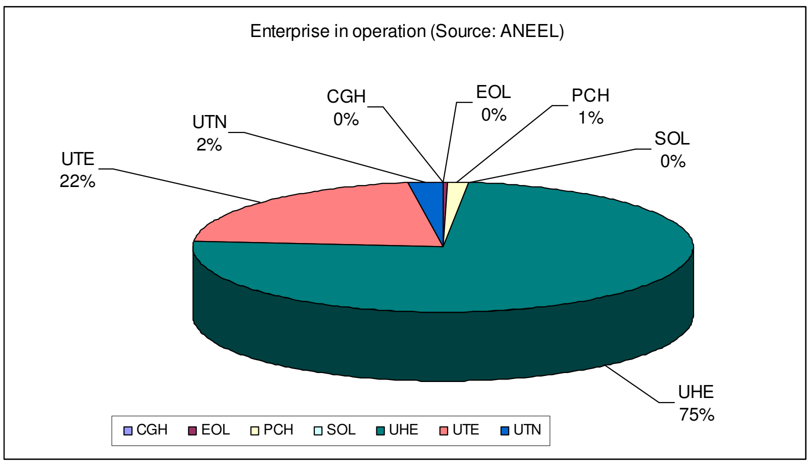


Figure 7: Total power generation in Brazil (source: ANEEL)

The following table shows the references for the graphic above.

Table 23: Legend for the figure 7

Legend	
CGH	Hydroelectric Power Plant owned by self-producers
EOL	Wind Power Plant
PCH	Small Hydroelectric Plant
SOL	Solar Power Plant

UHE	Conventional Hydroelectric Power Plant
UTE	Thermoelectric Power Plant
UTN	Nuclear Power Plant

Prevailing practice, existing regulatory or policy requirements would have led to implementation of a technology with higher emissions. These barriers clearly demonstrates the high risk perception of the small hydro power energy market and discourages possible investors because the incentives are not enough to guarantee the project profit.

Constantly changes in regulation are part of the main obstacles faced when developing PCH projects in Brazil. Some of the specific PCH regulation still needs refining, and this happens as projects are being developed and then, it is common to find out about new requirements during the developing stage that increase costs and delay timings.

In the case of the State of Goias, additional hydrology studies from the original ones are now required for obtaining the first environmental stage license. On the other hand, new criteria were defined for deciding the exclusivity of a project between various investors competing for the right to develop the same project. For example, the first investor to obtain approval for the river studies gets automatically participation in the project even if he is not the investor who obtained approval by the government energy agency (ANEEL) to develop the project. Before, there were other criteria that were decisive factors such as the percentage amount of land owned corresponding to the total area of the project (still valid today), or the market participation of the potential investor in the sub electrical sector where the project is located (not a decisive factor anymore). When facing such a variable regulation, uncertainty becomes higher, therefore risk increase and the investor demands a higher return.

Other complex process in the PCH regime is the Licensing. When developing a hydro project in Brazil, several state organizations have to intervene in order to achieve the different required approvals during development stage. In particular there are two main entities responsible for most of the documentation: ANEEL and the Environmental State Agency. Each organization runs its process independently; however there are authorizations from one organization that are prerequisite for the other one. This process creates confusion to investors, who are not completely familiarized with the process. Timing for every intervening party is different and delays are frequent, therefore license issuance usually takes longer than expected.

Commissioning the project is also a complicated process because of the several agents involved and authorizations that have to be issued. Besides the normal activities involved during this stage such as calibration of the turbines and generators, telecommunications links, there are other many intermediate steps that take place with several parties such as Câmara de Comercialização de Energia Elétrica – CCEE, Operador Nacional do Sistema Elétrico – ONS, Companhia Elétrica de Goiás – CELG (in this case the interconnection company) and ANEEL. The main obstacle that exists during this stage is the absence of control over the entire process and the lack of coordination between the different parties. Many authorizations, waivers and paperwork need to be issued in order to obtain the final approval from ANEEL to operate and interconnect to the system. The process lacks of coordination and instructions for a foreign investor interested in participating in this kind of project.

In the particular case of Sâo Domingos II other important barriers such as the project location have affected the development of the project. The region where the project is located is an isolated and underdeveloped area, which difficults its access and elevates logistics costs. There is a deficit of infrastructure such as roads, reliable supply of electricity, communications, transports, substations and transmission lines. The project sponsor have had to develop some of these facilities before beginning the implementation. Moreover, as the region is poor there are no qualified workers available in the area and raw materials needed for implementing the project have to come from other sites. In addition, archeological sites were found that forced a delay in the project construction and an authorization had to be obtained to be able to continue.

This barrier clearly demonstrates the high risk perception of the small hydro power energy market and discourages possible investors because the incentives are not enough to guarantee the project profit.

In summary, São Domingos II Hydroelectric Project cannot be considered as a common practice, is not a business-as-usual type scenario and faces several barriers that prevent its implementation. Therefore, it is clear that, in the absence of the incentive created by the CDM; this project would not be the most attractive scenario.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

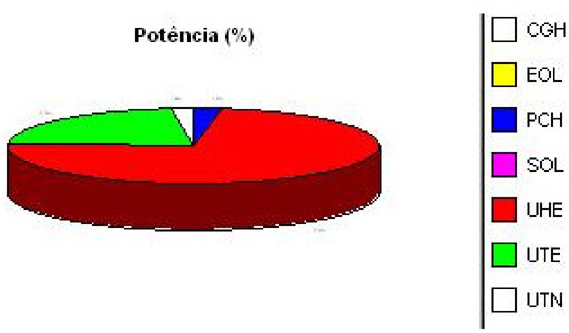
The continuation of the current practices, i.e., keeping the actual grid as it is, (baseline = *alternative 2*: the electricity supply by the Brazilian Interconnected Electricity System) is not affected by any of the barriers; the continuation of the current situation does not imply any change in the usual operation of the company, thus, it is not affected by the barriers mentioned above.

