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:

Project Title: Revalidation of project 0489 “Repowering Small Hydro Plants (SHP) in the State of São Paulo, Brazil”

PDD Version: 03

Date: 03/15/2011

A.2. Description of the project activity:

CPFL Energia is a holding company that, through its subsidiaries, distributes, generates and trade electricity in Brazil. In 2004, it was one of the three largest electricity distributors in Brazil, based on 36,647 GWh of electricity delivered to more than 5.4 million customers in the richest region in the country.

The installed capacity of its generation subsidiary, CPFL Geração de Energia S.A., or Geração, was 812 MW of which its 19 SHP contributed with 15% of the total. Since 2000, CPFL is increasing its capacity by upgrading some of the older generation SHPs and participating in the construction of six new large hydroelectric generation facilities in several points of the country.

This project encompasses the upgrade of CPFL’s SHPs in the State of São Paulo, south-eastern of Brazil. In this region, all major hydropower potential have long been tapped, together with most of the smaller ones as well. Expanding generation in the region brings the advantage of increasing energy supply in the country’s richest region with lower transmission losses and thus avoiding hydropower plants in the Amazon region. The plants were built in the early 1900s and have been running basically with the original turbines and generators. As they were extending their lifetime, CPFL sought options to repower them.

All the repowering projects maintained the same reservoir area and were authorized to run with the same head, meaning that no additional environmental impact will be brought by these projects. The whole gain is an efficiency upgrade by using modern generation technology. In four of the plants, the extra power is achieved with fewer turbines than before. One of the plants always operated with one turbine, and the sixth plant replaced its two turbines for two new ones.

All the plants still have the original buildings and work quarters as in the time they were built and are regarded as a historical testimony of the early stages of industrial development in Brazil. Preserving these sites adds to the memory of a country where this value is much too often neglected, and keeping the plants running is the best way to preserve them.

The SHPs Esmeril, Dourados, São Joaquim, Gavião Peixoto, Chibarro and Capão Preto have all concluded their repowering. The repowering of these six plants raised their total installed capacity from 25.6 MW to 35.93 MW, adding more than 86 GWh per year to the grid. All these plants were originally built between 1910 and 1930 when turbine-generator efficiency was significantly lower than today. So,

the extra power is being tapped without any change to the existing reservoirs and therefore without adding any environmental impact.

Under the same modernization program, still another SHP was repowered – SHP Salto Grande. Due to the expansion of the water supply system to the São Paulo-Campinas metropolitan areas, federal offices authorized a lower operating head and flow to the plant so that it is now generating less energy than before the repowering project.

The electric sector in Brazil has been traditionally supplied by large hydropower plants, as illustrated by the figure below. Although the country still has a large unexplored hydro potential, most of it is located in the Amazon region where the environmental constrains impose severe limitations for the amount of electricity potential to be explored in the next few years, as governments latest studies suggets[1]. Furthermore, these sources are far removed from the main consumption centres located in south-eastern region.

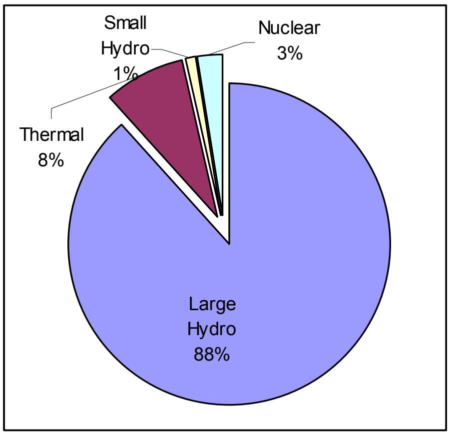


Figure 1 – Electric Generation by Source – 2003
Source: Sumário 10-year Electricity Generation Expansion Plan Executive Summary 2003-2012, Mines and Energy Ministry[1]

In 2001, due to a series of years of underinvestment in power generation, Brazil suffered a major shortage in supply, leading the government to implement a rationing program that deeply affected the economy.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Private entity – CPFL Geração	No

[1] Ministério de Minas e Energia (MME) – Plano Decenal de Expansão de Energia – PDE 2003-2012

	de Energia S.A.	
	Private Entity - C-Trade Comercializadora de Carbono Ltda	No
	Private Entity – Lumina Engenharia e Consultoria Ltda	No
United Kingdom of Great Britain and Northern Ireland	Private Entity - Cantor Fitzgerald Europe	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.		

Table 1– Private and public parties and entities involved in the activity

Detailed information for contact with the party (ies) and with the public/private entities involved in the project activity is related in Annex 1.

This project was developed under the responsibility of CPFL Energia with the support of Lumina Engenharia e Consultoria Ltda. All activities are being developed and limited to Brazil.

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.:

State of São Paulo, south-eastern region

A.4.1.3. City/Town/Community etc.:

Patrocínio Paulista, Nuporanga, Guará, Gavião Peixoto, Araraquara and São Carlos.

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

SHP	Code	Location		City	River	Basin
		Longitude (W)	Latitude (S)			
Esmeril	USES	20°50'23''	47°18'07''	Patrocínio Paulista	Esmeril	Sapucaí Mirim
Dourados	USDO	20°38'37''	48°40'07''	Nuporanga	Sapucaí	Sapucaí Mirim
São Joaquim	USJO	20°34'25''	47°46'58''	Guará	Sapucaí Mirim	Sapucaí Mirim
Gavião Peixoto	USPE	21°50'53''	47°42'20''	Gavião Peixoto	Jacaré-Guaçu	Tietê
Chibarro	USCH	21°53'17''	48°08'50''	Araraquara	Chibarro	Tietê
Capão Preto	USCP	21°53'54''	47°47'04''	São Carlos	Conxim, Negros, Itaúna, Quilombos	Mogi-Guaçú

Table 2 – List of SHPs covered by this project

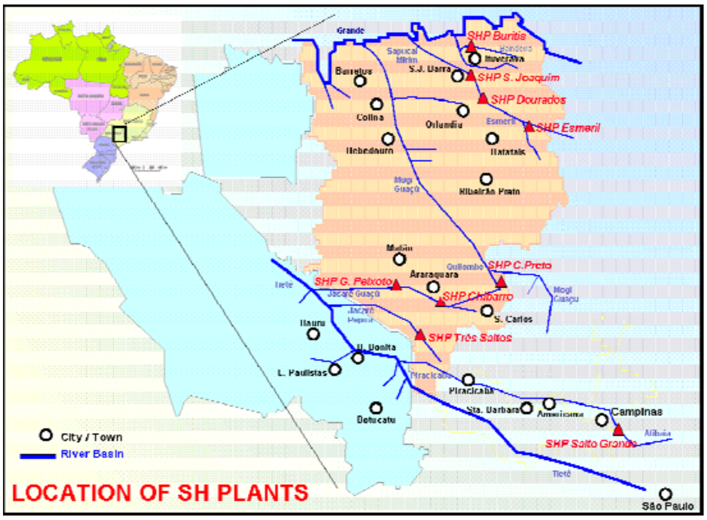


Figure 2 – Location of CPFL' repowered power plants covered by the project activity

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

Sectoral Scope 1 – Energy Industries (Renewable/Non-renewable sources)

The project activity is grid-connected electricity generation from renewable energy source. These are run-of-river hydro power projects with existing reservoirs where the volume of the reservoir is not increased.

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

The table below lists the main physical characteristics of the SHPs reservoirs, which will remain the same and not be modified by the project activity:

SHP	Flooded Area (km²)
Esmeril	0.28
Dourados	0.54
São Joaquim	0.84
Gavião Peixoto	0.077
Chibarro	0.0108
Capão Preto*	2.50

*Capão Preto has four small reservoirs with the following flooded areas (km²): R1 0.46; R2 1.00; R3 0.01; R4 1.03.

Table 3– Reservoirs' Main Physical Characteristics

The Table 4 presents the repowered SHP technical information's prior to the project activity and the main technical characteristics of the project activity.

SHP	startup	equipment	type	flow rate (m3/s)	equipment	generator capacity (MW)	generator voltage (kV)
Esmeril	1912	Turbine 1	Francis	1.12	generator	0.58	2.2
		Turbine 2	Francis	1.12	generator	0.58	2.2
		Turbine 3	Francis	1.86	generator	0.61	2.2
	2001	**Turbine 1**	**Francis**	**4.88**	**generator**	**2.5**	**2.2**
		Turbine 2	**Francis**	**4.88**	**generator**	**2.5**	**2.2**
Dourados	1926	Turbine 1	Francis	33.00	generator	6.4	6.3
	2002	**Turbine 1**	**Francis**	**44.00**	**generator**	**10.8**	**6.9**
São Joaquim	1911	Turbine 1	Francis	7.35	generator	0.84	2.2
		Turbine 2	Francis	7.35	generator	0.84	1.05
		Turbine 3	Francis	16.2	generator	1.92	2.2
		Turbine 4	Francis	15.89	generator	1.92	2.2
	2002	**Turbine 1**	**Kaplan**	**17.5**	**generator**	**2.79**	**6.9**
		Turbine 2	**Kaplan**	**17.5**	**generator**	**2.79**	**6.9**
		Turbine 3	**Kaplan**	**17.5**	**generator**	**2.79**	**6.9**
Gavião Peixo	1913	Turbine 1	Francis	6.00	generator	0.7	6.5
		Turbine 2	Francis	6.00	generator	0.7	6.5
		Turbine 3	Francis	6.00	generator	0.98	6.3
		Turbine 4	Francis	13.2	generator	1.73	6.5
	2007	**Turbine 1**	**Francis**	**15.00**	**generator**	**2.43**	**6.9**
		Turbine 2	**Francis**	**15.00**	**generator**	**2.43**	**6.9**
Chibarro	1912	Turbine 1	Francis	2.09	generator	1.21	2.2
		Turbine 2	Francis	2.06	generator	1.08	2.2
	2008	**Turbine 1**	**Francis**	**2.2**	**generator**	**1.3**	**2.2**
		Turbine 2	**Francis**	**2.2**	**generator**	**1.3**	**2.2**
Capão Preto	1911	Turbine 1	Francis	2.06	generator	1.76	2.2
		Turbine 2	Francis	3.2	generator	1.76	2.2
		Turbine 3	Francis	3.6	generator	2.00	2.2
	2008	**Turbine 1**	**Francis**	**2.2**	**generator**	**2.00**	**2.2**
		Turbine 2	**Francis**	**3.6**	**generator**	**2.3**	**2.2**

Table 4– SHPs technical information

The following table shows the additional electricity and the projected amount of energy to be generated by each power plant.

SHP	Start of Operation	Previous Capacity (MW)	Project Capacity (MW)	Added Capacity (MW)
Esmeril	2003	1.76	5.00	3.24
Dourados	2002	6.40	10.80	4.40
São Joaquim	2002	5.52	8.37	2.85
Gavião Peixoto	2007	4.12	4.86	0.74
Chibarro	2007	2.29	2.60	0.31
Capão Preto	2008	5.52	4.30	(1.22)
Total		25.61	35.93	10.32

Table 5 – SHPs Installed Capacity

The SHP plants were built between 1910 and 1930 during the expansion of coffee plantations in the state of São Paulo and consequent expansion of the railway system built to transport production to the sea port at Santos. The projected capacity at the time reflected the state-of-technology at the beginning of the 20th century. Efficiency of electricity generation during the 1930s was approximately 65%. The use of modern technology, with efficiencies exceeding 80%, enables CPFL to increase their power capacity by using the same water flow and thus without having to increase reservoir areas: neither in dam height nor in the flood area. Furthermore, CPFL is concerned with the existing buildings in each site. All of them, powerhouses and workers quarters, were conserved as originally built and are considered historical sites. All repowering projects were limited to explore the electricity surplus without any modifications to the sites other than basically replacing old turbo-generators by more efficient ones, reinforcing foundations and, in some cases, by increasing the capacity of the water adduction channels.

The modifications in each plant considered in the project activity are described below:

1. Small Hydro Power Plant Esmeril:
   - ✓ Three old turbo-generators were replaced by two new generators, with an 2.5 MW installed capacity each.
   - ✓ Old penstocks were replaced with a new one.
   - ✓ Canal section was broadened in 3.0 m maintaining previous characteristics of velocity and rugosity coefficient, doubling its capacity.
   - ✓ The new machinery was installed in the same place as the previous ones.
   - ✓ Basic reinforcement of foundations and structure of the powerhouse were carried out.

2. Small Hydro Power Plant Dourados:
   - ✓ An old turbo-generator was replaced by a new one more efficient.
   - ✓ The buildings, adduction channel and penstocks suffered no modifications.

3. Small Hydro Power Plant São Joaquim:
   - ✓ Four older turbo-generators were replaced by three new ones, adding 2.85 MW to the plant, presenting now a total nominal capacity of 8.37MW (with 3 generators of 2.79MW each), but is authorized by ANEEL[2] to operate at 8.05MW. There is a document (Ofício 827-2009-SFG-ANEEL, dated 16/09/2009) that regularizes this difference. This was done in order to have a

[2] ANEEL Resolution Nº 469, of October 31st, 2001

reserve between the operational capacity and the maximum capacity, being an engineering consideration during the early project phase

- ✓ The buildings, adduction channel and penstocks suffered no modifications.

4. Small Hydro Power Plant Gavião Peixoto:
   - ✓ The older set of turbo-generators will be replaced by a new 4.86 MW set, adding 0.74 MW to the plant.
   - ✓ The new machines will be installed in the same place as the older ones.
   - ✓ Basic reinforcement of foundations and structure of the powerhouse will be carried out.
   - ✓ The buildings and adduction channel will suffer no modifications.

