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

CONTENTS

Annexes

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Títle : Salto Santo Antonio Small Hidro Power Plant Project (JUN 1028), Brasil
Version : 01
Date : 01/05/07

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

The project activity encompasses a small hydro power plant with a final total installed capacity of 6,740 KW, in the state of Santa Catarina.

The Salto Santo Antônio Small Hydro Power Plant is located on the Chapecó River, Basin of the Uruguay River in the municipality Água Doce, SC. It has a small 0.05 km^2 reservoir.

The objective of project activity is to supply electric energy to the baking and shredding units from ADAMI S/A-Madeiras and dispatch the surplus electricity to the interconnected network, subsystem S-SE-CO (South – Southeast – Midwest), offsetting thermal generation with renewable electricity generation to help meet the rising energy demand in Brazil. This also improves the electricity supply contributing to environmental sustainability by way of increased participation of renewable energy related to total energy consumption in Brazil.

Whereas the project consists of a small hydro power plant with a small 0.05 km^2 reservoir, the same presents practically null environmental impacts compared to large hydroelectric installations.

The project activity reduces emissions of Greenhouse Gases (GHG) avoiding the use of fossil fuel that would be burned in thermoelectric generation units interconnected to network.

The project activity of Salto Santo Antônio small hydro power plant is helping Brazil reach its goals of promoting sustainable development.

The project activity is also aligned with the specific requirements of CDM (Clean Development Mechanism) of host country since:

- It contributes to environmental sustainability since it reduces the use of fossil fuel (nonrenewable sources). Thus the project contributes to better utilization of natural resources and makes use of clean and efficient technologies;
- It contributes to better working conditions and increases employment opportunities in the area where the project is located – the new plant shall require employees for management, operation and maintenance services;
- It contributes to better working conditions for the local economy, since the use of renewable fuel reduces dependence on fossil fuels, reducing the quantity of associated pollution and social costs related to same.

Moreover, the project diversifies the sources of electricity generation and decentralizes energy generation to bring about specific advantages such as:

- greater credibility, with shorter and less extensive interruptions;
- fewer demands related to reserve margin;
- better quality energy since project is located at point of CELESC grid which needs energy;
- smaller losses on lines;
- control of reactive energy;
- mitigation of congestion in transmission and distribution;
- greater system capacity with smaller investments on T&D (transmission and distribution).

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 Country)	Adami S/A-Madeiras	No
	Carbotrader Ltda	

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage
of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

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

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

A.4.1.1. Host Party(ies):

Brazil

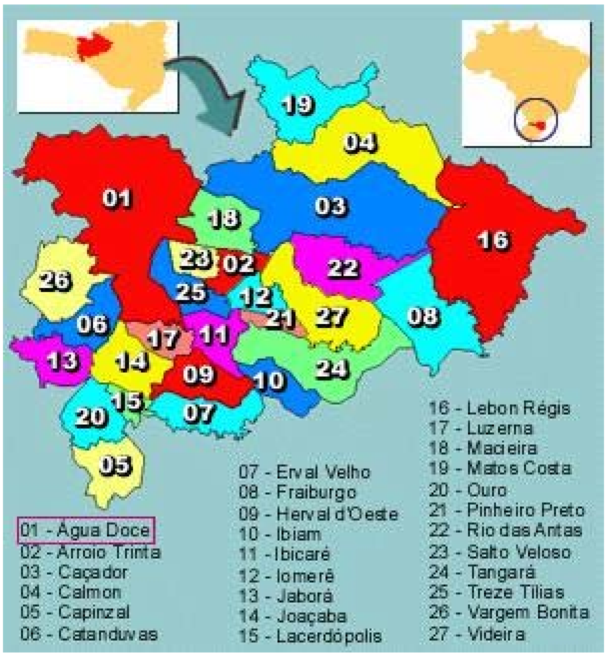
A.4.1.2. Region/State/Province etc.:

South Region – State of Santa Catarina (S.C.)

A.4.1.3. City/Town/Community etc:

City of Agua Doce

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



The Salto Santo Antônio Small Hidro Power Plant is located at the Chapecó river , south latitude 26^{0} 41' 51'', west Longitude 51^{0} 49' 28'', in the city of Água Doce, State of Santa Catarina , south region, Brazil.

Figure 1 : Água Doce – Physical Location
Source : City Brazil // www.citybrazil.com.br

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

Small-scale project activity.
Type 1 : Renewable energy project.
Category : Renewable electricity generation for a grid.