Step 4. Common practice analysis

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

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

Despite the fact that the Brazilian power system has a large hydro component, only a few hydro power plants have size and capacity similar to São Domingos II. According to ANEEL[11], there are 655 hydro power plants operating in Brazil at the moment. However, only 21% of them are independent energy generation (140 hydro power plants), and among them, only 10 are small hydro power plants similar to São Domingos II Hydroelectric Project (less than 28 MW and more than 20 MW). This shows that only 1.5 % of the total number of hydro power plants operating in Brazil is similar to the São Domingos II Hydroelectric Project, which demonstrates that the project is not a common practice.



Legend	
CGH	Hydroelectric Generator Center
EOL	Wind Generator Center
PCH	Small hydroelectric Power Plant
SOL	Solar Generator Center Photovoltaic
UHE	Hydroelectric Power Plant
UTE	Thermoelecric Power Plant
UTN	Thermonuclear Power Plant

Figure 8: Types of operational projects in Brazil.

As it is shown in the graphic above, independent of the political and economic efforts made by government, the installed power capacity of SHP has not undergone significant increase. This is the reason why the small hydroelectric power plants still cannot be considered common practice in Brazil, because it represents only 1.46 % of the total electric generation in the country.

[11] Source: http://www.aneel.gov.br/area.cfm?idArea=15 (Capacidade Geração Brasil and Resumo Estadual)

In addition, if we consider the generation in the Goias state it is possible to verify that there are 15 small hydros (below to 30 MW according to ANEEL definition) in operation at the year 2010; however, these SHPs are different from the proposed project activity and, the most important aspect, they have been installed considering additional incentives as CDM revenues or PROINFA program.

Taking into account that Sao Domingos II is a small scale project (with an installed power of 24 MW, below 30 MW according to ANEEL definition), that it is classified as IPP -Independent Power Producer- (PIE in Portuguese), is owned by a private party and that this plant did not apply to PROINFA, there is no plant with similar characteristics in Goias state as it is shown in the following table:

Table 24: Small Hydroelectric Power Plant in operation in Goias State

Number	Plant Name	Installed Capacity (MW)	Category	Comments
1	**Alto Araguaia**	0.800	SP	SP
2	**Irara**	30	PIE	PROINFA
3	**Lago Azul**	3.992	COM	It is been operating since 1990, that is, before the regulation of 1995 that has modified all the Energy Generation Scenario.
4	**Rochedo**	4	SP	SP
5	**Cachoeira do Lavrinha (São Patrício)**	3.01	SP	SP
6	**Piranhas**	18	PIE	PROINFA
7	**Santa Edwiges III**	11.6	PIE	CDM
8	**Santa Edwiges II**	13	PIE	CDM
9	**Riachão (Ex-Santa Edwiges I)**	10.1	PIE	CDM
10	**São Domingos II**	24.3	PIE	The proposed CDM Project Activity
11	**Mosquitão**	30	PIE	PROINFA
12	**Planalto**	17	PIE	CDM

13	**Retiro Velho**	18	PIE	PROINFA
14	**Mambaí II**	12	PIE	PROINFA
15	**Jataí**	30	PIE	PROINFA

Legend
APE - Self producer
PIE- Independent Power Producer
SP - Public Service

In conclusion, São Domingos II can not be considered common practice since there is no small hydroelectric power plants with similar conditions as the proposed project activity in the Goias state. The common practice in Brazil is the installation and the operation of large power plants, such as thermoelectric plants and large hydroelectric plants, and therefore São Domingos II does not fit in the business as usual type scenario.

In summary, São Domingos II Hydroelectric Project cannot be considered as a common practice, is not a business-as-usual type scenario and faces several barriers that prevent its implementation. Therefore, it is clear that, in the absence of the incentive created by the CDM; this project would not be the most attractive scenario.

Considering all the statements made above, it can be concluded that the project activity is not common a practice.

Conclusions

As defined by ANEEL[12], small hydro power plants are power plants with installed capacity greater than 1 MW and up to 30 MW, and with reservoir area lower than 3 km². This is not the business-as-usual scenario in a country where large hydro and thermal fossil fuel projects are preferred. The CDM has made it possible for some investors to set up small hydro plants and sell electricity to the grid and this fact has motivated the implementation of São Domingos II Hydroelectric Project. With the financial benefit derived from the CERs, it is anticipated that other project developers would benefit from this new source of revenues and would then decide to develop such projects.

[12] Resolution no. 394, December 4th, 1998.

The registration of the proposed project activity will help São Domingos II Hydroelectric Project to improve its economic performance and may have a strong impact in paving the way for similar projects to be implemented in Brazil.

Considering all the above assessment, it is clear that the proposed project activity satisfies all the additionality requirements; therefore, the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission reduction

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

$$ER_y = BE_y - PE_y - LE_y$$

Baseline emissions

The baseline emissions (BE_y, in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y, in MWh) as follows:

$$BE_y = EG_y \times EF_{grid,CM\ y}$$

Emission factor

The baseline emission factor ($EF_{grid,\ CM\ y}$) is calculated by the Ministry of Science and Technology of Brazil[13] using the latest version of the “Tool to calculate the emission factor for an electricity system”.

The grid emission factor is calculated as the weighted average of the operating margin emission factor and the build margin emission factor and is expressed in tCO_2/MWh.

$$EF_{grid,CM,y} = w_{OM}.EF_{grid,OM,y} + w_{BM}.EF_{grid,BM,y}$$

Where

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

In this case, for weighting these two factors, the default value of 50% will be considered for both the operating margin and the build margin emission factors (i.e., $w_{OM} = w_{BM} = 0.5$).