5. Small Hydro Power Plant Chibarro
   - ✓ Replacement of the older 1.21 MW and 1.08 MW turbo-generators by two new of 1.3 MW each.
   - ✓ The water adduction channel will be broadened.
   - ✓ Basic reinforcement of foundations and structure of the powerhouse will be carried out.
   - ✓ No changes will be carried out to the remaining facilities.

6. Small Hydro Power Plant Capão Preto
   - ✓ The two older 1.76 MW and 2 MW turbo-generators will be replaced by a 2 MW and 2.3 MW.
   - ✓ The junction of the existing penstocks will be revised in order to reduce head losses.

The evidences that the reservoir area did not change after the project implementation in each plant are described below:

1. Small Hydro Power Plant Esmeril:
   On pages 50 and 60 of the Final Report written by Roma Engenharia e Consultoria S/C Ltda were described alternatives scheme considered. On page 50 is described that the alternative 1 the reservoir will not change and is described on page 60 that the alternative 1 was chosen.

2. Small Hydro Power Plant Dourados:
   On page 44 of the Final Report written by InterTechne describes that there are records of the highs reached in the maximum duct leakage during the occurrence of some flooding, notably in 1983 therefore concluded that the reservoir area is equal than the area before starting the project .

3. Small Hydro Power Plant São Joaquim:
   On page 8 of the Final Report written by InterTechne is described that in alternative 1, change in dam is not considered. On page 37 it is assured that it was not considered the effect of reservoir inflows in the regularization of the recovery and on page 38 concludes that through the feasibility study was adopted the alternative 1.

4. Small Hydro Power Plant Gavião Peixoto:
   On page 1 of chapter 3 of the Final Report written by Poente Engenharia e Consultoria, Gana Engenharia e Consultoria and Schahin Engenharia is described that existing facilities will be fully exploited, such as keeping the share of the reservoir.

5. Small Hydro Power Plant Chibarro

On page 63 of the Description Memorial written by Themag Engenharia, the Technical Sheet indicates that the reservoir already exists.

6. Small Hydro Power Plant Capão Preto
On page 83 of the Description Memorial written by Themag Engenharia, the Technical Sheet indicates that the reservoir already exists.

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

The estimated amount of CERs for the 2nd crediting period is:

Year	Annual estimation of emission reduction in tCO_2e
2010	18,583
2011	18,583
2012	18,583
2013	18,583
2014	18,583
2015	18,583
2016	18,583
Total estimated reductions (tCO_2e)	130,079
Total number of crediting years	21 y (3 x 7)
Annual average over the crediting period of estimated reductions (tCO_2e)	18,583

Table 6 - Estimation of emissions reductions of the project activity

A.4.5. Public funding of the project activity:

There is no public funding from Annex I parties for project activities.

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:

This project applies entirely the approved consolidated methodology ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". Version 12.1

The tools referred by the methodology are:

- "Tool for the demonstration and assessment of additionality" – Version 05.2;
- "Tool to calculate the emission factor for an electricity system" – Version 2;
- "Combined tool to identify the baseline scenario and demonstrate additionality" – Version 02.2;
- "Tool to calculate project or leakage CO2 emissions from fossil fuel consumption" – Version 02 (this tool was not used in this project).

For more information about the methodology consult the following link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The approved consolidated methodology ACM0002 version 12.1 is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).The project situation is (c), retrofit of existing plants.

The methodology is applicable under the following conditions:

- The project activity is the installation capacity addition, retrofit or replacement 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 the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;

- In case of hydro power plants, one of the following conditions must apply:
    - o The project activity is implemented in an existing reservoir, with no change in the volume of reservoir;
    - o 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 Emissions section, is greater than 4 W/m^2;
    - o The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

The methodology 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[3] 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 the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".

The project activity consists in the retrofit of hydropower plants and complies with the methodology statement that "The project activity is (...) retrofit (...) of a (...)hydro power plant/unit (...)" and the project is implemented in existing reservoirs, with no change in their volumes.
Also, as requested by ACM0002 and justified in section B.4, the project's baseline scenario is the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance.

Therefore, the approved methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". Version 12.1, is applicable to the project activity.

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

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.

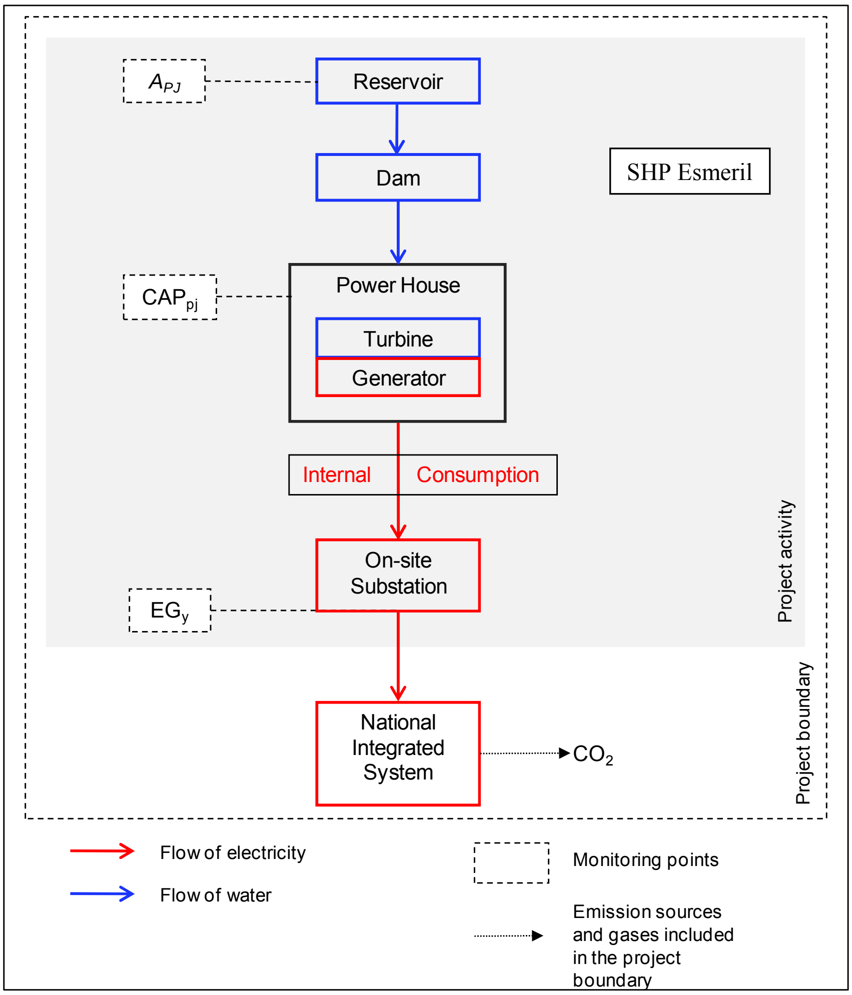
The greenhouse gases and emission sources included in the project boundary are shown in the table below.

	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	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam.	CO_2	No	Minor emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Minor emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.

[3] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

Table 7 - Emissions sources included in or excluded from the project boundary

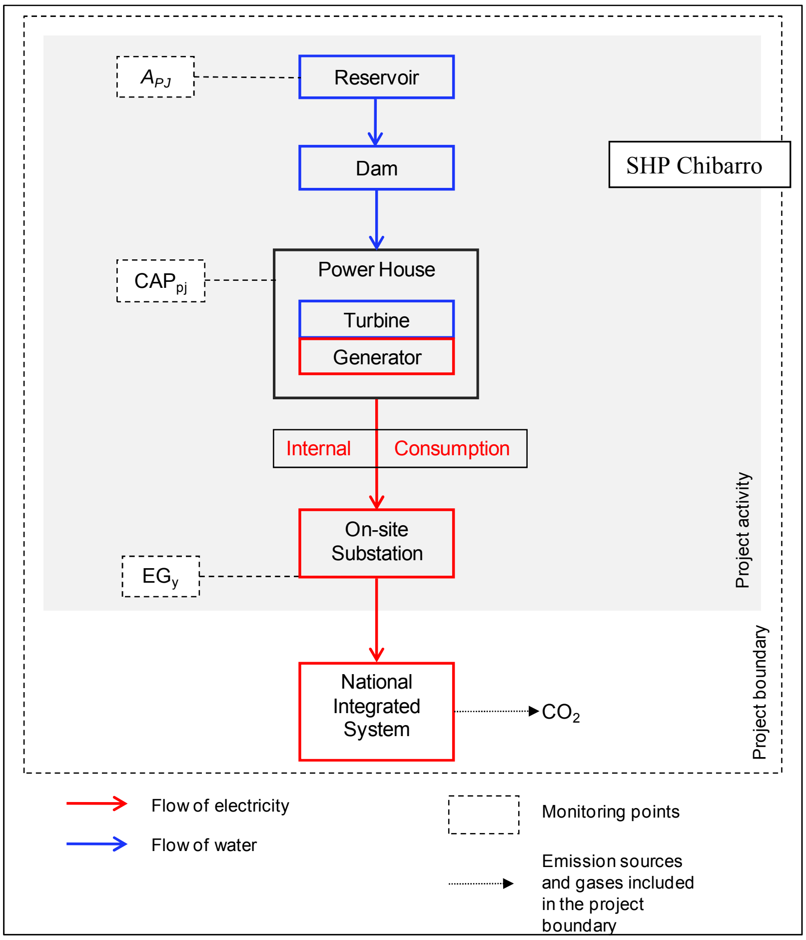
The spatial extent of the project boundary is depicted in the figures below:



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 3 -SHP Esmeril's flow diagram

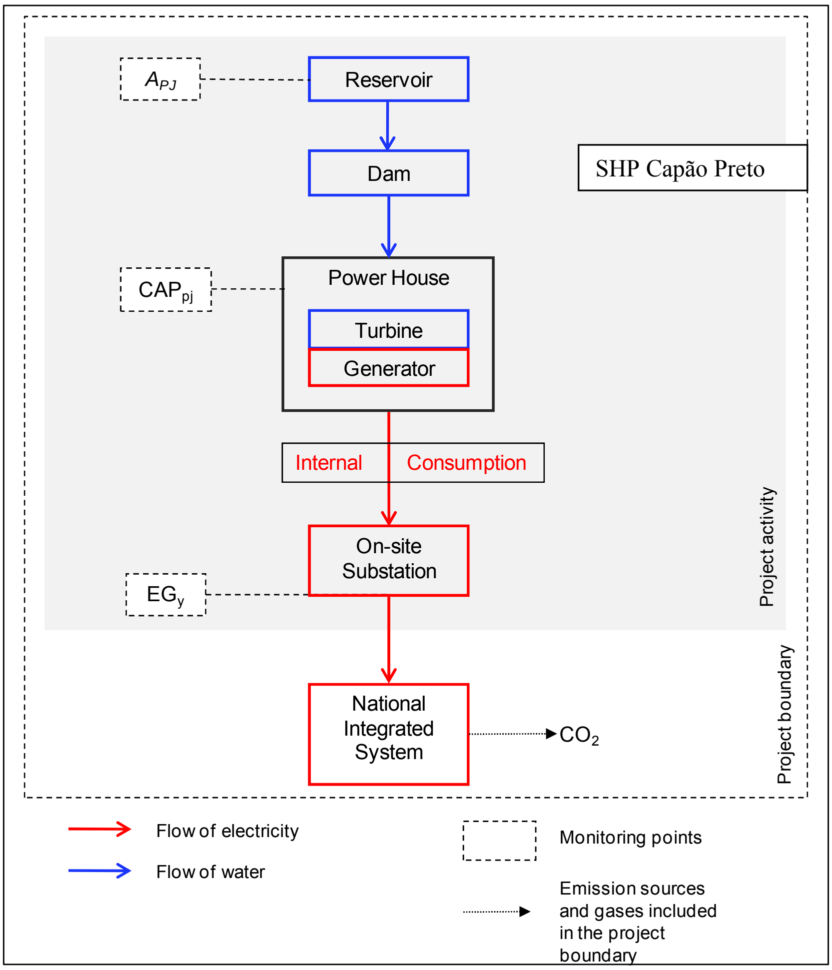
In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 4 -SHP Chibarro's flow diagram

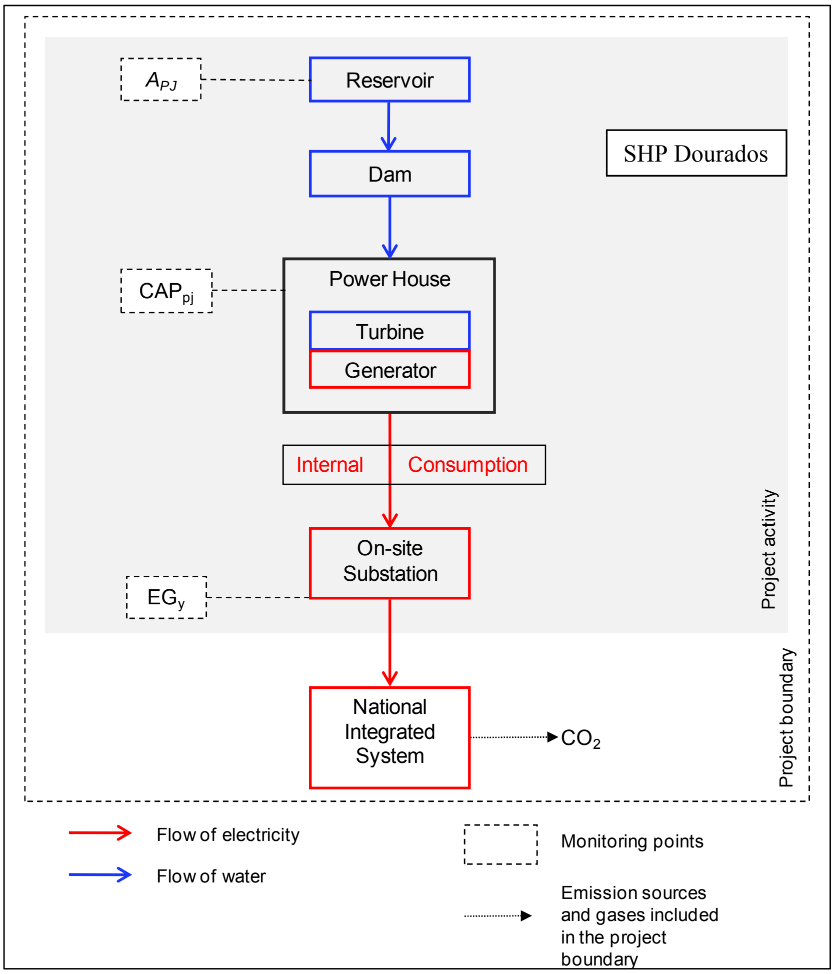
In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 5 -SHP Capão Preto's flow diagram