The Salto Santo Antônio Small Hydro Power Plant utilizes renewable hydric potential from the Chapecó River and has a small 0.05 km^2 reservoir.

It is classified as a small hydro power plant since in accordance to Ruling 652, dated 9 December 2003, of the National Electric Energy Department (ANEEL), to be considered a small hydroelectric plant, the reservoir area shall be less than 3 Km^2 and production capacity shall be from 1 MW to 30 MW.

It will be interconnected with the national energetic grid (SIN – National Interconnected System) and shall supply electric energy to the baking and shredding units from ADAMI S/A-Madeiras and the surplus energy to the Brazilian subsystem S-SE-CO (South – Southeast - Midwest).

The installed capacity of project activity shall initially be 1,736 KW in Phase 1 (up to December 2009) with three generator groups GG1/GG2 and GG3. It is established in the expansion the increasing of capacity of the GG1 generator group and installation of two additional generator groups GG4 and GG5, the first increasing capacity to final total power of 6,740 KW in Phase 2 (from January 2010), therefore below the limit of 15,000 KW (or 15 MW) for small-scale MD projects.

The generator group GG3 with 100 KW is utilized only for ancillary services (equipment, lighting, houses of operators, villa).

Thus the project activity Salto Santo Antônio Small Hydro Power Plant is a project that consists in the use of water, directly originating from the river, to generate electricity. The gravitational water energy is used to move the turbines and, on doing this, generate electric energy. It is a source of clean and renewable energy presenting a minimum impact on the environment.

The technology and equipment utilized in project activity are developed and manufactured in Brazil, and the transfer of know-how or technology to host country is not established.

The characteristics of project in phases 1 and 2 and of main equipment are specified below:

Table 1 - Main Datas from Salto Santo Antonio Small Hidro Power Plant

	Phase 1	Phase 2
General		
Installed Power (MW)	1,736	6,740
Reservoir (km^2)	0.05	0.05
Reservoir Hight (m)	Useful 30m (Total 31.50m)	Useful 30m (Total 31.50m)
Planed Capacity Factor	E firm / E installed = 1.0	E firm / E Installed = 0.75
River Medium Flow Rate(m^3/s)	22.18	22.18
Generator Set 1		
Turbine Type	Francis Horiz./Single Spiral	Francis Horiz./ Single Spiral
Manufacturer	Hidraulica Ind. S.A.	Hidraulica Ind. S.A.
Power (kW)	1,470	1,600
Flow Rate (m^3/s)	6.16	6.16
Rotation (rpm)	360	360
Generator		
Manufacturer	Oerlikon	Oerlikon
Nominal Power (kVA)	1,245	2,000
Effective Power (kW)	996	1,600
Nominal Voltage (V)	380/220	380/220
Nominal Current (A)	1,890	2,430
Rotation (rpm)	360	360
Power Factor	0.8	0.8
Frequency (Hz)	60	60
Generator Set 2		
Turbine Type	Francis Horiz./Single Spiral	Francis Horiz./ Single Spiral
Manufacturer	Hidraulica Ind. S.A.	Hidraulica Ind. S.A.
Power (kW)	588	640
Flow Rate (m^3/s)	2.46	2.46
Rotation (rpm)	240	240
Generator		
Manufacturer	Weg	Weg
Nominal Power (kVA)	800	800
Effective Power (kW))	640	640
Nominal Voltage (V)	380/220	380 / 220
Nominal Current (A)	1,216	1,216
Rotation (rpm)	1,200	1,200
Power Factor	0.8	0.8
Frequency (Hz)	60	60