Project emissions

According to the methodology, for new hydroelectric power project with reservoirs no project emissions have to be considered if power density is greater than 10 W/m^2. The project power density is 16 W/m^2 (installed power generation capacity is 24.3 MW and surface area at full reservoir level of 1,506,650 m^2). Therefore, no project emissions are considered in the proposed project activity.

Leakage

As per the methodology, the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling and land inundation. Project participants do not need to consider these emission sources as leakages in applying this methodology. Project activities using this baseline methodology shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario.

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

Data/Parameter:	***$EF_{grid,CM,y}$***
Data unit:	tCO_2/MWh
Description:	CO_2 baseline emission factor for the grid electricity displaced due to the project activity
Source of data used:	Value calculated by the Ministry of Science and Technology of Brazil with official data.
Value applied:	0.1842 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	The emission factor calculation consists of the combination of operating margin (OM) and build margin (BM) and the calculation was made using official data according to the procedures prescribed in the approved tool to calculate the emission factor for an electricity system. The $EF_{grid,OM,y}$ = 0.2909 tCO_2/MWh and the $EF_{grid,BM,y}$ = 0.0775 tCO_2/MWh.
Any comment:	These data will be updated during monitoring to estimate baseline emissions and emission reductions during the crediting period.

[13] http://www.mct.gov.br/index.php/content/view/74689.html

B.6.3. Ex-ante calculation of emission reductions:

As stated before, emission reductions are equal to baseline emissions because neither project emissions nor leakage effects are expected.

Baseline emissions

The baseline emissions (BE_y, in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CMy}$ in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y, in MWh) as follows:

$$BE_y = EG_y \times EF_{grid,CM,y}$$

Emission factor

Following the tool to calculate the emission factor for an electricity system, the combined margin emission factor ($EF_{grid,CM,y}$) consisting of the combination of operating margin emission factor ($EF_{grid,OM,y}$) and build margin emission factor ($EF_{grid,BM,y}$).

Baseline emission factor ($EF_{grid,\ CM,y}$)

This is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{gridBM,y}$). The weights w_{OM} and w_{BM}, have been chosen as 50% (i.e., w_{OM} = w_{BM} = 0.5), following the default values given in the methodology.

$$EF_{grid,CM,y} = w_{OM}.EF_{grid,OM,y} + w_{BM}.EF_{grid,BM,y}$$

$$EF_{grid,CM} = 0.5 \times 0.2909 + 0.5 \times 0.0775 = 0.1842 \text{ tCO}_2\text{e/MWh}$$

Electricity generation

The proposed project activity involves the installation of a small hydroelectric plant with a capacity of 24.3 MW. The São Domingos II plant is already under construction and it is expected that its commercial operation starts in May 2009. The electricity expected to be supplied by the project activity to the grid (EG_y in MWh/ year) is calculated as follows:

$$EG_y = Power\ Capacity \times hours\ per\ year \times Load\ Factor$$

The following table summarises the values used to calculate the above result.

Table 25: Input values for calculating electricity generation

Parameter	Value	Unit
Power capacity	24.3	MW
Hours per year	8,760	hs/year
Load factor	92.75	%

Therefore, electricity supplied by the project activity to the grid for the chosen crediting period can be estimated and is shown in the following table.

Table 26: *Ex-ante* electricity generation during the 10-year crediting period

Year	Generation (hours per year)	EG_y (MWh/year)
2010	8,760	197,435
2011	8,760	197,435
2012	8,760	197,435
2013	8,760	197,435
2014	8,760	197,435
2015	8,760	197,435
2016	8,760	197,435
2017	8,760	197,435
2018	8,760	197,435
2019	8,760	197,435
Total	**87,600**	**1,974,351**

Electricity generation has been estimated in the spreadsheet *Emission Reductions São Domingos.xls*.

Baseline emissions

As mentioned above, baseline emissions include CO_2 emissions from fuels that would have been used by the operation of grid-connected power plants and by the addition of new generation sources, in order to generate the quantity of electricity generated through the proposed project activity.

$$BE_y = EG_y \times EF_{grid,CM,y}$$

where

EG_y	Electricity supplied by the project activity to the grid (MWh/year)
$EF_{gridCM,y}$	Combined margin CO_2 emission factor for grid-connected power generation in year y calculated using the latest version of the "tool to calculate the emission factor for an electricity system" (tCO_2/MWh)
$BE_{,y}$	Baseline emissions in tonnes of CO_2 equivalent per year

The combined margin CO_2 emission factor for grid-connected power generation displaced due to the project activity is equivalent to 0.1842 tonnes CO_2e/MWh.

Therefore, GHG baseline emissions for the chosen crediting period can be estimated and are shown in the following table.

Table 27: *Ex-ante* baseline emissions during the 10-year crediting period

Year	**EGy** (MWh/year)	**Baseline emissions** (tCO_2/year)
2010	197,435	36,368
2011	197,435	36,368
2012	197,435	36,368
2013	197,435	36,368
2014	197,435	36,368
2015	197,435	36,368
2016	197,435	36,368
2017	197,435	36,368
2018	197,435	36,368
2019	197,435	36,368
Total	**1,974,351**	**363,675**

Baseline emissions have been estimated in the spreadsheet *Emission Reductions São Domingos.xls*.

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

The project activity has the capacity to reduce **363,675** tonnes of CO_2 equivalent emissions during the 10-year crediting period.

The emission reduction ER_y achieved by the project activity is given by:

$$ER_y = BE_y - PE_y - LE_y$$

The following table summarises the values obtained above.