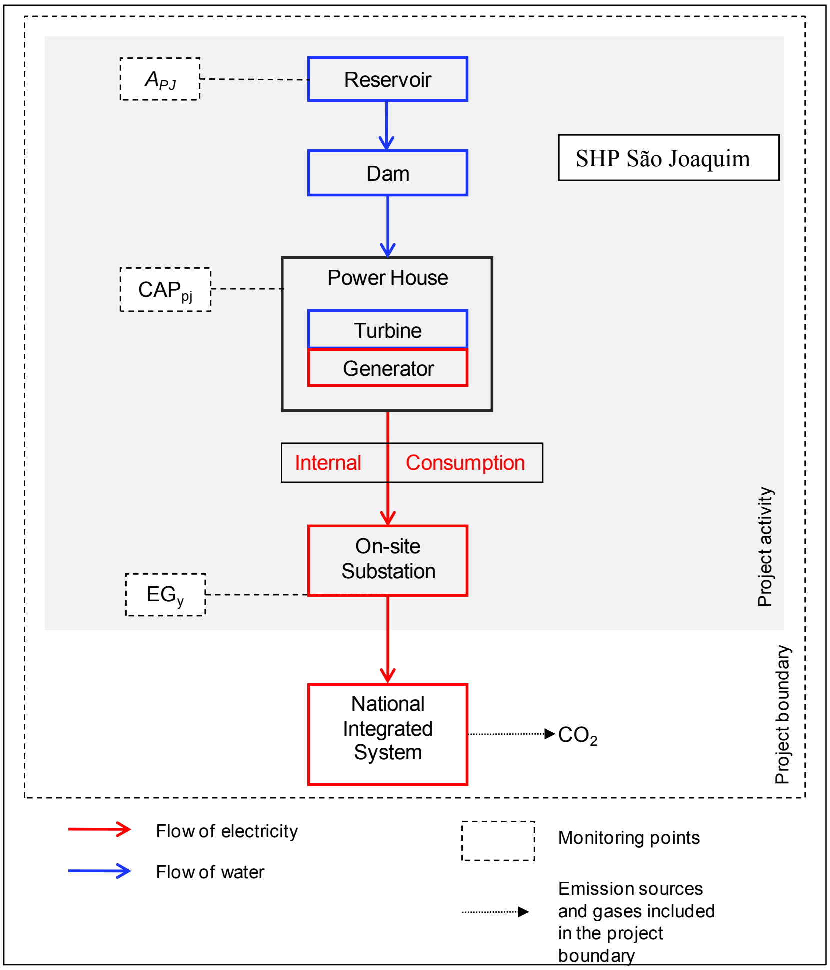
In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 6 -SHP Dourados' flow diagram

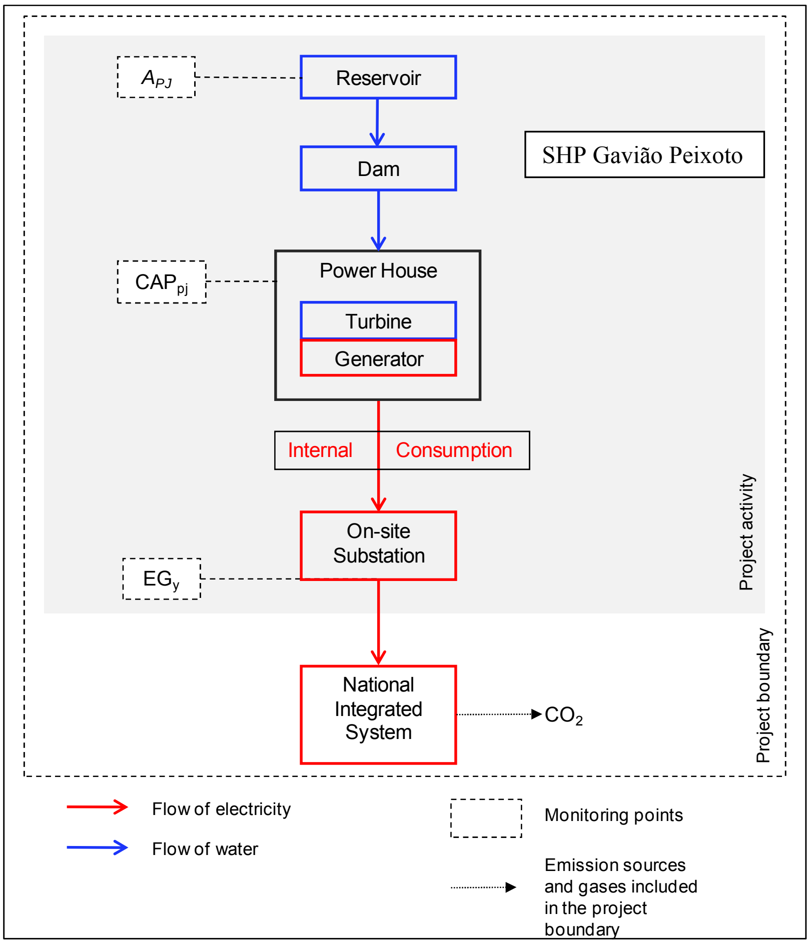
In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 7 -SHP São Joaquim's flow diagram

In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.



A_{pj} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²);
CAP_{pj} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
EG_y = Quantity of electricity generation supplied by the project plant to the grid in year *y*

Figure 8 -SHP Gavião Peixoto's flow diagram

In baseline the National Interconnected Power System includes thermal power plants that emit CO_2. To increase installed capacity and electricity production by repowering the SHP there was no reservoir change therefore the flooded areas remain the same. By consequence the reservoir area for the retrofitted SHP is equal to zero, with no emission of CH_4.

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

In accordance with the "Procedures for Renewal of the Crediting Period of a registered CDM Project Activity" (Annex 11 of the EB 46 Meeting), the project participants shall update those sections of the project design document (CDMPDD) relating to the baseline, estimated emission reductions and the monitoring plan using the latest approved version of a baseline and monitoring methodology, applied in the original CDM-PDD of the registered CDM project activity, shall be used whenever applicable.

According to the latest version of the methodology ACM0002 (Version 12.1), if the project activity is the retrofit or replacement of existing grid-connected renewable power plant/unit(s) at the project site, which is the case of the project activity, then the Step 1 of the "Combined tool to identify the baseline scenario and demonstrate additionality" should be applied, as follows.

Step 1: Identification of alternative scenarios

This Step serves to identify all alternative scenarios to the proposed CDM project activity(s) that can be the baseline scenario through the following Sub-steps:

Step 1a: Define alternative scenarios to the proposed CDM project activity

Identify all alternative scenarios that are available to the project participants and that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity.

The following alternative scenarios are considered:

- P1: The proposed project activity undertaken without being registered as a CDM project activity;
- P2: The continuation of the current situation, i.e. to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system.
- P3: Retrofit the plants using equipments with a lower capacity than the one proposed by the project activity;
- P4: Shut down the plants, and buy electricity from other plants in the grid.

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

All four scenarios identified above comply with existing legal framework.

Step 2: Barrier analysis

Sub-step 2a: Identify barriers that would prevent the implementation of alternative scenarios

Establish a complete list of realistic and credible barriers that may prevent alternative scenarios to occur.

(a) Investment Barrier

The 2001 study included a thorough financial feasibility study that included:

- EPC quotes for construction costs (including new turbines and generators);
- Operation and maintenance costs based on historical figures;
- Presumed revenues from the sales of electricity;
- Taxes;
- Depreciation on investments and on existing installations.

The analysis performed at that time calculated the electricity tariff for expected values of IRR in two scenarios. In the first one, which later became the chosen option, the company would invest 30% of its own capital and apply for a BNDES loan covering the remaining 70%. In the second scenario CPFL would invest all the required capital.

The feasibility analysis sought the energy tariffs that would render two levels of IRR: 15% and 18%. At that time, 15% IRR was considered the lowest acceptable value by shareholders when fully financing projects with own capital. This value can be compared with the average SELIC rate (Monetary Policy Committee reference rate) of 19% in 2001.

The table below summarizes the equivalent electricity tariffs for some of the SHPs:

Capital Structure	30% own 70% financed (during construction) shareholder IRR = 18%	100% own shareholder IRR = 15%
Plant	average tariff R$ / MWh	average tariff R$ / MWh
Chibarro	48,74	54,21
Esmeril	41,57	46,91
Capão Preto	30,66	34,14
Buritis	57,97	65,08
Salto Grande	33,73	38,90
average	42,53	47,85

Table 8 – Equivalent tariff for scenarios

The energy tariff obtained at 18% IRR was R$ 42.53 / MWh (US$ 15.70 at 2.709 RS$/US$ - 09/19/01). This value can be compared with the average energy price of R$ 42.56 / MWh that CPFL paid for the more than 35,000 GWh it commercialized that year.

As a further point, the project as a whole suffered a delay in 2002-03 as the national economy suffered a recession period and the economics wouldn't allow for allocating the required capital. It was only in 2003, as the Brazilian economy started to recover and with it, CPFL's revenues, that the project was, once again further pursued.

Therefore, the decision of repowering the SHPs does not configure a classical business as usual situation, as it was not a business opportunity motivated only by high returns on investment. It is more of a strategic necessity in face of the alternative of shutting down the plants, and one that renders only a small rate of return according to its internal standards.

It must be emphasized once more, that shutting down the plants would mean removing 25.6 MW (or more than 200 GWh/year) from the grid and that this capacity would have to be supplied from other sources.

(b) Technological barrier

All plants under this project were built between 1910 and 1930 and turbines and generators are still the original equipments. Despite their reasonable conditions to keep operating, it is known that they would need to be replaced by 2027. From that point onwards, the only alternative would be to shut down the plants and buy the same amount of energy from the market. In this case, instead of adding an extra amount of 86 GWh/year to the grid, closing the plants would create an extra demand of more than 200 GWh/year.

Once the decision to repower the plant is reached, it is logical – both technically and economically - to tap the maximum amount of energy possible and, therefore, to specify the turbines and generators with the highest possible yield.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers:

- **Scenario P1**

The option of the project being implemented without the benefits of the CDM would face the financial barrier, and the decision to carry on with the plant´s retrofitting only occurred when the sale of the project´s CERs were considered, therefore this option is not feasible.

- **Scenario P2**

The continuation of the current situation remains a valid option, as the equipments could be kept operating with proper maintenance.

- **Scenario P3**

The retrofitting of the SHPs using equipments with a lower capacity than the one proposed by the project activity is not feasible, both technically and economically.

- **Scenario P4**

As justified above, CPFL could opt for shutting down the plants and supply its needs in the market at the same level of tariffs. The existing equipment could be sold as used parts and scrap and the land could be

sold to neighbouring farms. The decision to close plants is not new to CPFL. As of today, two SHPs, outside the scope of this project, are not operating due to problems with water supply. A third is closed for technical reasons and a fourth may also be closed in a nearby future due to the lack of water, as a new sugar plant built upstream is diverting much water for its process. Therefore, this option remains a valid alternative scenario.

Therefore, as stated above, the only feasible scenarios to be considered as alternatives for the project's baseline scenario are the following:

- P2: The continuation of the current situation, i.e. to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system; and

- P4: Shut down the plants, and buy electricity from other plants in the grid.

As per the "Combined Tool to identify the baseline scenario and demonstrate additionality", if after the barrier analysis there is still several alternative scenarios remaining, but which do not include the proposed project activity undertaken without being registered as a CDM project activity, then project participants may choose to either:

- Option 1: Perform an investment analysis; or

- Option 2: Identify the alternative with the lowest emissions as the baseline scenario.

Therefore, as per Option 2, the project's baseline scenario is Scenario P2: the continuation of the current situation, which is the scenario that would render the lowest emissions.

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):

As per ACM0002, version 12.1, the project's additionality was demonstrated according to the "Tool for the demonstration and assessment of additionality", version 05.2, which provides a step-wise approach to demonstrate and assess additionality, including the following:

1) Identification of alternatives to the project activity;
2) Investment analysis to determine that the proposed project activity is either:
    a. not the most economically or financially attractive, or
    b. not economically or financially feasible;
3) Barriers analysis; and
4) Common practice analysis.

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

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

As demonstrated in Section B.4, the alternatives considered to the project activity are the following:

- P1: The proposed project activity undertaken without being registered as a CDM project activity;

- P2: The continuation of the current situation, i.e. to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system.