Generator Set 3		
Turbine Type	**Francis Horiz./Single Spiral**	**Francis Horiz./ Single Spiral**
Manufacturer	**Hidraulica Ind. S.A.**	**Hidraulica Ind. S.A.**
Power (kW)	**110**	**110**
Flow Rate (m^3/s)	**0.48**	**0.48**
Rotation (rpm)	**1,200**	**1,200**
Generator		
Manufacturer	**Eliott Co**	**Eliott Co**
Nominal Power (kVA)	**125**	**125**
Effective Power (kW))	**100**	**100**
Nominal Voltage (V)	**220/127**	**220 / 127**
Nominal Current (A)	**329**	**329**
Rotation (rpm)	**1,200**	**1,200**
Power Factor	**0.8**	**0.8**
Frequency (Hz)	**60**	**60**
Generator Set 4		
Turbine Type		
Manufacturer		**N.Defined**
Power (kW)		**2,300**
Flow Rate (m^3/s)		**8.35**
Rotation (rpm)		**360**
Generator		
Manufacturer		**N.Defined**
Nominal Power (kVA)		**2,750**
Effective Power (kW))		**2,200**
Nominal Voltage (V)		**2,400 / 4,160 V - 6 cables**
Nominal Current (A)		**381**
Rotation (rpm)		**1,200**
Power Factor		**0.8**
Frequency (Hz)		**60**
Generator Set 5		
Turbine Type		
Manufacturer		**N.Defined**
Power (kW)		**2,300**
Flow Rate (m^3/s)		**8.35**
Rotation (rpm)		**360**
Generator		
Manufacturer		**N.Defined**
Nominal Power (kVA)		**2,750**
Effective Power (kW)		**2,200**
Nominal Voltage (V)		**2,400 / 4,160 V - 6 cables**
Nominal Current (A)		**381**
Rotation (rpm)		**1,200**
Power Factor		**0.8**
Frequency (Hz)		**60**

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

Year	Annual Estimation of Emission Reductions in tCO2e
2007	1,658
2008	3,316
2009	3,316
2010	11,390
2011	11,390
2012	11,390
2013	11,390
2014	5,695
Total estimated reductions (tCO2e)	59,545
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO2e)	8,506

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

No public funding is involved in the project activity.

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

The Salto Santo Antonio Small Hidro Power Plant Project is not part of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Approved baseline and monitoring methodology : AMS-I.D. - Grid connected renewable electricity generation -Version 10 , 12/23/2006.

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

In accordance to the list of sector scopes available on site of UNFCCC, the category in which the project is classified belongs to Sector Scope I - Energy Industries (renewable/non-renewable sources)

The project activity is applicable to type 1 of small-scale projects (renewable energy), methodology I.D. – Generation of renewable electric energy connected to grid – since it is classified in applicability requirements necessary for this category. This category encompasses renewable sources, as hydric, which supply electricity to an electricity distribution system that is fed by at least one fossil fuel fired generation unit.

The installed capacity of project activity shall initially be 1,736 KW in Phase 1 (up to December 2009). It is established in the expansion the increasing of capacity of the GG1 generator group and installation of two additional generator groups GG4 and GG5, the first increasing capacity to final total power of 6,740 KW in Phase 2 (from January 2010), therefore below the limit of 15,000 KW (or 15 MW) for CDM small-scale projects.

B.3. Description of the project boundary:

The project boundary for baseline encompasses the physical and geographical locality of source of renewable generation, and it is defined as an electric grid fed by project, the interconnected system grid S-SE-CO, and shall include all direct emissions related to generation of electricity.

In accordance to guidelines and rules for small-scale project activities, the emissions related to production, transport and distribution of fuel used in baseline electric units are not included in project boundary, since they do not occur at the physical and geographical locality of project.

For the same reason, the emissions related to transport and distribution of electricity are also excluded from the project boundary.

B.4. Description of baseline and its development:

The current Brazilian scenario shows a supplied energy grid in large part by large hydro power plants, however with an important participation of charcoal, fuel oil and natural gas fired thermal power plants, which jointly represent 16.0%[1] of national production. In the South-Southeast region of the country, where the main consumption centers are concentrated, the potential of hydro power production through large-scale plants is found to be practically exhausted. The absence of a system that guarantees energy reserves capable of supplying basic and emergency needs and the increasing demand for energy verified in the country, mainly in the regions mentioned above, makes it necessary to add energy production plants which, for different reasons, are frequently based on fossil fuels.

Kartha et al. (2002) state that "the central matter of the challenge of a baseline for electricity projects clearly lies in calculation the "avoided generation", which is, what occurs without CDM or another GHG mitigation project. The fundamental point is if avoided generation is in the "**build margin**" (which is, to substitute an installation that *would have,* in another way, been constructed) and/or in the **operating margin"** (thus, that affects the *operation* of current or future plants)".