Table 28: ***Ex-ante*** **emission reductions during the 10-year crediting period (tCO_2)**

Year	**Estimation of project activity emissions (tonnes of CO_2 e)**	**Estimation of baseline emissions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2e)**	**Estimation of overall emission reductions (tonnes of CO_2e)**
2010	0	36,368	0	36,368
2011	0	36,368	0	36,368
2012	0	36,368	0	36,368
2013	0	36,368	0	36,368
2014	0	36,368	0	36,368
2015	0	36,368	0	36,368
2016	0	36,368	0	36,368
2017	0	36,368	0	36,368
2018	0	36,368	0	36,368
2019	0	36,368	0	36,368
Total (tonnes of CO_2e)	**0**	**363,675**	**0**	**363,675**

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

B.7.1. Data and parameters monitored:

Data/Parameter:	***EG_y***
Data unit:	MWh/year
Description:	Electricity supplied by the project activity to the grid
Source of data to be used:	ContourGlobal
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	197,435

Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording of the electricity delivered to the grid will be monitored through electricity meter installed in the generation unit and in the energy generation reception unit.
QA/QC procedures to be applied:	The uncertainty level of the data is low, and the equipment will be regularly calibrated. Double check by receipt of sale or trough a CCEE[14] report.
Any comment:	This data will be used to calculate the emission reductions obtained through the project activity. Data will be archived electronically until two years after finishing the crediting period.

Data/Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	ContourGlobal
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	24.3
Description of measurement methods and procedures to be applied:	The installed capacity will be determined on the basis of recognized standards.
QA/QC procedures to be applied:	-
Any comment:	This parameter will be monitored yearly.
Data / Parameter:	A_{PJ}
Data unit:	km^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	ContourGlobal
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	1.5
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.

[14] CCEE: Câmara de Comercialização de Energia Elétrica (Brazilian Electric Power Chamber)

QA/QC procedures to be applied:	-
Any comment:	This parameter will be monitored yearly.

B.7.2. Description of the monitoring plan:

According to the approved methodology ACM0002 version 08, the monitoring plan shall consist of the monitoring of the electricity generation from the proposed project activity, the surface area of reservoir at the full reservoir level and the installed capacity of the plant after project implementation.

The energy generated by São Domingos II will be measured and monitored with a measurement and invoicing system according to a standard procedure used for all energy generation systems. This procedure is performed by the owner as per technical procedures established in sub-module 12 of ONS[15] manual and submitted for approval to CELG[16] and then to ONS. After equipment installation, CELG commissions the equipment and informs ANEEL[17] that the project is operational and meets the procedures set forth. The meters will be previously calibrated at CELG's measurement laboratory.

The Monitoring and Measurement System, called SMF, consists of a meter panel and a satellite-link to communicate and send the data to CCEE[18]. Both SMF and link are commissioned by CELG and meet the technical requirements of ONS and ANEEL. SMF energy measurement panel consists of a principal meter and a back-up meter (reserve meter), simultaneously connected to the panel. If there is problem with the principal meter, the back-up meter automatically continues the measurement of energy, without any discontinuity. A reserve meter disconnected from the panel is available to immediately replace the damaged equipment, avoiding any delay due to equipment procurement. After installation and commissioning, both meters (principal and back-up) will be sealed by CELG as well as measurement equipment panels at the substation's yard (current and potential transformers) to ensure the system's inviolability. Before its effective operation, SMF system will be calibrated at CELG and Embratel[19] calibration laboratories following the procedures and meeting the standards for domestic and imported equipment. Calibration results will be submitted to CCEE, ONS and ANEEL for approval. CELG will

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[15] ONS: Operador Nacional do Sistema Eletrico (National Operator of the Electric System)

[16] CELG: Centrais Elétricas de Goiás - Concessionaria de Energia Local (Local Energy Franchise)

[17] ANEEL: Agencia Nacional de Energia Elétrica (National Agency of Electrical Energy).

[18] CCEE: Camara de Comercializaçao de Energia (Chamber of Energy Commerce)

[19] Embratel: Empresa Brasileira de Telecomunicações (Brazilian Telecommunications Company)

calibrate the meters, and the certifications will be kept by the owner and will be available to the verifier whenever the verifier requires. The equipment will be calibrated each year, and the calibration certifications will be attached to follow-up reports. If during the year significant reading discrepancies occur, both meters will be calibrated again.

All the energy generated by the PCH São Domingos II, will be monitored online by CCEE (located in São Paulo). CCEE is responsible for the monthly readings and keeping the records of the energy generated. If any problem happens at the local meter level, the reading lecture corresponding to the amount of energy during the time of the problem will not be lost because of the online reading performed by CCEE.

Energy registered by the main meter provides enough evidence for invoicing purposes, as long as the error is within the authorized limits. Santa Cruz Power Corporation will sign an agreement with CELG, by which the latter will monitor, operate and maintain the SMF measurement system. All the meters will be calibrated annually, in order to ensure their accuracy which shall not less than (+/- 0.2%). If errors larger than those permitted by the regulation are found, the meters will be taken out of the panel and will undergo the necessary repairs and calibrations. If during any of the previous months the reading on the main meter is not correct (error larger than expected) or the meter does not work properly, total energy generated will be determined first by the back-up meter reading, unless any of the parties proves that this reading is not correct. If back-up meter reading is not correct, the parties together will estimate the correct reading. If the parties do not agree in an estimate regarding the energy generated, the dispute will be solved by an arbiter following standard procedures described in the regulation.

The project participant will assign a qualified person to compile the necessary data according to the approved methodology to accurately calculate emission reductions. The data will be compiled in a manner amenable to third party audit and deliverable to the DOE for certification purposes.