- P3: Retrofit the plants using equipments with a lower capacity than the one proposed by the project activity;

- P4: Shut down the plants and buy electricity from other plants in the grid.

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

All scenarios identified in Sub-step 1a comply with existing legal framework.
As per the "Tool for the demonstration and assessment of additionality", project participants may choose to proceed with Step 2: Investment analysis or Step 3: Barrier analysis.

Step 2: Investment Analysis

Not evaluated.

Step 3: Barrier analysis

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

(a) Investment Barrier

The 2001 study included a thorough financial feasibility study that included:
- EPC quotes for construction costs (including new turbines and generators);
- Operation and maintenance costs based on historical figures;
- Presumed revenues from the sales of electricity;
- Taxes;
- Depreciation on investments and on existing installations.

The analysis performed at that time calculated the electricity tariff for expected values of IRR in two scenarios. In the first one, which later became the chosen option, the company would invest 30% of its own capital and apply for a BNDES loan covering the remaining 70%. In the second scenario CPFL would invest all the required capital.

The feasibility analysis sought the energy tariffs that would render two levels of IRR: 15% and 18%. At that time, 15% IRR was considered the lowest acceptable value by shareholders when fully financing

projects with own capital. This value can be compared with the average SELIC rate (Monetary Policy Committee reference rate) of 19% in 2001.

The table below summarizes the equivalent electricity tariffs for some of the SHPs:

Capital Structure	30% own 70% financed (during construction) shareholder IRR = 18%	100% own shareholder IRR = 15%
Plant	average tariff R$ / MWh	average tariff R$ / MWh
Chibarro	48,74	54,21
Esmeril	41,57	46,91
Capão Preto	30,66	34,14
Buritis	57,97	65,08
Salto Grande	33,73	38,90
average	42,53	47,85

Table 9 – Equivalent tariff for scenarios

The energy tariff obtained at 18% IRR was R$ 42.53 / MWh (US$ 15.70 at 2.709 RS$/US$ - 09/19/01). This value can be compared with the average energy price of R$ 42.56 / MWh that CPFL paid for the more than 35,000 GWh it commercialized that year.

As a further point, the project as a whole suffered a delay in 2002-03 as the national economy suffered a recession period and the economics wouldn't allow for allocating the required capital. It was only in 2003, as the Brazilian economy started to recover and with it, CPFL's revenues, that the project was, once again further pursued.

Therefore, the decision of repowering the SHPs does not configure a classical business as usual situation, as it was not a business opportunity motivated only by high returns on investment. It is more of a strategic necessity in face of the alternative of shutting down the plants, and one that renders only a small rate of return according to its internal standards.

It must be emphasized once more, that shutting down the plants would mean removing 25.6 MW (or more than 200 GWh/year) from the grid and that this capacity would have to be supplied from other sources.

(b) Technological barrier

All plants under this project were built between 1910 and 1930 and turbines and generators are still the original equipments. Despite their reasonable conditions to keep operating, it is known that they would need to be replaced by 2027. From that point onwards, the only alternative would be to shut down the plants and buy the same amount of energy from the market. In this case, instead of adding an extra amount of 86 GWh/year to the grid, closing the plants would create an extra demand of more than 200 GWh/year.

Once the decision to repower the plant is reached, it is logical – both technically and economically - to tap the maximum amount of energy possible and, therefore, to specify the turbines and generators with the highest possible yield.

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

- **Scenario P1**

The option of the project being implemented without the benefits of the CDM would face the financial barrier, and the decision to carry on with the plant´s retrofitting only occurred when the sale of the project´s CERs were considered, therefore this option is not feasible.

- **Scenario P2**

The continuation of the current situation remains a valid option, as the equipments could be kept operating with proper maintenance.

- **Scenario P3**

The retrofitting of the SHPs using equipments with a lower capacity than the one proposed by the project activity is not feasible, both technically and economically.

- **Scenario P4**

As justified above, CPFL could opt for shutting down the plants and supply its needs in the market at the same level of tariffs. The existing equipment could be sold as used parts and scrap and the land could be sold to neighbouring farms. The decision to close plants is not new to CPFL. As of today, two SHPs, outside the scope of this project, are not operating due to problems with water supply. A third is closed for technical reasons and a fourth may also be closed in a nearby future due to the lack of water, as a new sugar plant built upstream is diverting much water for its process. However, this option is not economically attractive to CPFL.

Therefore, the only feasible scenario to be considered as an alternative for the project's baseline scenario is P2: the continuation of the current situation.

Step 4. Common practice analysis

Retrofitting power plants in Brazil is not a common practice. In fact, there are studies indicating that the country could tap an additional 10-15% of all its demand through retrofit projects in its major plants, either by replacing original turbines with more efficient state-of-art technology or by adding new turbines in older plants were there is still electric potential to be tapped.

In the 2003 Ten-year National Operation Plan, the main official planning document developed by Eletrobras, only one large plant was planned for retrofitting.

There are more than 1,000 small hydro plants in the country and research carried out in the official data bases showed no repowering project being developed as of today.
For the renewal of the crediting period, it is also necessary to apply the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period". This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at

the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: **Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies**

The current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period.

Step 1.2: **Assess the impact of circumstances**

No new circumstances, legislation or practices impact the baseline of the project activity.

The assumptions that were used to determine the baseline were maintained in relation to the initial scenario of 2003 and do not change.

The baseline scenario is the continuation of the project situation regarding power generation. The project activity reduces emissions of greenhouse gas associated with the fossil fuel fraction of power generation, which would be emitted in the absence of the project.

The Interministerial Commission on Global Climate Change – "Comissão Interministerial de Mudança Global do Clima" – CIMGC in its 43rd Meeting, on April 29th, 2008, decided to adopt a standard Unique System for CDM projects that use the emission factor calculation tool in methodology ACM0002 to estimate transmission restrictions in the SIN sub-markets are not enough to substantially decrease the global benefit of the project, depending on the region where it is implemented.

CONSTRUCTION MARGIN - 2008
Average Emission Factor (tCO_2/MWh) - ANNUAL
0.1458

MARGIN OPERATION												
Average Emission Factor (tCO2/MWh) - PER MONTH												
YEAR	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
2008	0.5727	0.6253	0.5794	0.4529	0.4529	0.4579	0.518	0.4369	0.4258	0.4369	0.3343	0.4686

Emission Factor of CO_2 (tCO_2/MWh.month)												
YEAR	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
2008	0.252525	0.265675	0.2542	0.222575	0.223825	0.23885	0.218575	0.2158	0.2119	0.218575	0.192925	0.2265

EF Average	0.2285

Emission Factor Calculation

Figure 9 shows the transmission system operated by the National System Operator – "Operador Nacional do Sistema", named ONS.

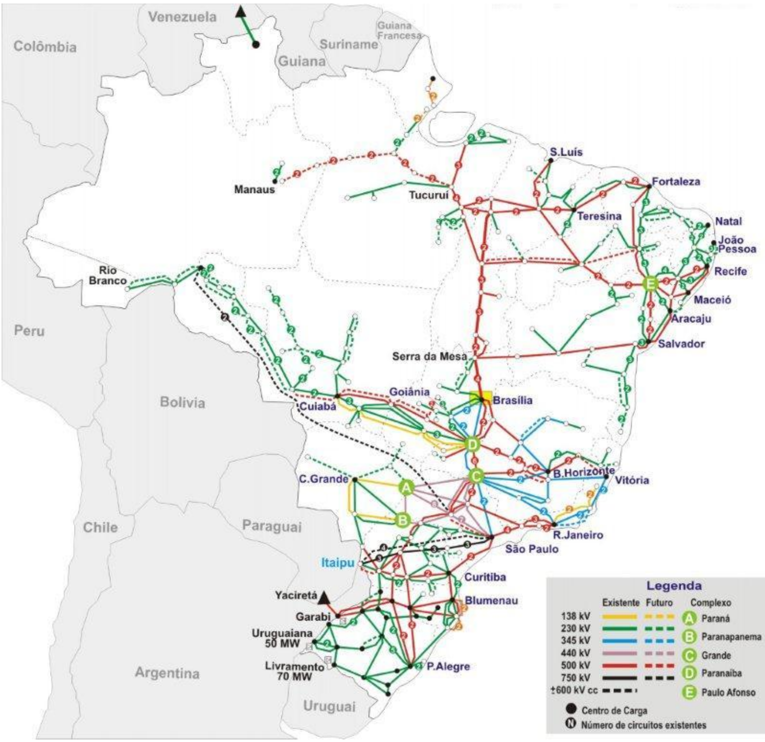


Figure 9 – Transmission System May/2010 – Horizon 2012
Source: National Operator System – ONS

Step 1.3: **Assess whether the continuation of the use of current baseline equipment(s) is technically possible**

As stated in Sub-step 2a, with proper maintenance the plants could be kept operating for years to come until the end of the plant´s concession, by 2027, which is longer the projects´ renewal crediting period.

Step 1.4: **Assessment of the validity of the data and parameters**

Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:

- Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;

- Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity.

The emission factor for the Brazilian Interconnected Grid, where the plants are connected, is calculated and published annually by the Ministry of Science and Technology (MCT) and ANEEL. Therefore, these values must be updated for the following crediting period.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

It is necessary to update the current baseline emissions for the subsequent crediting period, based on the latest approved version of the methodology applicable to the project activity.

The consolidated methodology ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" has changed the calculation method for the emissions, in particular concerning the historical electricity generation in its latest version (version 12.1). The details of this change are given in section B.6.1.

Step 2.2: Update the data and parameters

The updated data is used and details are given in B.6.1.

CDM consideration and real and continual effort in securing the CDM status

In 2002, in the wake of the Marrakesh COP-7 Conference, CPFL hired a consultancy to perform an extensive study of the impact and opportunities arising from climate change issues in the company.

This study then examined existing projects in the company related to energy efficiency measures and the large and small hydro plants that it owned or had stakes. It analyzed current IPCC emission data for electricity generation using fossil fuels together with the most-likely technology to be used in the expansion of the electric sector in Brazil to obtain an emission factor of 0,14 tC / MWh[4].

The study assumed that retrofitting most of the SHPs would increase CPFL' generation in 208 GWh per year, which would be equivalent of reducing 150,000 tC in a 20 year period and a revenue of US$ 450,000 using a 3 US$ / tC price. This value would represent 5 % of the then estimated investment necessary for retrofitting the plants.

---

[4] The study used tons of carbon instead of equivalent tons of carbon dioxide in both the conversion factor and the estimated price of CERs. This misinterpretation should be forgiven as at the time when it was developed, carbon market was still in its beginnings.

Together with the 2001 study for its Board of Directors, since 2002 CPFL acknowledged that CERs could add weight to the retrofitting alternative, rendering these projects further attractive for its shareholders, even if its impact in the equivalent tariffs would not be greater than a few percent.

CPFL's concern with emission reductions is part of its commitment with global environmental standards stated in their Institutional Profile and part of several corporate guidelines. As part of this concern, in 2001 it hired a consultancy company, CarboNetwork, to perform a study that, besides updating CPFL on the state of negotiations within UNFCCC, sought the company's opportunities and weaknesses from the climate change perspective and proposed a strategic plan to face those challenges. This study found that repowering SHPs presented a possible line of action.

As of today, CPFL has the concession of 19 SHPs of which two are not operating and a third remained closed during almost ten years. The decision to run or not a plant is taken at the highest level of the company based fundamentally on economics and considering the related social and environmental impacts.

The main studies carried out in 2001 [*CPFL, 2001*] served as base of the decision of CPFL's Board to approve the repowering of the plants included in this project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

According to ACM0002, for most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant and these emissions should be accounted as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:
PE_y = Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y*(tCO_2e/yr)
$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The GHG emissions from project activities are zero, once there are no emissions from fossil fuel consumption ($PE_{FF,y} = 0$) nor from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y} = 0$). The emissions from the water reservoirs of the project power plants are also not accounted, once the project do not result in any new reservoirs or in an increase of the existing reservoirs ($PE_{HP,y} = 0$).

Baseline emissions

Baseline emissions shall include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$

Where:
BE_y = Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$ = 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 (tCO2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions.

The project activity is the retrofit of existing grid-connected SHP in the State of São Paulo and, therefore, option (b) was selected by project participants to calculate $EG_{PJ,y}$ as follows.

b) Retrofit or replacement of an existing renewable energy power plant

As the project activity is the retrofit of an existing grid-connected renewable power plant, the baseline scenario is the continuation of the operation of the existing plant. The methodology uses historical electricity generation data to determine the electricity generation by the existing plant in the baseline scenario, assuming that the historical situation observed prior to the implementation of the project activity would continue.

The power generation of renewable energy projects can vary significantly from year to year, due to natural variations in the availability of the renewable source (e.g. varying rainfall, wind speed or solar radiation).

The use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity.

$EG_{PJ,y}$ is calculated as follows:

$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical})$; until $DATE_{BaselineRetrofit}$

And

$EG_{PJ,y} = 0$; on/after $DATE_{BaselineRetrofit}$

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
$EG_{historical}$ = Annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$\sigma_{histrorical}$ = Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$DATE_{BaselineRetrofit}$ = Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)
$EG_{historical}$ is the annual average of historical net electricity generation, delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity. To determine $EG_{historical}$, project participants may choose between two historical periods. This allows some flexibility: the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years.

Project participants may choose among the following two time spans of historical data to determine $EG_{historical}$:

a) The five last calendar years prior to the implementation of the project activity; or
b) The time period from the calendar year following $DATE_{hist}$, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least five calendar years, where $DATE_{hist}$ is latest point in time between:

i. The commercial commissioning of the plant/unit;
ii. If applicable: the last capacity addition to the plant/unit; or
iii. If applicable: the last retrofit of the plant/unit.