The factor of emission from baseline is calculated with a **combined margin**, consisting of operating margin and build margin. For purposes of determining the emission factors "build margin" and "operating

[1] Information Bank of Generation (BIG) from National Electric Energy Board
http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp

margin", an electric system project is defined as the spatial extension of plants that can be dispatched without significant restrictions in transmission. In a similar way, an **interconnected electric system** is defined as any electric system that is connected by transmission lines to project, in which plants can dispatch without significant restrictions in transmission

The methodology approved for small-scale AMS - ID - "Grid connected renewable electricity generation", applies the increases in electricity capacity of small hydro power plants, which is the proposed project activity.

The baseline scenario considers electricity that has been in a different manner generated by operation of plants connected to the grid and by addition of new generation sources. .

The reduction in CO2 emission by project activity of PCHs is the result of dislocation of fossil fuel fired thermal generation plants that would have been placed in the interconnected electric system in another way.

Environmentally speaking, the addition of small hydro power plants has appeared to be a very interesting option, since in addition to not producing GHG[2] emissions it is a renewable type, even presenting reduced local environmental impact.

The region where the municipality of Água Doce (State of Santa Catarina) is located and neighboring municipalities is supplied by the National Interconnected Electric Grid. Part of the electricity coming from PCH Salto Santo Antônio would /have to be generated, in the event of its absence, by thermal plants connected to an electric grid and fired by fossil fuels, increasing anthropogenic emissions. The PCH, with a final installed capacity of 6,740 kW shall comply with all requisites of a small-scale CDM project.

Name of person/entity determining the baseline:

Sr. Arthur Moraes – Carbotrader Ltda
Tel.: +55 11 4522-7180
E-mail: moraes.arthur@carbotrader.com
End.: Rua Vinte e Três de Maio, 790 sala 22 A – Jundiaí – SP CEP: 13.207-070

Carbotrader is the Project Advisor and also a Project Participant

[2] GHG – Greenhouse Gases

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Follow the necessary steps to evaluate and demonstrate that project is additional:

Step 0. Preliminary grading based on initial date of project activity:

Not applicable.

Step 1. Identification of alternatives to project activity in accordance to laws and standards in effect:

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

The alternative to activity of project would be continuity of current activities, which is the generation of electricity with significant participation of units fired by fuel oil, natural gas, charcoal on interconnected electric grid S-SE-CO and non-implementation of project activity.
In this manner the capital to be invested could be maintained/invested in some financial market alternative.

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

Both, project activity and alternative scenario comply with applicable laws and regulations.

Step 3. Barrier analysis

For this project the barriers considered are the following:

Financial/economic – This barrier evaluates the feasibility, attractiveness and financial/economic risks associated to each scenario, considering general economic aspects of project and/or economic conditions in country.

Business practice in effect – Evaluating if the project activity represents the sector business practice in effect. In other words, it evaluates, in the absence of standards, if it is a standard practice in sector, if there is experience to apply technology and if there is a trend for these activities to have high-level management priority.

Other barriers – This barrier evaluates if the emissions would have been greater without project activity, for any other motive identified, such as institutional obstacles or limited information, management resources, organizational capacity, financial resources or capacity to absorb new technologies.

With respect to **financial/economic barriers**:

The project activity faces financial and economic barriers. In Brazil, the interest rates for financing in local currency are significantly higher than the rates in US Dollar. The National Social and Economic Development Bank –BNDES – is the only supplier of long-term loans.
The financing of BNDES debts is realized mainly by way of commercial banks. The credit market is dominated by shorter due dates (from 90 days to 1 year) and the lines of long-term credit are only available for stronger corporate client loan receivers and for special governmental initiatives.Credit becomes restricted to short-term transactions in Brazil.

The internal financial markets with a term of one year or more practically do not exist in Brazil. Experience has shown that in moments of financial tension the duration of savings instruments contracted fall to levels close to one day, with a large concentration in banking deposits such as the overnight type. The savers do not maintain long-term financial contracts because it is not possible to determine the price from uncertainly involved in preservation of value of purchasing power.

The lack of local long-term financing results from the reluctance of financial institutions to increase the term of their investments. This makes the investors choose more liquid investments and place their money in short-term government bonds, instead of investing in long-term opportunities that could finance infrastructure projects.

As a result of all the difficulties explained above, ADAMI S/A-Madeiras is forced to use their own resources (company cash flow) in a way that it could start-up all procedures necessary for approval of projects by ANEEL (National Electric Energy Agency) and other responsible bodies. During this period, the revenue of a CDM project activity was seriously considered a means to relieve such expenses.