The monitoring of the electricity generation will be carried out by Contour Global through its maintenance and operation team, whose operational centre will be located in São Paulo. The transmission of the data from the generation unit to the operation centre will be made through the communication systems available (satellite, radio, etc).

The operational center team consists of a manager and four operators working in a regime of 24 hours.

The data collected will be archived electronically in an operational system that will be installed.

Data collected will be archived until two years after finishing the crediting period according to ELETROBRAS/ANEEL procedures.

The operating engineering team will be responsible for the facility equipment and systems technical support. This team will submit reports including operating hours and key performance indicators of the units.

The organizational chart of the operating and maintenance team is as follows:

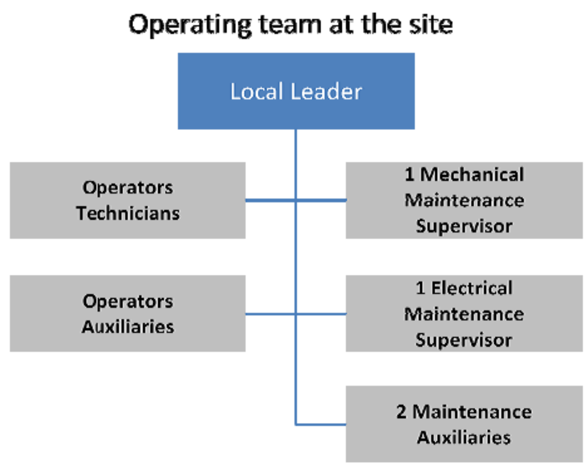

Figure 9: Organizational chart

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

Date of completion: 14/2/2008

Rocío Rodriguez and Fabián Gaioli, MGM Worldwide LLC.

Junín 1655, 1° B

C1113AAQ, Buenos Aires, Argentina

Tel./Fax: (54 11) 5219-1230/32

E-mail: rrodriguez@mgminter.com

Rocío Rodriguez and Fabián Gaioli are not project participants.

SECTION C. Duration of the project activity/crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

30/03/2007. The starting date of the project activity corresponds to the date of civil work contract signature.

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

40 years.

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:

N/A

C.2.1.2. Length of the first crediting period:

N/A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The crediting period will start on January 1st, 2010 or on the date of registration of the CDM project activity, planned for 01/01/2010, whichever is later.

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

Regarding the environmental permits, the proponent of any project that involves construction, installation, expansion, and operation of any polluting or potentially polluting activity or any activity capable of causing environmental degradation is required to secure a series of permits from the state environmental agency concerned. In addition, any such activity requires the preparation of an environmental assessment report before obtaining construction and operation permits.

The project developer has the following authorizations:

- Authorization to establish as electric energy self-producer issued by ANEEL (ANEEL Resolution nº 510, issued on 26/11/2001).
- Installation Permit issued by AGMA (*AGÊNCIA GOIANA DO MEIO AMBIENTE*) nº 400/2005
- Rescue Fauna Permit issued by AGMA (*AGÊNCIA GOIANA DO MEIO AMBIENTE*) nº 003/2007.
- Vegetation Exploration Permit issued by AGMA (*AGÊNCIA GOIANA DO MEIO AMBIENTE*) Nº 0985/2006.

The following is a summary of the Environmental Impact Assessment (EIA) named "Estudo De Impacto Ambiental Pequena Central Hidroelétrica São Domingos II".

Human environment

From a local human point of view, the project is feasible. Because of the location of the project and the small number of people directly affected, the positive impacts overcome the negative ones, and the implementation of the activity reflects the community's anxiety for the generation of jobs and income, the stimulation of the economy and the impulse to make São Domingos as a tourist destination. At this moment, not executing the project would have a negative impact on the population, frustrating expectations around the São Domingos II Hydroelectric Plant.

Direct negative impacts are restricted to six landowners who will have their properties flooded. To the project proponent, this problem is easy to solve, as those who did not choose this and will lose their farms will have their rights respected, not suffering financial losses.

The environmental compensation of the project must be applied to the host municipality, and the population must participate in development of the project, primarily those able to multiply the investment and generate jobs and income.

Physical environment

The areas of the reservoir, dam and other buildings do not have the types of rock that the Angélica and Terra Ronca caves are made of. This kind of natural heritage is located in Terra Ronca State Park, Bambuí Group calcareous. Alkaline granites of the plutonic type occur in the reservoir area. Volcanic sedimentary rocks occur in the southwest, near the left shoulder of SD II SHP (São Domingos II Small Hydroelectric Plant).

The aquifers occurring in the reservoir area belong to the psammitic, plutonic-volcanic and pelitic systems. These aquifers are fractured and have low permeability, with low storage capacity. The creation of the reservoir will cause an increase of these aquifers' phreatic level, due to being recharged by the reservoir. However, this effect will not cause any significant negative impact; rather, it will be beneficial, because there will be an increase of the renewable/permanent aquifer reserves.

As to the karstic aquifer system occurring in the surroundings of the proposed site for the future SD II SHP reservoir, no changes are expected in its hydrological regime, since calcareous rocks do not occur in the reservoir area. Moreover, small calcareous insulations mapped in the surroundings of SD II SHP are found suspended atop the hills and above the region's phreatic level, being consequently totally drained.

The regional hydrological balance depends on the protection of the porous aquifers existing in Goiás's Serra Geral, Urucuia aquifer system. Its importance is due to its hydrological characteristics, great permeability and capacity of storage, and geomorphologic situation, i.e., it occurs in an extended area of regional recharge represented by plain highlands (chapadões) atop Goiás's Serra Geral, thus being continuously re-fed directly by pluvial waters. The high capacity of this aquifer in absorbing, storing and transmitting water is responsible for the remarkable regularization of the drainage flows with sources along the Serra Geral, like the São Domingos River. Deforestation and uncontrolled use of Goiás's Serra Geral highlands (chapadas) represent a threat to the regional hydrological balance and to the project itself.