Calculation of $DATE_{BaselineRetrofit}$

In order to estimate the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity ($DATE_{BaselineRetrofi}$), project participants may take the following approaches into account:

a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g., based on industry surveys, statistics, technical literature, etc.;
b) The common practices of the responsible company regarding replacement/retrofitting schedules may be evaluated and documented, e.g. based on historical replacement/retrofitting records for similar equipment.

The methodology also states that the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

The table below shows the baseline electricity generation data, calculated from a 5-year historical average as determined by the methodology ACM0002 (version 12.1). The table also shows the date when the first three plants started operations after their retrofit was concluded and the planned date for the retrofit of the next three plants. The last column shows the date when the federal concession ends, which is adopted as point in time when the existing equipment would need to be replaced in the absence of the project activity ($DATE_{BaselineRetrofit}$).

Power Plant	Power Capacity after Repowering (MW)	EG Baseline (MWh)	Operational Start after Repowering	End of Concession Date
Esmeril	5.00	7,261.5	Jan/03	Nov/27
Dourados	10.80	44,912.5	Jul/02	Nov/27
São Joaquim	8.37	30,408.7	Jul/02	Nov/27
Gavião Peixoto	4.86	22,185.7	Jun/07	Nov/27
Chibarro	2.60	9,523.4	Dec/07	Nov/27
Capão Preto	4.30	13,388.7	Feb/08	Nov/27

Table 10 – Baseline: Electricity Generation and Effective and Estimated Retrofit Date

Power Plant	Standard Deviation Historical (σ)
	MWh
Esmeril	107.92
Dourados	520.57
São Joaquim	338.85
Gavião Peixoto	200.43
Chibarro	173.65
Capão Preto	415.89

Table 11 - Standard Deviation Historical ($\sigma_{historical}$)

Calculation of $EF_{grid,CM,y}$

The latest version of ACM0002 methodology, for the generation of interconnected grid electricity from renewable sources, requires the application of the "Tool to calculate the emission factor for an electricity system", which uses derived margins that were applied to the context of the project activity by determining emissions factors from the Brazilian Interconnected System, the national grid (electric

system that is interconnected by transmission lines to the project electric system, and in which the plants can be dispatched without significant restrictions in transmission).

According to the tool, the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the combined margin (CM), which consists of the combination of factors of the operating margin (OM) and the build margin (BM). In order to determine the emissions factors of the build margin and the operating margin, a project electric system is defined as being the physical extension of the plants that can be dispatched without significant restrictions on transmission. Similarly, an interconnected electric system is defined as being an electric system that is interconnected by transmission lines to the project electric system, in which the plants can be dispatched without significant restrictions in transmission.

According to the latest version of the "Tool to calculate the emission factor for an electricity system" (version 2), the baseline emission factor ($EF_{grid,CM,y}$) should be calculated by applying the following steps:

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose wether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Identify the group of power units to be included in the build margin (BM).
STEP 6. Calculate the build margin emission factor.
STEP 7. Calculate the combined margin (CM) emissions factor.

The operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) calculation for the project activity is calculated as follows:

Step 1: Identify the relevant electricity systems

The Brazilian DNA (Brazilian Science and Technology Ministry) has published a delineation of the project electricity system and connected electricity systems, which are used for the project activity. Please, see Annex 3 – Baseline Information for detailed information.
The electricity generated by the repowered SHPs considered in this project activity will be exported to the Brazilian National Interconnected System (SIN), the national electric grid. Therefore, project participants chose to use national grid for the calculation of the combined margin emission factor.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may chose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I was selected by project participants.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The dispatch data analysis OM (c) was selected to calculate the project's emission factor. For this method, the emissions factor can be calculated using either of the two following data vintages:

- *Ex-ante* option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- *Ex post* option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year *y* is usually only available later than six months after the end of year *y,* alternatively the emission factor of the previous year *y – 1* may be used. If the data is usually only available 18 months after the end of the year *y*, the emission factor of the year proceeding the previous year , the emission factor of the year proceeding the previous year *y – 2* may be used. The same data vintage (*y, y – 1 or y – 2*) should be used throughout all crediting periods.

The emissions factor of the project activity will be calculated *ex post* and, as per the "Tool to calculate the emission factor for an electricity system" (version 2), for the dispatch data analysis OM, project participants ought to use the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring.

Step 4: Calculate the operating margin emission factor according to the selected method

(c) Dispatch data analysis OM

The operating margin is calculated and made available by the Brazilian DNA (Brazilian Science and Technology Ministry - MCT). The following table presents the monthly aggregated operating margin used for the emission factor calculation in 2008:

Average Montlhy Emission Factor (tCO_2/MWh)											
January	February	March	April	May	June	July	August	September	October	November	December
0.5727	0.6253	0.5794	0.4529	0.4579	0.518	0.4369	0.4258	0.4102	0.4369	0.3343	0.4686

Table 12 – Monthly Operating Margin Emission Factor
Source: Brazilian Science and Technology Ministry

Therefore, the average operating margin emission factor is

$EF_{grid,OM-DD,y}$ = 0.4765 tCO_2/MWh

Step 5: Identify the group of power units to be included in the build margin

The sample group of power units *m* to calculate the build margin consists of either:

a) The set of five power units that have been built most recently; or
b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

It should be used the set of power units that comprises the larger annual generation and power plant registered as CDM project activities should be excluded from the sample group *m*.

The build margin is calculated by the Brazilian DNA based on the set of most recently built power units.

Step 6: Calculate the build margin emission factor

The build margin is calculated and made available by the Brazilian DNA (Brazilian Science and Technology Ministry - MCT). The following table presents the monthly aggregated operating margin used for the emission factor calculation in 2008:

Average Annual Build Margin Emission Factor (tCO_2/MWh)
2008
0.1458

Table 13 – Average Annual Build Margin Emission Factor
Source: Brazilian Science and Technology Ministry

Therefore, the average build margin is:

$EF_{grid,BM,y}$ = 0.1458

Step 7: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

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

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

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;
- All other projects: w_{OM} = w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting periods, unless otherwise specified in the approved methodology which refers to this tool.

Therefore, for this project activity's revalidation, it will be adopted w_{OM} = 0.25 and w_{BM} = 0.75 and, thus, the combined emissions factor is as follows:

$EF_{grid,CM,y} = 0.4765 * 0.25 + 0.1458 * 0.75$

$EF_{grid,CM,y}$ = 0.2285 tCO_2/MWh

Leakage

According to the latest version of the methodology ACM002, no leakage emissions are considered. 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 and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where:
ER_y = Emission reductions in year *y* (tCO_2e/yr)
BE_y = Baseline emissions in year *y* (tCO_2e/yr)
PE_y = Project emissions in year *y* (tCO_2e/yr)

As $PE_y = 0$, then:

$ER_y = BE_y$

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

Data / Parameter:	**$EG_{historical}$**
Data unit:	MWh/yr
Description:	Annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data used:	Project Activity Site
Value applied:	Table B.6.1
Justification of the choice of data or	It will be used to calculate the Baseline of the project.

description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh/yr
Description:	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data used:	Calculated from data used to establish $EG_{historical}$
Value applied:	Table 8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement project activities
Any comment:	-

Data / Parameter:	**$DATE_{BaselineRetrofit}$**
Data unit:	date
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity
Source of data used:	Project Activity Site
Value applied:	Table B.6.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per provisions in the methodology above
Any comment:	-

Data / Parameter:	**Cap_{BL}**
Data unit:	W
Description:	Installed Capacity of the hydro power plant before the implementation of the project activity.
Source of data used:	Project Site
Value applied:	Table B.6.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This parameter will be updated annually.

Any comment:	-

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data used:	Project Site
Value applied:	Table 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured from topographical surveys, maps, satellite pictures, etc. This parameter will be updated annually.
Any comment:	-

Data / Parameter:	w_{OM}
Data unit:	%
Description:	Operating Margin weight
Source of data used:	Tool to calculate the emission factor for an electricity system
Value applied:	25
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor calculation.
Any comment:	-

Data / Parameter:	w_{BM}
Data unit:	%
Description:	Build Margin Weight
Source of data used:	Tool to calculate the emission factor for an electricity system
Value applied:	75
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor calculation.
Any comment:	-

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

As demonstrated in Section B.6.1, there are no leakage or project emissions to be accounted as emission reductions calculation. Therefore, the emission reductions are the same as baseline emissions:

$$ER_y = BE_y$$

Where:
ER_y = Emission reductions in year y (tCO_2/y);
BE_y = Baseline Emissions in year y (tCO_2/y);

$$ER_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:
ER_y = Emission reductions in year y (tCO_2/y);
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh);
$EF_{CO2,grid,y}$ = Emission factor of the grid in year y (tCO_2/MWh).

As the Brazilian DNA publishes the Emission Factors of the national grid, the last published[5] emission factor was used to estimate the projected emission reduction and is as follows:

Average Montlhy Emission Factor (tCO_2/MWh)											
January	February	March	April	May	June	July	August	September	October	November	December
0.5727	0.6253	0.5794	0.4529	0.4579	0.518	0.4369	0.4258	0.4102	0.4369	0.3343	0.4686

Average Annual Build Margin Emission Factor (tCO_2/MWh)
2008
0.1458

As described on section B.6.1, the EF calculation is:

$$EF_{grid,\ OM,y} = 0.75 * 0.1458 + 0.25 * 0.4765$$

$$EF_{grid,\ OM,y} = 0.1093 + 0.1191$$

$$EF_{grid,\ OM,y} = 0.2285\ tCO_2/MWh$$

The tables below summarize the data presented in Annex 3 to this PDD.

EG Baseline	Generation	Standard Deviation Historical (σ)	EG hist + Std. Dev. hist.
EG Historical	**MWh**	**MWh**	**MWh**
Esmeril	7,261.5	107.9	7,369.4
Dourados	44,912.5	520.6	45,433.1

[5] http://www.mct.gov.br/index.php/content/view/303076.html#ancora

São Joaquim	30,408.7	338.9	30,747.6
Gavião Peixoto	22,185.7	200.4	22,386.1
Chibarro	9,523.4	173.7	9,697.1
Capão Preto	13,388.7	415.9	13,804.6
Total	127,680.6	1.757.3	129,437.9

Table 14 – Generation and Standard Deviation Historical of each power plant

Power Plant	Assured Energy	Estimated Energy	Baseline	Additional Energy
			EGhist+σhist	EGpj,y
	MWm	MWh	MWh	MWh
Esmeril	2.88	25,229	7,369.4	17,860
Dourados	7.76	67,978	45,433.1	22,544
São Joaquim	5.63	49,319	30,747.6	18,571
Gavião Peixoto	3.82	33,463	22,386.1	11,077
Chibarro	1.69	14,804	9,697.1	5,108
Capão Preto	2.28	19,973	13,804.6	6,168
TOTAL	24	210,766	129,438	81,327

Table 15 – Assured Energy, Estimated Energy, Generation + Standard Deviation Historical and Additional Energy

Therefore, the project's emission reduction is:

ER_y = 81,327 * 0.2285

ER_y = 18,583 tCO_2/year

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

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2010	0	18,582.78	0	18,583
2011	0	18,582.78	0	18,583
2012	0	18,582.78	0	18,583
2013	0	18,582.78	0	18,583
2014	0	18,582.78	0	18,583
2015	0	18,582.78	0	18,583
2016	0	18,582.78	0	18,583
Total (tCO2e)	**0**	130,079.45	**0**	130,079

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data to be used:	It will be used spreadsheets got every month directly of the meters with the hourly generation information. In a monthly basis, the information will be confronted with the available generation spreadsheets at the website of CCEE.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	81,327
Description of measurement methods and procedures to be applied:	Please, see the description in section B.7.2.
QA/QC procedures to be applied:	Uncertainty level of data is Low. These data will be used for calculate the emission reductions. The electricity generated will be monitored by the project participants and it will be checked by the available datasheets in the CCEE website (information comparison between operation data and CCEE reports).
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2/MWh
Description:	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".
Source of data to be used:	Brazilian DNA (MCT)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.2285
Description of measurement methods and procedures to be applied:	Ex-post emission factor will be calculated by MCT with the ONS data. The operating margin and build margin emission factors will be also monitored and calculated by MCT and ONS, with the Dispatch Data of the National Grid Subsystem.
QA/QC procedures	Uncertainty level of data is Low.

to be applied:	
Any comment:	Data from 2008.

<table>
<tr><th>Data / Parameter:</th><th>Emission Factor Operating Margin ($EF_{grid,OM,y}$)</th></tr>
<tr><td>Data unit:</td><td>tCO2/MWh</td></tr>
<tr><td>Description:</td><td>National Grid Emission Factor</td></tr>
<tr><td>Source of data to be used:</td><td>Brazilian DNA (MCT)</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions in section B.5</td><td>Average = 0.4765
<table>
<tr><th colspan="13">Emission Factor (tCO2/MWh)</th></tr>
<tr><th>Month</th><th>Jan</th><th>Feb</th><th>March</th><th>Apr</th><th>May</th><th>June</th><th>July</th><th>Aug</th><th>Sept</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>EF_{OM}</td><td>0.5727</td><td>0.6253</td><td>0.5794</td><td>0.4529</td><td>0.4579</td><td>0.5180</td><td>0.4369</td><td>0.4258</td><td>0.4102</td><td>0.4369</td><td>0.3343</td><td>0.4686</td></tr>
</table></td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>Ex-post emission factor will be calculated by MCT with the ONS data. The operating margin emission factor will be monitored and calculated by MCT and ONS, with the Dispatch Data of the National Grid Subsystem.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Uncertainty level of data is Low.</td></tr>
<tr><td>Any comment:</td><td>Data from 2008.</td></tr>
</table>

Data / Parameter:	Emission Factor Build Margin ($EF_{grid,BM,y}$)
Data unit:	tCO2/MWh
Description:	National Grid Emission Factor
Source of data to be used:	Brazilian DNA (MCT)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1458
Description of measurement methods and procedures to be applied:	Ex-post emission factor will be calculated by MCT with the ONS data. The build margin emission factor will be monitored and calculated by MCT and ONS, with the Dispatch Data of the National Grid Subsystem.
QA/QC procedures to be applied:	Uncertainty level of data is Low.
Any comment	Data from 2008.