With respect to barriers due to **business practice in effect:**

The common practice in Brazil has been the construction of large-scale hydro power plants, and more recently, fossil fuel fired thermal power plants, using, such as natural gas, which also receive government incentives. Yet 21.18% of energy generated in country comes from thermal power plants, and the tendency is that this number increases in the following years, 41.22% of projects approved from 1998 to 2005 are thermoelectric plants (compared to only 12.48% for PCHs). Only 1.63% of installed capacity in Brazil comes from small hydroelectric sources (1.57 GW of a total 96.2 GW).
Moreover, of the 3,848 MW under construction in country, only 1,061 MW are from small hydroelectric plants.[3]

[3] Information Bank of Generation (BIG) from National Electric Energy Board
http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadeBrasil.asp

With respect to **other** barriers:

- Institutional barriers -

Given the different programs and incentives, which were considered during the last few years, but never implemented successfully, it is easy to note the difficulty and obstacles to full implementation of projects addressing small hydroelectric plants in the country. The first was called PCH-COM structured between the end of 2000 and beginning of 2001. In February 2001 the tariff was planned to be R$ 67.00/MWh, in which was the reference price of the so-called "competitive energy source", or the average of additional costs of energy regularly generated, but the market reference for sources of PCH at that time was about R$ 80.00/MWh. Despite the low tariff, the incentive was based in the guaranty of CCVE (Purchase and Sale of Energy Contract) and special financing sources.
The program did not reach success because of the necessary guarantees and contractual clauses.

Thus, one can notice that market electricity policies are in a state of permanent change in Brazil.
An excessive number of laws and standards was created to try to organize and provide incentives to new energy sector investments. The results of this regulatory instability work contrary to the one sought.

During the electric energy rationing period in Brazil (2001), electricity prices exceeded R$ 600/MWh (about US$ 200/MWh) and the projected market price for new energy reached the levels of R$ 120 to 150/MWh (about US$ 45). In mid-2004 the average price was below R$ 50/MWh (less than US$ 20/MWh). The high volatility of electricity price in Brazil, despite being short-term, contributed to making market analysis difficult by developers.

Step 4. Common practice analysis:

The expansion of Brazilian electric sector during the 1960's and 1970's was fundamentally based on large state-owned hydro power plants. Central planning began to lose strength only in the 1990's with privatization of sector.
Central planning, executed in Brazil, always sought large plants as a means to maintain control of the system of allocating scarce resources (monetary and labor) to better projects. Currently, less than 1.7% of installed capacity in the country consists of small plants (less than 30MW). One of the side effects was the absence of market forces providing incentive to players to seek alternative sources.

Note that the traditional players (privatized hydro power companies) are still seeking larger plants and the new players and inspection agencies are still in the process of learning to act in a more decentralized system. At the end of 2004, only nine PCH projects were authorized by the Regulatory Agency.

To stimulate other alternatives, the Brazilian government inaugurated a program called Proinfa (Incentive Program for Alternative Electric Energy Sources), which sought to increase the proportion of PCHs, cogeneration of biomass and wind-powered source. This program basically offers purchase prices above market value, long-term electricity contracts and lower interest rates on federal development bank loans (BNDES). Even with these conditions, the program attracted fewer projects than it had planned on. Currently, some projects that are included in the program are basically being reevaluated due to the slow process of obtaining funding from BNDES. Like other similar projects, despite its attractiveness, the Project PCH Salto Santo Antônio did not require participation in Proinfa.

Step 5. Impact of CDM Registration

In accordance to Brazilian legislation, PCHs in Brazil are hydro power plants with an installed capacity of more than 1 MW and up to 30 MW and with a reservoir area of less than 3 km². They generally consist of a run-of-river hydro power plant with minimum environmental impact.

This activity of the project is not the usual business scenario in a country where preference is given to large hydroelectric and gas-fired thermal power plants. With the financial benefit from the RCEs (Certified Emission Reduction), it is expected that other project developers benefit from this new source of revenue and, thus, decide to develop these projects.

CDM made it possible for some investors to install small hydroelectric plants and sell electricity to the grid. The record of activity of the project proposed shall have a strong impact on opening a path for implementation of similar projects in Brazil.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The baseline is the kWh produced by renewable generation unit multiplied by an emission coefficient (measured in kgCO2e/kWh) calculated in a transparent and conservative manner, called combined margin (CM), which consists of a combination between the operation margin (OM) and the build margin (BM) according to procedures prescribed in the approved ACM0002 methodology.