Downstream of the site proposed for damming, karstic aquifers constitute a regionally important water system. The study concluded that the project will have low impacts on the hydrological regime downstream of the dam. The only impact expected to the karstic aquiferous system will be low and temporary during the filling of the SD II SHP reservoir.

From a geomorphologic point of view, due to the small size of the lake to be formed, there is no obstacle to building SD II SHP. The slopes along the future lake, even showing moderate declivities at some points, have a high natural stability. There is no high risk of erosion anywhere in the banks.

It is important to emphasize that there are no quartzose eluvio-colluvial sands derived from the weathering of cretaceous arenites. These soils have a high erosion risk, as verifiable along the BR-020 access road to the city of São Domingos.

From another point of view, the region proposed for the SD II SHP lake has great scenic beauty. Creating the new lake will provide the region with a new scenic attraction with a high potential of utilization for leisure.

The existence of the São Domingos reservoir, upstream of the proposed site for São Domingos II, will greatly reduce the risk of aggradation of the new reservoir. The current one acts as a “decantation tank” for retention of the sedimentary load brought down by drainage. The aggradation studies showed that the threshold of the water intake will be reached in approximately 100 years, therefore not representing a risk for the project. This condition does not exclude the need for reforestation of the reservoir’s rim area in order to avert erosive processes that would occur in the reservoir’s sub-basin, accelerating its aggradation.

Biotic environment

The dimension of the use of natural resources by the human population depends on the extension of the distribution of such resources in the region and the infrastructure set up for this purpose. In the area directly influenced by the project under the feasibility analysis, one of the most important human activities is fairly extensive cattle breeding, along with lumbering, mining and economically primitive mining activities (e.g., extraction of clay, sand and rocks), which can be considered colonial economic activities. These activities are ancient and were the first big transformative forces in the region.

Opening the forested vegetation, probably in most of the region, resulted in pastures under the few trees in the “cerradão” or in the seasonal forest that remained as witnesses (to the extent that it is possible to separate these two phytophysiognomies). In certain places, primitive vegetation turned again to occupy the terrain utilized to grow cattle, and in other places, the forest gave place to woods with predominance of certain trees of the same size, which indicates management by selective cut.

The other important human activity is more recent: mechanized agriculture, which has been definitively transforming the region, changing soils and the natural drainage flows, occupying a significant part of the region. The growth of cities and villages is mostly confined to the capital flow promoted by these activities. Recently, efforts were made to intensify tourism, which includes visiting the falls. Hunting is another activity promoting interaction between local residents and visitors, but it does not transfer financial resources to the local economy as the other activities mentioned do.

Mechanized agriculture, lumbering for several purposes and cattle breeding are activities encompassing the largest amount of terrain and natural resources today. These activities will be intensified with the energy supply, and will integrate the cost-benefit model that might be set up for the project's feasibility analysis. It should be clarified that this analysis will only be conducted to interpret the gains and losses of the habitat, including populations of animals and plants.

There must be special interest in the maintenance of forests in the São Domingos region. Most of the forest species in Central Brazil seem to adapt to two distribution patterns:

1. Forest species with different deciduous levels (seasonal forest) depending essentially on the occurrence of fertile soil spots within the cerrado domain, tending to diffuse especially within a northeast-southwest curve that connects the caatinga to the chaco borders;
2. Most of the species in the gallery and riparian forests (bigger gallery forests along the big rivers) depend on high soil humidity, and many are diffused in the Amazon and Atlantic pluvial forests, crossing the cerrado region in the northwest-southwest arch through the dendritic grid of gallery forests (gallery and riparian forests).

These western and northern forests have a stronger link to the Amazon's pluvial forests. Central and southern forests have more affinity with the semi-deciduous forests in the Southeast region of Brazil. For example, *Antonia ovata*, found in the forests in the studied region, is common to the cerrado and Amazon gallery forests. *Emmotum nitens* spreads over Central Brazil, but reaches the borders of the Atlantic forest and the Amazon. Along with *Vochysia hankeana*, this species is considered an indicator of the transition area between the Amazon forest and the dystrophic cerrado in sandy soils (species distributed in the northeast-southeast arch). On the other hand, *Tabebuia caraiba* and *Machaerium acutifolium* are examples of species registered in the Alto Araguaia region that are distributed throughout the northeast-southeast arch, spread from the caatinga to the chaco limits. It is suggested that an ancient continuous forest formation existed in Central Brazil, fragmented at present and making corridors that interconnect these biomes.

As to the fauna, there is no evidence that animal populations have attained the carrying capacity of the region. Selective cut, planting and hunting have confined some populations in native vegetation spots, with low density, and some species widely explore all habitats up to the planting and cerrado areas used for cattle breeding. With the filling of the reservoir, populations in gallery forests and adjacent habitats will be pushed to the banks, and will be concentrated in the seasonal forests.

The region the project will be located in still has a rich and diversified herpetofauna, avifauna and mastofauna, characteristic of the cerrado areas under the impact of traditional agricultural activities. However, large monocultures installed in the highlands will change this regional background, which will be strongly guided by the increased supply of electrical power from the plant's installation and operation.