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Project site

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable.
Description of measurement methods and procedures to be applied:	As seen on board equipment.
QA/QC procedures to be applied:	Not applicable.
Any comment:	Not applicable.

Data / Parameter:	A_{PJ}
Data unit:	m²
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²).
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable.
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.
QA/QC procedures to be applied:	Not applicable.
Any comment	Not applicable.

B.7.2. Description of the monitoring plan:

The overall responsibility of the project is with the Environmental Department Manager.

The Operation of all the Company's Small Hydro Plants is totally controlled by the COG, located at the Campinas Headquarters. The small power plants included in this project are fully automated. The Small Hydro Plants Operators are only performing maintenance tasks.

There are controlled working instructions covering all the tasks and defining functions involved in the GHG data management. The accessibility of such documentation to persons working on the project is secured.

Electricity Data Monitoring System – ZFA-F

The electrical energy generation data collection is made automatically with the utilization of the ZFA-F Remote Reading System and stored in the Data Base. This information is utilized by the COG Engineer to generate the Energy Production Report, used for the GHG monitoring report.

There is a procedure # 4987, version 1.1, for the operation of the ZFA system, which includes a process flow diagram, describing the entire process from gathering raw data to reporting totals, including the process for validating the readings.

For each hydro plant there is one main electricity-meter in use. A second (back-up) electricity-meter is installed in each hydro plant, to be used in case of meter failures. Every five minutes the generated energy is integrated and recorded. Every hour, the integrated generation information is transmitted, via Satellite, to the Server. Every month a reading from the ZFA Data Base, with information collected from the ZFA-F remote reading system is made by the COG Engineer and sent to Lumina Engenharia e Consultoria Ltda., to be used in the monitoring report. The same information is collected by the CPFL's Director of Energy Sales and Purchasing and sent to CCEE. Energy is invoiced based on this information.

The Basic Operation Guide (Guia de Operação Básico do ZFA-F), utilized for the training on the ZFA-F System is a controlled document.

Metering Calibration

There is a procedure # 3908, version 1.7, to control the electricity meters, defining the monitoring and control system to guarantee the quality and traceability of the meters. It also defines the calibration frequency as every two years.

Storage of CDM data

The CDM data storage follows an internal procedure of CPFL, described in the procedure #11,193 which contains all steps of the CDM file storage. All CDM data monitored and required for verification and issuance purposes will be kept for two years after the end of the crediting period or until the last issuance of CERs for the project activity, whichever occurs later.

For extra information on the monitoring plan please check the Annex 4 of this document.

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: 10th March, 2009.

Responsible: Sergio Augusto Weigert Ennes from Lumina Engenharia e Consultoria Ltda (project developer).

Formatted: English (U.S.)

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:

31/10/2001

Note: as each plant had or will have a different start-up date, all calculations were made assuming a few months to stabilize operations after start-up. As discussed above, baseline reference period is different for each plant.

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

30y – 0m (average plant lifetime)

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

C.2.1. Renewable crediting period:

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

01/01/2010

C.2.1.2. Length of the first crediting period:

7y – 0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

All plants were built before 1930 and are, according to Brazilian law; exempt from environmental licenses as long as no modifications are made that might affect flooded area, and reservoir size or significant

changes to buildings. There is a copy of the official document from the State Environmental Secretary of Sao Paulo State exempting the plants from needing licenses. Document was provided during site visit: Letter number CPRN/DAIA 446/99, issued by Secretaria do Estado do Meio Ambiente do Estado de São Paulo: Coordenadoria de Licenciamento Ambiental e de Proteção de Recursos Naturais – CPRN, dated 20/09/1999.

The activities of this project will cause no changes in the size of the reservoirs during project's lifetime. ANEEL – Agência Nacional de Energia Elétrica, the federal regulatory agency for the electric sector, carries annual inspections in all plants and reports on the physical and operational conditions of all site installations.

In 2001, CPFL submitted to the Environmental State Secretary (Secretaria Estadual do Meio Ambiente) reports on the project for each plant, specifying the scope of the works that where then planned to be carried out. These reports contain the necessary explanations of the zero-environmental impact stemming from each project.

All the Small Hydro Plants are on date with the environmental licenses.

The project has the following energy licenses:

- Authorizing resolution nº 682 – September 19th 2006 (Capão Preto, Gavião Peixoto, Chibarro);
- Resolution nº 280 – May 21st 2002 (Esmeril);
- Resolution nº 469 – October 31st 2001 (Dourados, São Joaquim)

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:

Environmental impacts were not considered significant.

SECTION E. Stakeholders' comments

This project will cause no changes in existing sites and reservoirs.

The plant sites, being built in early 1900s, have historical value as a testimony of the social-economical development of the state of São Paulo and of the country, representing the early stages of the industrial boom that then took place. The sites still have the housings built for the employees that operated the plants that are in the same style of the housings used by railway workers that were built by English engineers. One of CPFL' concerns, following their commitment with the community they serve, was to preserve local and national heritage and therefore all improvements to be made should be carried in way as to not affect this cultural asset.

The repowering project presented here is part of a larger modernization program being developed by CPFL. One important part of this program deal with plant automation. By now, all plants (including other eight plants that are not being repowered or were before year 2000) are fully operated from the company's central command room located at the Campinas headquarters. As a consequence of the automation process, around 100 employees would no longer be needed as plant operators. Instead of simply dismissing them, CPFL developed a special plan where those who where near retiring age received

an extra incentive that overcompensated early-retirement and the rest passed through retraining courses and were relocated to better posts.
Under these circumstances, no specific communications with stakeholders were held for the first three plants that were repowered and are in operation (Esmeril, Dourados and São Joaquim).

Brazilian DNA (Interministerial Commission on Global Climate Change – CIMGC/MCT) released Resolution #1 defining the necessary procedures of stakeholder communications for projects in Brazil. This Resolution was released in September, 2003, when these first three plants were in operation.

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

A letter describing project activities was sent to the following stakeholders, inviting comments:

Environment Secretary of the State of São Paulo (where all plants are located);
Fórum Brasileiro de Mudanças Climáticas;
Fórum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e Desenvolvimento;
Public Attorney of the State of São Paulo
CETESB – Companhia de Tecnologia de Saneamento Ambiental;
Mayor, President of the County Hall and Secretary in charge of Environment and class associations in the counties of:

- Nuporanga (SHP Dourados);
- Patrocínio Paulista (SHP Esmeril);
- Guará (SHP São Joaquim);
- Gavião Peixoto (SHP Gavião Peixoto);
- Araraquara (SHP Chibarro);
- São Carlos (SHP Capão Preto).

The Environment Department of CPFL Geração is in charge of receiving and replying all comments.

E.2. Summary of the comments received:

No comments were received by the project participants.

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

No comments were received by the project participants.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CPFL Geração de Energia S.A.
Street/P.O.Box:	Rod. Campinas Mogi-Mirim, km. 2,5
Building:	
City:	Campinas
State/Region:	São Paulo
Postcode/ZIP:	13 088-900
Country:	Brazil
Telephone:	+55.19.3756.8318
FAX:	+55.19.3756.8408
E-Mail:	
URL:	www.cpfl.com.br
Represented by:	
Title:	Department Manager
Salutation:	Mr.
Last name:	Sirol
Middle name:	
First name:	Rodolfo
Department:	Environment Department
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	rsirol@cpfl.com.br

Organization:	C-Trade Comercializadora de Carbono Ltda
Street/P.O.Box:	Praia do Botafogo, 501 2º andar - Torre Corcovado
Building:	
City:	Rio de Janeiro
State/Region:	Rio de Janeiro
Postcode/ZIP:	22250-040
Country:	Brazil
Telephone:	+55 21 2546-9845
FAX:	+55 21 2586.6000
E-Mail:	
URL:	
Represented by:	
Title:	Manager
Salutation:	Mr.
Last name:	Furini
Middle name:	
First name:	Gustavo
Department:	
Mobile:	

Direct FAX:	
Direct tel:	
Personal e-mail:	gfurini@c-trade.com

Organization:	Lumina Engenharia e Consultoria Ltda
Street/P.O.Box:	Rua Bela Cintra, 746, cj.102
Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	01415-000
Country:	Brazil
Telephone:	+55 11 3259.4033
FAX:	+55 11 3259.4033
E-Mail:	sergio.ennes@luminaenergia.com.br
URL:	
Represented by:	
Title:	Executive Director
Salutation:	Mr.
Last Name:	Ennes
Middle Name:	August Weigert
First Name:	Sergio
Department:	
Mobile:	+55.11.8384.0022
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Cantor Fitzgerald Europe
Street/P.O.Box:	17 Crosswall
Building:	
City:	London
State/Region:	
Postfix/ZIP:	EC3N 2LB
Country:	England
Telephone:	
FAX:	
E-Mail:	JEmert@cantorco2e.com
URL:	www.emissionstrading.com
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Emert
Middle Name:	
First Name:	Jarett
Department:	

Mobile:	646-932-3859
Direct FAX:	
Direct tel:	802-496-9620
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I parties were or will be sought for project activities.

Annex 3

BASELINE INFORMATION

EGhistorical

SHP DOURADOS

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	2,270.000	3,845.000	4,305.000	3,915.000	4,395.000	4,275.000	4,415.000	4,190.000	3,790.000	3,660.000	4,010.000	3,940.000	47,010.000
1988	4,155.000	3,995.000	4,050.000	4,025.000	4,185.000	3,975.000	4,215.000	1,015.000	0.000	0.000	0.000	15.000	29,630.000
1989	3,860.000	3,730.000	705.000	0.000	4,700.000	4,090.000	4,550.000	4,645.000	4,195.000	3,830.000	1,195.000	4,340.000	39,840.000
1990	4,245.000	3,645.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7,890.000
1991	0.000	0.000	10.000	1,285.000	5,387.000	3,350.000	1,500.000	2,690.000	4,320.000	4,292.500	3,782.000	3,955.000	30,571.500
1992	3,820.000	3,990.000	3,885.000	4,200.000	4,295.000	4,305.000	4,630.000	4,550.000	4,160.000	3,590.000	4,285.000	4,260.000	49,970.000
1993	4,500.000	3,375.000	4,215.000	4,315.000	4,165.000	4,425.000	4,320.000	4,645.000	4,385.000	4,455.000	3,515.000	3,980.000	50,295.000
1994	4,290.000	3,850.000	4,340.000	3,392.000	2,220.000	0.000	1,820.000	3,560.000	2,510.000	2,245.000	3,305.000	4,170.000	35,702.000
1995	1,340.000	435.000	4,200.000	3,545.000	4,360.000	4,325.000	4,550.000	4,250.000	3,000.000	3,200.000	3,975.000	4,167.000	41,347.000
1996	4,060.000	4,070.000	4,270.000	4,200.000	4,415.000	4,350.000	4,475.000	4,480.000	3,940.000	3,825.000	3,910.000	4,275.000	50,270.000
1997	3,715.000	3,905.000	3,960.000	4,200.000	4,185.000	4,125.000	4,330.000	4,495.000	3,100.000	2,805.000	3,455.000	3,870.000	46,145.000
1998	4,260.000	3,710.000	4,395.000	4,265.000	4,460.000	4,330.000	4,415.000	4,095.000	2,545.000	3,200.000	3,500.000	2,730.000	45,905.000
1999	2,075.000	3,799.200	4,150.800	4,042.800	4,324.800	4,147.200	2,565.900	0.000	0.000	0.000	0.000	0.000	25,105.700
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.000	375.200	53.200	243.700	4.000	652.800	265.700	1,594.600
2003	0.000	1,619.300	1,080.000	0.000	3,004.000	4,088.000	4,563.000	2,826.000	0.000	0.000	791.640	5,022.000	22,993.940
2004	4,453.200	4,453.200	4,516.200	4,946.400	5,250.600	5,045.400	3,819.600	4,289.400	2,761.200	4,152.600	4,833.000	6,292.800	54,813.600
2005	5,243.400	5,454.000	6,783.100	5,556.600	5,495.400	5,070.600	5,137.200	3,745.800	3,133.800	2,800.800	4,440.600	7,147.800	60,009.100
2006	2,098.098	0.000	0.000	0.000	0.000	180.702	4,539.600	2,838.600	2,723.400	3,906.000	4,600.800	5,724.000	26,611.200
2007	3,736.800	2,602.800	3,859.040	4,873.110	5,304.096	4,805.568	5,305.658	4,592.657	2,795.346	743.591	2,422.760	2,570.382	43,611.808
2008	4,728.953	2,822.630	551.844	6,611.980	6,826.810	6,061.918	5,712.462	4,688.273	3,900.521	3,610.829	4,114.141	4,435.027	54,065.387
2009	6,554.984	5,055.728	7,639.067	6,613.848	7,627.543	7,207.693	6,312.388	5,270.915	2,082.110	0.000	19.087	5,072.483	59,455.847
2010	6,727.547	6,447.078	4,874.314	5,554.408	4,988.048								28,591.394