The calculation of the operating margin emission factor(s), is based on one of the following methods:

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

The methodology indicates that, if possible, the Analysis of Dispatch (c) should be the priority calculation method, but, in this project, the Simple Adjusted Operating Margin (b) was adopted because there was no official detailed information available, making use of the first option unfeasible.

<u>OPERATING MARGIN</u>:

The calculation of the simple ajusted operating margin emission factor ($EF_{OM,simple\_adjusted,y}$), is based on the following formulae :

$$EF_{OM,simple\_adjusted,y} = (1-\lambda_y)\frac{\sum_{i,j} F_{i,j,y}.COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_k GEN_{k,y}} \quad (\text{tCO}_2\text{e/GWh})$$

Where:

λy is the share of hours in year y (in %) for which low-cost/must-run sources are on the margin.

$\Sigma i,jF_{i,j(ou\ k),y}$ is the amount of fuel i (in mass or volume unit) consumed by relevant power sources j(analogous for sources k) in year(s) y,

$COEF_{i,j(ou\ k),y}$ is the CO2e coefficient of fuel i (tCO2e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources j (analogous for sources k) and the percent oxidation of the fuel in year(s) y and,

$\Sigma jGEN_{j(ou\ k),y}$ is the electricity (MWh) delivered to the grid by source j (analogous for sources k)
.

It is assumed here that all the low-cost/must-run plants produce zero net emissions.

$$\frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_{k} GEN_{k,y}} = 0 \text{ (tCO}_2\text{e/GWh)}$$

BUILD MARGIN:

The "build margin" emission factor ($EF_{BM,y}$) is the weighted average emissions (in kgCO2e/MWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants (2005) or the 5 most recent plants,

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y}.COEF_{i,m}}{\sum_{m} GEN_{m,y}} \text{ (tCO}_2\text{e/GWh)}$$

EMISSION FACTOR :

The electricity baseline emission factor is calculated through a weighted-average formula, considering both the OM and the BM, being the weights 50% and 50% by default. That gives:

$EF_{eletricity} = 0,5 * EF_{OM} + 0,5 * EF_{BM}$

BASELINE EMISSION :

$BE_{electricity} = EF_{electricity} \cdot EG_y$

Where:

$BE_{electricity}$ are the baseline emissions in tCO_2e/ano;
EG_y are the generated electricity in year y in MWh.

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

Data / Parameter:	EF_y
Data unit:	tCO_2e/MWh
Description:	Emission factor for the Brazilian South-Southeast-Midwest interconnected grid
Source of data used:	Data provided by ONS (National dispatch center).
Value applied:	0,2611
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to the approved methodology – ACM0002, version 6, 2006
Any comment:	

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Operating Margin emission factor of the grid in a year *y*
Source of data used:	Data provided by ONS (National dispatch center). Calculated according to the approved methodology – ACM0002, version 6, 2006
Value applied:	0,4349
Justification of the choice of data or description of measurement methods and procedures actually applied :	More details in Annex 3
Any comment:	

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Build Margin emission factor of the grid in a year *y*
Source of data used:	Data provided by ONS (National dispatch center). Calculated according to the approved methodology – ACM0002, version 6, 2006
Value applied:	0,0872
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	λ_y
Data unit:	No unit
Description:	Fraction of time during which low-cost/must-run sources are on the margin
Source of data used:	Data provided by ONS (National dispatch center). Calculated according to the approved methodology – ACM0002, version 6, 2006
Value applied:	λ_{2003}=0.5312, λ_{2004}=0.5055, λ_{2005}=0.5130
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The baseline methodology considers the determination of the emissions factor for the grid to which the project activity is connected as the core data to be determined in the baseline scenario. In Brazil, there are two main grids, South-Southeast-Midwest and North-Northeast, therefore the South-Southeast-Midwest Grid is the relevant one for this project.

The method that will be chosen to calculate the Operating Margin (OM) for the electricity baseline emission factor is the option (b) *Simple Adjusted OM,* since the preferable choice (c) *Dispatch Data Analysis OM* would face the barrier of data availability in Brazil.

In order to calculate the Operating Margin, daily dispatch data from the Brazilian electricity system manager (ONS) needed to be gathered. ONS does not regularly provide such information, which implied in getting it through communicating directly with the entity.