During the survey period, a remarkable fact was the great number of mammal species registered in a short period of search. According to the local people, there is intensive hunting. As far as it is possible to trust their testimony, there is a strong suggestion that the mammalian fauna in the region is still preserved, with high presence of species in still high densities, even those in the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis's (IBAMA's) endangered species list, such as the maned wolf ("lobo-guará") and the giant anteater ("tamanduá-bandeira"). It is suggested that this situation is a result of a mosaic of fragmentary habitats ranging from forest areas (gallery and semi-deciduous forests) to open areas (typical stricto-sensu cerrado, rocky cerrado, wet field).

The survey shows that some species of birds associated to gallery forests were also registered in the deciduous seasonal forest fragments existing in the region. These forests will not be directly impacted by the filling of the reservoir, but will be the main environment for the dislocation of the individuals in the affected areas. Despite the apparently high similarity of the avifauna between the gallery forest and the deciduous seasonal forest, it is necessary to carry out the filling of the reservoir during the end of the rainy season, avoiding the fall of the leaf cover of the deciduous seasonal forest.

Another important issue is the presence of as yet undescribed fish species in the region, requiring more attention and effort for their identification and description. It is possible to find undescribed species in rivers of the region, which have hardly been explored by researchers.

Conclusion

For the environmental impacts identified at each stage steps for their prevention, mitigation and compensation will be carried out, and an environmental monitoring will be undertaken during project operation. With the assessment stated above, it is observed that impacts can be mitigated in every aspect.

Finally, the project has fewer impacts on the environment and it can boost the regional economy, therefore resulting in a better quality of life and social standards for the local people. In other words, the project will contribute to local sustainable development.

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 project participant has presented the Environmental Impact Assessment to AGMA, the Goiás environmental agency. The project participant should follow the guidelines set forth in the document for the prevention, mitigation and compensation of the project environmental impacts. The project participant is fully aware of these conditions.

SECTION E. Stakeholders' comments

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

In the case of this project, the local stakeholder consultation process was carried out twice. The reason for that was that during the Validation process, the rules established by the Brazilian DNA to perform the local stakeholder consultation process were modified and as a consequence, following an advice of the DNA itself, the process was repeated, according to the new rules.

The first Local Stakeholder Consultation was held in October 2007 following the rules established in the Resolution # 1 issued by CIMGC (Comissão Interministerial de Mudança Global do Clima), the Brazilian DNA.

In March 2008, Resolution # 7 was published, modifying some rules previously established in the Resolution # 1. One of the modifications was the inclusion of another entity to be invited to make comments: the Federal Public Ministry. Therefore, according to Resolution # 7, the consultation should be performed by the project sponsor inviting for comments at least the following entities:

- Municipality
- Alderman Chamber
- State Environmental Agencies
- Municipal Environmental Agencies
- Public Ministry
- Federal Public Ministry
- Brazilian Forum of NGOs
- Community Associations

The second consultation was performed in July 2008.

The invitation letters were sent informing that the full content of the Project Design Document, as well as the Annex 3 regarding the contribution of the Project Activity to sustainable development, would be made available on the internet at:

http://www.mgminter.com/stakeholder/Sao_Domingos_II_Hydroelectric_Project/.

Contact information was also specified in the invitation letter in order to receive comments, doubts and opinion about the project.

The local stakeholders invited for the consultation process are shown in the following table:

Table 29: Invited stakeholders

Company/Institution	Name of Person Representing	Position Held
Municipality	Rozana Zago Valente	Mayor
Municipality	Trajano Pinheiro Cardoso	Vice Mayor
Alderman Chamber	Joseberto da Silva Rosa	President of Chamber
State Enviromental Agency	Neuzelides Maria Rebelo Fonseca	Soil Use Manager
Municipal Enviromental Agency	Marlene Ramos Guedes Pinheiro	Secretary
Public Ministry	Pedro Paulo de Oliveira	Court Judge
Public Ministry	Jean Cleber Cassiano Zamperlini	Justice Prosecutor
Federal Public Ministry	Antonio Fernando Barros e Silva de Souza	Republic Attorney General
Brazilian Forum of NGOs (FBOMS – "Fórum Brasileiro de ONG's e Movimentos Sociais para o Meio Ambiente e Desenvolvimento")	Esther Neuhaus	Executive Manager
Electricity Regulatory Agency (ANEEL)	Jamil Abid	Superintendent of the Supervisory Services of Generation
Community Association NGO GREASB	Dorivaldo Ferreira da Silva	Executive Manager
São Domingos Parish	Iron Rodrigues de Oliveira	Priest
Municipal School Padre Geraldo	Maria Cleusa dos Reis Aquino	Director
Municipal School Monte Sião	Arlete Pereira dos Santos	Director
State School João Honorato	Junia Maria de B. Oliveira	Director
State School Maria Regis	Aparecida Laura Fonseca	Director

E.2. Summary of the comments received:

During the first consultation, comments were received from only one local stakeholder, named Community Associations and Brazilian NGO and Social Organizations Forum for Environment and Development (FBOMS).

CONTOURGLOBAL received a letter from FBOMS on December 18, 2007 with the following points:

- Confirmation of receipt of the invitation letter for comments on the "São Domingos II Hydroelectric Project";

- A description of FBOMS expectations on its role in the evaluation of the PDD and its relationship with the Brazilian DNA;
- A suggestion for the project participants to adopt criteria of sustainability evaluation, such as the "Gold Standard";

FBOMS did not provide any analysis of the project activity, even though they declared their intention. They observed that their lack of technical analysis in the provided time schedule (30 days) did not mean their approval.

Up to now, 120 days after the end of the second local stakeholder consultation process, no additional comments have been received resulting from both consultation processes.

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

As the comment that was received in the first consultation did not affect the project, no further action was necessary.