	Under repowering
	Plant stopped
	After repowering

EG Baseline 5-year-history before the repowering													Average
Generation MWh	3,090.00	3,183.84	4,195.16	4,050.56	4,348.96	4,255.44	4,067.18	4,176.00	3,019.00	3,055.00	3,629.00	3,842.40	44,913

Standard Deviation	520.57

SHP ESMERIL

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	866.100	822.300	925.300	886.200	907.500	907.000	830.600	700.400	669.300	713.800	727.000	664.800	9,620.300
1988	647.520	585.240	635.700	627.600	645.300	906.100	858.300	804.100	122.300	768.900	545.860	836.800	7,983.720
1989	1,286.040	748.300	820.300	691.480	642.200	636.000	658.300	650.000	641.000	620.700	570.500	808.100	8,772.920
1990	869.600	756.800	874.700	870.900	900.200	869.500	782.400	740.300	781.470	730.600	680.000	765.700	9,622.170
1991	806.800	695.000	740.400	579.400	652.000	629.400	576.100	729.700	820.300	813.300	649.000	781.600	8,473.000
1992	792.800	748.800	747.500	746.300	799.100	855.300	892.100	890.100	840.100	739.200	705.500	896.000	9,652.800
1993	963.600	772.500	879.600	857.300	857.640	888.000	858.740	862.500	639.100	665.900	628.500	755.800	9,629.180
1994	686.100	466.200	0.000	0.000	0.000	0.000	0.000	138.200	481.500	574.200	652.500	707.900	3,706.600
1995	652.700	702.600	873.400	810.900	468.800	879.700	927.900	799.200	647.260	641.700	568.700	738.000	8,710.860
1996	829.500	384.700	496.700	682.800	708.500	835.800	915.600	666.900	891.200	707.700	837.700	886.500	8,843.600
1997	705.100	816.200	793.800	904.600	931.700	905.300	948.600	904.300	610.000	762.100	745.400	618.600	9,645.700
1998	453.800	269.000	646.500	632.300	692.200	827.500	648.600	909.700	648.500	785.600	742.500	816.900	8,073.100
1999	746.500	715.700	239.080	862.500	958.000	953.600	778.800	615.200	469.700	258.600	0.000	0.320	6,598.000
2000	201.600	512.500	487.000	648.000	524.020	638.700	662.000	654.660	579.900	468.400	511.000	486.300	6,374.080
2001	647.000	543.500	477.400	490.200	523.800	468.000	543.700	502.600	410.700	489.800	543.900	609.000	6,249.600
2002	459.800	428.300	25.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	913.600
2003	595.200	1,100.800	2,147.200	2,206.400	2,142.400	1,844.800	1,406.400	1,092.500	870.124	761.408	990.144	2,153.024	17,310.400
2004	2,675.200	2,784.000	3,136.000	3,052.800	3,270.400	2,020.800	1,883.200	1,420.800	992.000	1,446.400	1,480.000	2,584.000	26,745.600
2005	3,278.400	2,849.600	2,616.000	1,653.600	1,616.800	1,713.600	1,585.600	1,038.400	966.400	849.600	1,475.200	2,638.400	22,281.600
2006	2,894.400	2,656.000	2,985.600	2,582.400	2,286.400	1,633.600	1,209.600	811.200	731.200	1,345.600	1,609.600	2,779.200	23,524.800
2007	3,230.400	3,068.800	2,467.340	1,703.020	1,702.328	1,721.748	1,644.969	1,196.132	488.737	407.942	1,114.649	1,350.979	20,097.044
2008	2,088.984	3,070.534	3,266.689	2,092.918	3,256.982	2,483.483	1,814.531	1,359.397	957.558	1,098.697	1,352.700	1,364.422	24,206.896
2009	3,112.101	2,715.038	3,338.846	3,224.850	3,082.059	2,203.880	1,675.583	1,188.348	1,560.923	1,974.838	1,772.461	3,127.746	28,976.672
2010	2,431.389	2,975.649	3,197.290	2,999.666	2,485.338								14,089.332

	Repowering
	After repowering

	EG Baseline 5-year-history before the repowering												Average
Generation MWh	501.74	493.80	528.76	707.52	725.94	758.62	716.34	717.29	543.76	552.90	508.56	506.22	**7,261**

Standard Deviation	107.92

SHP SÃO JOAQUIM

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	2,703.400	2,810.600	3,337.000	3,586.400	3,187.900	3,407.000	2,965.300	2,279.700	2,206.500	2,369.400	2,695.400	3,327.160	34,875.760
1988	3,415.400	3,214.300	2,433.100	2,275.500	2,470.900	2,375.800	2,257.100	2,487.500	2,207.100	2,877.800	2,877.800	3,162.000	32,054.300
1989	2,987.200	2,017.500	2,263.500	2,357.100	2,485.900	2,389.200	2,686.700	2,735.900	2,399.300	2,200.200	1,809.600	1,653.100	27,985.200
1990	3,298.100	3,076.700	2,978.000	2,047.200	2,381.800	2,545.800	2,274.700	2,019.000	1,626.900	2,033.700	2,216.300	2,456.300	28,954.500
1991	3,076.700	2,598.000	3,058.300	2,130.600	2,145.400	1,957.300	2,954.100	2,039.800	1,548.650	1,983.100	1,634.900	2,826.000	27,952.850
1992	3,064.300	2,790.600	3,176.400	3,187.700	3,329.200	2,981.900	2,361.300	1,639.500	13.600	2,487.700	3,332.400	3,494.690	31,859.290
1993	3,444.300	2,850.500	2,855.500	3,127.200	3,236.300	3,036.300	2,921.500	2,354.400	2,231.900	2,010.700	1,354.800	2,390.700	31,814.100
1994	3,342.100	3,056.000	3,353.100	3,362.300	3,461.500	3,050.700	2,705.100	2,041.100	1,213.400	1,592.000	1,795.000	2,361.500	31,333.800
1995	2,420.400	1,928.500	2,222.400	2,274.400	2,293.300	2,377.900	2,469.400	2,326.200	2,033.500	2,268.000	2,311.200	2,237.000	27,162.200
1996	2,322.400	2,085.400	2,364.400	2,346.200	2,434.200	2,438.000	2,470.800	2,359.200	2,364.600	2,455.500	2,866.900	1,962.700	28,470.300
1997	2,059.100	2,030.100	3,045.800	3,302.100	3,454.400	3,369.300	2,278.400	1,922.000	2,218.400	2,612.600	2,674.700	3,303.600	32,270.500
1998	3,463.800	2,800.100	3,399.500	3,298.800	3,488.900	3,387.000	3,245.100	2,849.000	2,097.000	2,758.500	2,732.000	2,139.100	35,658.800
1999	3,011.400	2,998.000	3,314.900	3,313.700	3,589.600	3,376.200	2,791.900	2,023.200	1,762.900	1,307.200	1,631.400	2,276.400	31,396.800
2000	2,250.200	2,057.600	2,293.200	2,040.600	2,419.000	1,998.400	2,130.800	1,641.400	2,292.600	1,421.400	1,820.600	1,805.000	24,170.800
2001	2,415.400	2,068.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4,484.200
2002	0.000	0.000	0.000	0.000	0.000	0.000	667.600	1,794.800	1,966.300	1,672.100	2,355.700	4,229.000	12,685.500
2003	2,219.400	1,088.100	3,929.000	3,196.500	3,806.000	3,409.800	3,947.400	3,409.100	2,705.416	2,109.034	2,255.836	3,121.901	35,197.487
2004	4,131.283	4,229.496	5,048.200	4,307.300	3,902.400	4,773.600	4,639.200	3,832.800	2,704.800	3,169.000	3,312.000	3,763.200	47,813.279
2005	3,765.600	3,372.200	3,710.400	3,832.800	3,691.200	2,913.600	3,508.800	2,930.397	2,822.400	2,491.200	1,862.400	1,855.200	36,756.197
2006	1,365.600	1,516.800	2,272.800	2,520.000	2,716.800	2,676.000	1,835.400	2,400.100	0.000	1,255.200	1,802.400	1,029.600	21,390.700
2007	2,066.400	1,665.600	2,781.650	3,119.080	3,629.715	3,621.814	3,538.274	3,547.066	2,513.270	2,372.455	3,080.107	3,307.008	35,242.440
2008	4,137.139	4,424.702	4,955.782	2,799.211	5,276.402	5,144.244	4,494.878	3,735.178	3,068.438	3,136.178	3,239.702	3,674.731	48,086.587
2009	4,632.986	3,621.828	4,448.806	5,040.919	4,187.050	3,637.481	4,762.159	4,042.728	3,067.207	3,014.405	3,032.743	3,140.201	46,628.513
2010	2,885.635	2,787.187	3,478.037	3,904.860	4,834.198								17,889.917

(red)	Repowering
(black)	After repowering

	EG Baseline 5-year-history before the repowering												Average
Generation MWh	2,639.98	2,390.92	2,883.56	2,860.28	3,077.22	2,913.78	2,583.40	2,158.96	2,147.10	2,111.04	2,345.12	2,297.36	30,409

Standard Deviation	338.85

SHP GAVIÃO PEIXOTO

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	2,908.200	2,528.400	2,397.600	1,604.400	1,941.600	2,600.410	2,228.200	1,890.600	2,094.600	1,154.400	1,166.400	2,592.000	25,106.810
1988	2,577.960	2,749.800	3,001.800	2,925.600	2,863.800	2,506.800	2,110.880	1,870.200	1,614.600	2,184.600	2,245.200	1,948.800	28,600.040
1989	3,032.400	2,601.080	2,572.800	1,700.400	2,217.000	2,272.200	1,988.400	2,065.800	834.600	0.000	0.000	1,873.200	21,157.880
1990	2,476.800	2,715.600	3,032.400	2,915.400	2,830.800	2,190.000	2,254.200	2,058.660	1,940.400	2,095.800	1,987.800	1,993.800	28,491.660
1991	2,375.400	2,556.000	2,991.000	2,814.600	3,188.000	2,991.000	2,355.000	1,821.000	1,740.000	1,868.160	1,697.700	2,134.600	28,532.460
1992	2,318.100	2,631.200	3,090.900	2,818.800	3,045.300	2,168.100	2,341.200	2,053.500	2,251.200	2,563.200	2,265.600	2,332.600	29,879.700
1993	2,623.800	2,201.700	2,392.200	2,622.300	2,993.100	2,749.500	2,548.500	2,466.300	2,273.700	2,304.600	2,059.500	2,562.220	29,797.420
1994	2,959.200	2,771.400	2,938.400	2,582.400	2,394.900	2,369.000	2,279.700	1,953.000	1,612.200	1,555.580	1,782.900	1,838.100	27,036.780
1995	1,797.600	340.200	506.700	1,733.700	1,842.900	1,746.000	1,848.300	1,859.700	1,794.900	622.800	1,251.600	1,497.000	16,841.400
1996	2,163.000	2,389.800	2,802.900	3,096.000	3,155.400	2,763.600	2,571.000	1,483.320	0.000	34.800	1,590.000	1,752.000	23,801.820
1997	1,777.200	1,610.400	2,685.600	2,694.000	2,242.800	2,780.400	2,651.040	2,064.960	1,976.400	2,050.800	1,833.600	2,658.000	27,025.200
1998	2,450.400	2,308.800	2,586.000	2,565.600	2,520.000	2,253.600	1,894.800	1,826.400	1,723.200	2,294.400	1,683.600	1,294.800	25,401.600
1999	2,052.000	2,007.600	2,310.000	2,335.200	2,394.000	2,314.800	2,245.200	1,771.200	1,911.600	1,642.800	1,562.400	1,884.000	24,430.800
2000	2,328.000	2,396.400	2,695.200	2,397.600	1,999.200	1,772.400	1,856.400	1,719.600	2,130.000	1,551.600	1,594.800	2,361.600	24,802.800
2001	3,630.400	2,551.200	2,584.800	2,283.600	2,114.400	1,790.400	760.800	1,063.200	1,526.400	2,032.800	1,744.800	2,366.400	24,449.200
2002	2,551.200	2,377.200	2,734.800	2,391.600	2,384.400	1,867.200	1,732.800	1,710.000	1,592.400	1,333.200	1,485.600	1,614.000	23,774.400
2003	1,335.600	988.800	1,125.600	1,096.800	1,424.400	1,582.800	1,504.800	1,552.800	1,611.600	1,782.000	1,740.000	1,778.400	17,523.600
2004	1,790.400	1,844.400	2,268.000	2,212.800	2,287.200	2,258.400	2,272.800	2,164.800	1,704.000	2,145.600	1,759.200	1,774.800	24,482.400
2005	1,737.600	1,570.800	1,759.200	1,711.200	1,593.600	1,765.200	1,840.800	1,782.000	1,711.200	1,713.600	1,152.000	0.000	18,337.200
2006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007	0.000	0.000	0.000	0.000	25.680	1,536.352	2,013.724	2,210.352	1,629.178	1,184.615	2,361.219	2,374.723	13,335.843
2008	2,565.643	2,815.446	3,001.110	2,963.324	2,858.244	2,587.536	2,047.321	2,018.396	1,529.840	1,934.034	1,873.512	2,261.333	28,455.738
2009	2,829.159	2,623.932	2,824.611	2,791.713	2,457.877	2,278.042	2,285.284	2,215.536	2,417.558	2,509.704	2,593.455	2,874.757	30,701.628
2010	2,960.950	2,599.358	2,978.905	2,911.892	3,045.662								14,496.768

(red)	Repowering
(black)	After repowering

	EG Baseline 5-year-history before the repowering												Average
Generation MWh	2,209.04	1,866.48	2,094.48	1,939.20	1,960.80	1,852.80	1,622.40	1,654.56	1,629.12	1,801.44	1,576.32	1,979.04	22,186
Standard Deviation	200.43												

SHP CAPÃO PRETO

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	1,871.200	2,039.200	1,754.400	1,216.800	1,476.800	1,287.800	896.000	826.400	456.000	924.000	978.400	1,222.400	14,949.400
1988	1,444.800	1,392.800	2,244.000	1,790.400	1,329.600	1,269.600	996.000	691.200	713.600	758.400	843.200	796.000	14,269.600
1989	1,405.600	1,461.600	1,532.000	954.000	1,056.800	931.200	974.400	982.400	996.800	700.800	675.200	677.600	12,348.400
1990	2,205.600	1,481.600	175.200	1,267.200	1,488.000	916.800	889.600	984.800	915.200	867.200	759.200	726.400	12,676.800
1991	904.800	1,372.800	2,173.600	2,904.000	1,971.200	1,335.200	1,493.600	1,217.600	860.000	1,129.600	764.000	1,282.400	17,408.800
1992	1,067.200	1,435.200	1,508.800	1,280.800	1,167.200	1,479.200	937.600	784.000	768.800	1,228.800	1,242.400	1,293.600	14,193.600
1993	1,275.200	2,345.600	2,199.200	1,938.400	1,526.400	1,465.600	1,403.200	1,273.600	1,252.000	1,165.600	908.800	1,164.000	17,917.600
1994	1,415.200	1,346.400	1,178.400	1,356.800	1,257.600	883.200	891.200	971.200	629.600	596.800	951.200	873.600	12,351.200
1995	947.200	2,704.000	1,490.400	1,644.800	1,544.800	1,513.600	1,089.600	1,067.200	773.600	786.400	927.200	730.000	15,218.800
1996	1,721.600	1,220.000	1,644.800	1,300.800	177.600	0.000	0.000	535.200	1,306.800	552.800	1,375.300	1,548.000	11,382.900
1997	1,807.800	1,084.800	1,552.800	1,012.800	1,154.400	1,555.200	1,252.800	141.600	736.800	907.200	700.800	840.000	12,747.000
1998	816.000	76.800	487.200	883.200	1,396.800	1,636.800	1,603.200	1,183.200	926.400	794.400	1,053.600	1,449.600	12,307.200
1999	2,589.600	2,601.600	2,815.200	2,056.800	1,764.000	1,701.600	1,612.800	1,264.800	1,008.000	888.000	972.000	1,368.000	20,642.400
2000	2,340.000	2,037.600	2,932.800	1,960.800	1,723.200	1,495.200	1,219.200	1,147.200	1,524.000	933.600	1,032.000	1,334.400	19,680.000
2001	1,519.200	1,468.800	1,552.800	1,221.600	1,192.800	1,142.400	787.200	676.800	936.000	818.400	674.400	1,608.000	13,598.400
2002	2,124.000	1,845.600	1,754.400	1,603.200	1,192.800	993.600	573.600	748.800	835.200	504.000	801.600	1,521.600	14,498.400
2003	1,663.200	1,538.400	1,612.800	1,324.800	720.000	787.200	813.600	556.800	599.808	532.800	597.600	1,137.600	11,884.608
2004	940.800	1,599.600	1,700.400	1,634.400	1,310.800	1,528.800	1,062.000	823.200	691.200	576.000	764.400	901.200	13,532.800
2005	1,645.008	1,516.800	1,675.200	1,636.800	1,491.600	1,231.200	1,058.400	726.000	544.800	628.800	828.000	1,207.200	14,189.808
2006	1,568.400	1,485.600	1,593.600	1,442.400	924.000	1,058.400	952.800	592.800	532.800	404.832	0.000	0.000	10,555.632
2007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	0.000	531.514	1,289.555	739.256	1,367.232	675.648	708.203	678.754	737.126	585.029	237.635	764.826	8,314.777
2009	1,004.374	1,434.511	1,874.108	1,866.618	1,261.386	906.968	854.620	1,166.164	1,418.264	1,229.408	1,191.695	2,668.003	16,876.120
2010	3,018.266	2,573.269	2,664.668	2,211.248	1,542.037								12,009.490

(red)	Repowering
(black)	After repowering

	EG Baseline 5-year-history before the repowering												Average
Generation MWh	1,588.28	1,597.20	1,667.28	1,528.32	1,127.84	1,119.84	892.08	689.52	640.76	529.29	733.20	1,275.12	**13,389**

Standard Deviation	415.89

SHP CHIBARRO

Year	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1987	1,445.600	1,290.200	1,310.400	1,157.600	695.000	1,262.400	907.200	782.400	742.400	1,523.840	869.240	1,148.800	13,135.080
1988	1,154.400	1,201.600	1,248.800	1,189.600	1,028.000	898.400	769.000	58.400	0.000	0.000	544.800	728.000	8,821.000
1989	1,107.200	689.600	768.800	736.000	754.080	752.800	852.800	846.400	789.600	640.000	735.200	904.680	9,577.160
1990	1,433.120	1,117.600	1,365.600	1,365.600	1,120.400	880.000	856.000	812.000	453.600	0.000	0.000	0.000	9,403.920
1991	585.600	807.200	890.400	848.000	1,090.640	1,087.400	1,027.200	1,027.340	714.400	942.400	588.800	1,099.200	10,708.580
1992	964.800	1,082.400	1,123.200	1,054.400	1,101.600	842.400	773.600	0.000	0.000	0.000	0.000	449.400	7,391.800
1993	389.600	1,258.400	1,428.000	1,361.600	1,328.800	1,279.200	947.200	920.000	1,040.000	928.800	766.400	1,534.240	13,182.240
1994	1,173.600	1,066.380	1,194.400	1,114.400	1,094.350	914.400	926.400	805.600	672.000	725.600	718.400	1,030.400	11,435.930
1995	1,148.800	1,202.400	1,182.400	1,248.000	1,292.800	1,158.400	973.600	879.200	800.000	920.000	863.200	929.000	12,597.800
1996	1,231.200	178.400	46.800	1,070.400	1,114.800	819.600	771.600	777.600	878.400	768.000	982.800	1,101.600	9,741.200
1997	1,231.200	1,041.600	924.000	1,075.200	961.200	1,183.200	1,045.200	859.200	807.600	824.400	726.000	808.800	11,487.600
1998	837.600	1,048.800	1,110.000	943.200	937.200	806.400	748.800	758.400	709.200	888.000	669.600	1,148.400	10,605.600
1999	1,362.000	1,279.200	1,359.600	1,275.600	1,191.600	1,096.800	940.800	771.600	856.800	709.200	723.600	994.800	12,561.600
2000	1,188.000	1,284.000	1,258.800	700.800	732.000	714.000	788.400	784.800	908.400	738.000	859.200	1,058.400	11,014.800
2001	1,066.800	1,077.600	1,009.200	780.000	800.400	700.800	704.400	660.000	697.200	734.400	685.200	1,088.400	10,004.400
2002	1,202.400	1,086.000	1,251.600	939.600	958.800	770.400	694.800	740.400	666.000	602.400	742.800	966.000	10,621.200
2003	1,202.400	1,156.800	1,100.400	1,014.000	822.000	734.400	661.200	673.200	604.800	538.800	648.000	699.600	9,855.600
2004	710.400	652.800	702.000	760.800	814.800	784.800	698.400	684.000	572.400	626.400	676.800	817.200	8,500.800
2005	1,237.200	1,035.600	1,138.800	830.400	781.200	700.800	690.000	650.400	638.400	626.400	658.800	887.424	9,875.424
2006	744.000	1,009.200	1,131.600	820.800	724.800	676.800	661.200	610.800	549.600	645.600	101.376	0.000	7,675.776
2007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	31.162	31.162
2008	447.710	949.499	1,046.195	1,345.983	1,059.074	949.759	821.950	768.969	654.022	621.531	551.748	799.918	10,016.358
2009	1,120.575	1,037.950	898.902	1,009.744	839.987	814.659	835.846	955.505	976.352	1,039.693	1,044.723	1,483.711	12,057.648
2010	1,670.599	723.595	1,232.606	1,483.488	1,206.394								6,316.682

(red)	Repowering
(black)	After repowering

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Average
	EG Baseline 5-year-history before the repowering												
Generation MWh	1,019.28	988.08	1,064.88	873.12	820.32	733.44	681.12	671.76	606.24	607.92	565.56	891.72	**9,523**

Standard Deviation	173.65

Annex 4

MONITORING INFORMATION

The “Approved consolidated monitoring methodology ACM0002”sets the procedures for monitoring the project activities.

Monitoring Plan:

As seen in Table D.2.1.2., data to be collected for monitoring reports are the updates of the emission factors ($EF_{OM,y}$, $EF_{BM,y}$, EF_y) and the monthly electricity generation (EG_y).

The emission factors data is updated yearly by requesting dispatch data to ONS.

Measurement of the amount of electricity generated is fully automated. In each plant, all sensors and instrumentation related to energy generation are redundant, as is the instrument that totalizes electricity generated. These are connected by serial interface to a redundant supervisor system installed in the control room of each plant. The supervisor updates all operational data in a 5 minutes timeframe. The operator has access to this information through the supervisor system or directly at the totalizing instruments installed in the front panel in the same room.

The supervisor system is linked through a satellite channel to the COG (Central de Operações de Geração – Generation Central Operation Room) in CPFL’s headquarters. The operator in charge of COG has a complete view and control of all 19 plants, including the 6 plants described in this project.

This same link feeds the company’s main data base in order to assure the same quality of maintenance, safety and backup routines. Backup routines include normal procedures of storing copies outside of the headquarter site.

Normal operations of the plants require the operator to read energy generation from panel instrumentation on a daily basis and inform the value to COG. The monthly total is also send separately to COG meaning that COG has access to three separate values of the monthly value.

Any discrepancy between values triggers a technical visit to the plant in order to evaluate possible malfunctioning of the instrumentation. If necessary, maintenance team is called in to calibrate or fix eventual problems. The company’s technical staff is responsible for reporting the correct value for the amount of electricity actually generated.

All the electricity generated by CPFL’s plants is informed to national regulatory authorities. The electric market in the country is tightly regulated by CCEE – Câmara de Comercialização de Energia Elétrica (Electric Energy Commercialization Chamber) de Energia Elétrica and existing norms establish the measuring equipments to be installed and procedures to be followed.

In order to comply with existing regulations, CPFL developed a set of manuals and internal procedures concerning measurement, operations, maintenance, calibration and emergency & failures.

These procedures received ISO 9002 certifications that are annually revalidated.

All written procedures are stored electronically in the company's intranet where all operators have direct access in case of need. The electronic documentation system is called GED - Gerenciador Eletrônico de Documentos.

Formatted: English (U.S.)

The items below refer each issue to a person or document number and section in the GED.

1. Person responsible for electric generation data:
   José Guilherme de Freitas
   Engenheiro Líder do Centro de Operações da Geração

2. Person responsible for training the operators involved in data collection:
   José Guilherme de Freitas
   Engenheiro Líder do Centro de Operações da Geração

1. Emergency procedures in case of failures in measurement, calculations and storage procedures:

Plant	Operation Manual (doc.number)	Emergency Procedures (doc.number)
Esmeril	5379	4943
Dourados	5386	5154
S. Joaquim	5387	5157
Gavião Peixoto	6173	3887
Chibarro	3899	3882
Capão Preto	3870	3881

4. Calibration Procedures for Measuring Equipment

doc.number 6175 – "Acompanhamento dos Dispositivos de Medição da Geração" (Follow-up of Generation Measurement Devices)
doc.number 4079 – "Controle dos Dispositivos de Medição no Documentum SAP R3" (Measurement Device Control in Documentum SAP R3)

Register Identification	Responsible	Order	Archiving	Storage System	Storage Period	Availability
Calibration Report	Technicians Engineers	Associated to each instrument	Electronic	Documentum/SAP	23 years	Historic Logs

5. Equipment and devices related to measuring: Maintenance, calculation and storage procedures:
   doc.number 4067 – "Atividades Rotineira do Operador"
   seção 3 – Equipamentos de Medição: inspeção do funcionamento dos equipamentos de medição; (Routine Operator Activities: section 3 – Measurement Equipments: working inspection)

6. Reporting Procedures

The official Report sent to CCEE as well as commercial invoices refer to the total electricity generated in CPFL's plants. This value is calculated in an internal report, in the form of a spreadsheet, showing the electricity generated by each plant.

7. Diary procedures for data registration:
doc.number 4067 – "Atividades Rotineira do Operador":
seção 6.2 Fechamento da produção de geração pelo medidor
seção 6.3 Fechamento do consumo interno pelo medidor
seção 6.5 Fechamento anual produção / consumo energia
(Routine Operator Activities: total energy generated – closing values: instrument and annual)

Formatted: Portuguese (Brazil)

8. Procedures dealing with uncertainties in data and their adjustments:
Data is transmitted electronically to COG and conferred daily and monthly with manual readings. When necessary, adjustments are made by technical committee.
All data is validated by national authority (CCEE).

9. Procedures for data and reported results revision:
See 8, above.

10. Procedures of internal audits performed on these data that could be extended to the carbon project:
All existing measurement procedures are extensible to carbon project.

11. Procedures for performance evaluation before data is submitted to annual verification:
All data is validated by CCEE and procedures are certified through ISO 9002 audit.

12. Procedures for corrective action seeking a more precise monitoring:
All procedures comply with CCEE technical specifications.

- - - - -