No comments have been received resulting from the second consultation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Santa Cruz Power Corporation Usinas Hidroelétricas S/A
Street/P.O.Box:	Alameda Santos, 771 - 4° andar
Building:	Ed. The Diamond Tower
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	CEP 01419-001
Country:	Brazil
Telephone:	11 3147-7100
Fax:	11 3284-8349
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Parties included in Annex I is available for this project activity.

Annex 3

BASELINE INFORMATION

The key data used to determine the *ex-ante* baseline scenario are given in the following table.

Table 30: Key data

Parameter	Data sources
Combined margin emission factor for the electricity system	Calculated according to the "Tool to calculate the emission factor for an electricity system" by the Brazilian DNA.
Variable	**Data sources**
Electricity generation of the industrial facility per year	Santa Cruz Power Corporation Usinas Hidroelétricas S/A

Annex 4

MONITORING INFORMATION

The Monitoring and Verification Plan (MVP) describes the procedures for data collection and auditing required for the project, in order to determine and verify emission reductions achieved by the project. This project will require only very straightforward collection of data, described below, most of which is already collected routinely by the staff of Santa Cruz Power Corporation Usinas Hidroelétricas Ltda., where the proposed CDM project is to be implemented.

The MVP document fulfills the CDM Executive Board requirement that CDM projects have a clear, credible, and accurate set of monitoring and verification procedures. The purpose of these procedures is to direct and support continuous monitoring of project performance and periodic auditing, verification and certification activities to determine project outcomes, in particular in terms of greenhouse gas (GHG) emission reductions. The MVP is a vital component of project design, and as such is subject to a formal third party validation process – along with the project baseline and other project design features.

Managers of the project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to successfully develop and maintain the proper set of information to undergo an audit for a greenhouse gas (GHG) emission reduction investment. These records and monitoring systems are needed to subsequently allow an Operational Entity to verify project performance as part of the verification and certification process. In particular, this process reinforces the fact that GHG reductions are real and credible to the buyers of the Certified Emission Reductions (CERs). This set of information will be needed to meet the evolving international reporting standards developed by the UNFCCC.

The document must be used by the project implementers and operators of the Technical Departments of Santa Cruz Power Corporation Usinas Hidroelétricas Ltda. Strict adherence to the guidelines set out in this monitoring plan is necessary for the project managers and operators to successfully measure and track project impacts for audit purposes.

The methodologies describe the procedure and equations for calculating emission reductions from monitored data. For the specific project, the methodologies are applied through spreadsheet model. The staff responsible for project monitoring must complete the electronic worksheets on a shift basis. The spreadsheets automatically provide annual totals in terms of GHG reductions achieved through the project.

The models contain a series of worksheets with different functions:

- Data entry sheets: electricity generation
- Result sheet: emission reductions

There are worksheets where the user is allowed to enter data. All other cells contain model fixed parameters or computed values that cannot be modified by the staff.

A color-coded key is used to facilitate data input. The key for the code is as follows*:*

- ***Input fields:*** Pale yellow fields indicate cells where project operators are required to supply data input, as is needed to run the model.
- ***Result fields:*** Green fields display result lines as calculated by the model.

Other sheets include fixed values, or values that are computed from data in the data entry sheets, and the last sheet shows the resulting annual emission reductions.

Annex 5

PROJECT TIMELINE

Document	Date	Event	Comment
Reference: 01	26 November 2001	Resolution nº 510 Authorization as Independent Power Producer (IPP) for Santa Cruz power corporation.	Authorization to explore the hydraulic potential
Reference: 02	2005	ARS bought the 90% of SMA financing the Basic engineering studies.	Part of the agreement is presented as supporting documentation.
Reference: 03	February 2006	Due diligence	CG performed a due diligence, considering the possibility of the CDM revenues from a renewable energy project.
Reference: 04	April 2006	Project approval by Energy National Agent (ANEEL)	
Reference: 05	26 June 2006	Power auction	http://www.ccee.org.br/cceeinterdsm/v/index.jsp?contentType=RESULTADO_LEILAO&vgnextoid=f24d33db87c6b010VgnVCM1000005e01010aRCRD&qryRESULTADO-LEILAO-CD-RESULTADO-LEILAO=905a93b4ae6cc010VgnVCM1000005e01010a____&x=6&y=13
Reference: 06	18 August 2006	Change in the type of the company from Ltda to S.A and the quantity of turbines in the Energy National Agent (ANEEL)	
Reference: 07 Reference: 08	31 October 2006	Shareholder agreement where ContourGlobal bought a participation in the company	CG performed an update of the due diligence and signed a shareholder agreement, considering the possibility of the CDM revenues from a renewable energy project. Therefore, CG in order to proceed with the CDM issues hired personal to be in charge and contact several CDM consulting firms.
Reference: 09 Reference: 10 Reference: 11	January 2007	Meeting with Ecoinvest and other CDM developers	Mail with the summary of the meeting. CG contacted several CDM developers.

Document	Date	Event	Comment
		(MGM, ICF)	
Reference: 12	17 January 2007	Power purchase agreement	
Reference: 13 Reference: 14 Reference: 15	March 2007	MGM Commercial Proposal	Mail where the commercial proposal is sent to CG and mail where it is accepted by CG. Also attached is part of the commercial proposal submitted.
Reference: 16	30 March 2007	Civil work contract signature	
Reference: 17	28 May 2007	Contract signature with MGM	Part of the consulting agreement sign between CG and MGM
Reference: 18	June 2007	Environmental installation license	
Reference: 19	October 2007	Stakeholder process	
Reference: 20	October 2007	Commercial proposal with DNV	
Reference: 21	February 2008	Contract signature with DNV	
Reference: 22	May 2008	PDD sent to validation with DNV	Mail where the PDD was sent to validation. Period for comments 16 May 08 - 14 Jun 08
	October 2008	Validation site visit.	

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