Simple Adjusted Operating Margin Emission Factor Calculation

According to the methodology, the project is to determine the Simple Adjusted OM Emission Factor ($EF_{OM,\ simple\ adjusted,\ y}$) . Therefore, the following equation is to be solved:

$$EF_{OM,simple\_adjusted,y} = (1-\lambda_y)\frac{\sum_{i,j} F_{i,j,y}.COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_k GEN_{k,y}} \quad (tCO_2e/GWh)$$

It is assumed here that all the low-cost/must-run plants produce zero net emissions.

$$\frac{\sum_{i,k} F_{i,k,y} . COEF_{i,k}}{\sum_{k} GEN_{k,y}} = 0 \text{ (tCO}_2\text{e/GWh)}$$

The Lambda factors were calculated in accordance with methodology requests. More detailed information is provided in Annex 3. The table below presents such factors.

Year	Lambda
2003	0.5312
2004	0.5055
2005	0.5130

Electricity generation for each year needs also to be taken into account. This information is provided in the table below.

Year	Electricity Load (MWh)
2003	288,933,290
2004	302,906,198
2005	314,533,592

Using therefore appropriate information for $F_{i,j,y}$ and $COEF_{i,j}$, OM emission factors for each year can be determined, as follows.

$$EF_{OM,simple\_adjusted,2003} = (1-\lambda_{2003}) \frac{\sum_{i,j} F_{i,j,2003} . COEF_{i,j}}{\sum_{j} GEN_{j,2003}} \therefore EF_{OM,simple\_adjusted,2003} = 0.4605 \text{ tCO}_2\text{/MWh}$$

$$EF_{OM,simple\_adjusted,2004} = (1-\lambda_{2004}) \frac{\sum_{i,j} F_{i,j,2004} . COEF_{i,j}}{\sum_{j} GEN_{j,2004}} \therefore EF_{OM,simple\_adjusted,2004} = 0.4544 \text{ tCO}_2\text{/MWh}$$

$$EF_{OM,simple\_adjusted,2005} = (1-\lambda_{2005}) \frac{\sum_{i,j} F_{i,j,2005} . COEF_{i,j}}{\sum_{j} GEN_{j,2005}} \therefore EF_{OM,simple\_adjusted,2005} = 0.3938 \text{ tCO}_2\text{/MWh}$$

Finally, to determine the baseline *ex-ante*, the mean average among the three years is calculated, finally determining the $EF_{OM,simple\_adjusted}$.

$$EF_{OM,simple\_adjusted\ 2003\_2005} = 0.4349 \text{ tCO}_2\text{/MWh}$$

According to the methodology used, a Build Margin emission factor also needs to be determined.

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

So after the calculation:

$EF_{BM,2005} = 0.0872$ tCO_2/MWh

Finally, the electricity baseline emission factor is calculated through a weighted-average formula, considering both the OM and the BM, being the weights 50% and 50% by default. That gives:

$EF_{electricity,2003-2005} = 0.5 * 0.4349 + 0.5 * 0.0872 = 0.2611$ tCO_2/MWh

It is important to note that adequate considerations on the above weights are currently under study by the Meth Panel, and there is a possibility that such weighing changes in the methodology applied here.

The baseline emissions would be then proportional to the electricity delivered to the grid throughout the project's lifetime. Baseline emissions due to displacement of electricity are calculated by multiplying the electricity baseline emissions factor ($EF_{electricity,2003-2005}$) with the electricity generation of the project activity.

$BE_{electricity,y} = EF_{electricity,2003-2005} . EG_y$

Therefore, for the first crediting period, the baseline emissions will be calculated as follows:

$BE_{electricity,y}$ = 0,2611 tCO_2/MWh . EG_y (in tCO_2e)

The emissions reduction (**ER**) of this project activity is:

ER = $BE_{electricity,y}$ – (L_y + PE_y)

To this project **Ly = 0** and ***PEy* = 0**

So:

ER = $BE_{electricity,y}$ – (L_y + PE_y) = 0.2611 tCO_2/MWh . EG_y – 0 → **ER = 0.2611 tCO_2/MWh . EG_y**

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

Table 2 - Summary		
Emissions reductions from electricity production	**Years**	**Source**
Operating margin emission factor (EF_OMy, in tCO2/MWh)	0.4349	ONS
Build margin emission factor (EF_BMy, in tCO2/MWh)	0.0872	ONS
Baseline emission factor (EFy)[4]	0.2611	ONS
Project activity generated electricity (EG, in MWh/year) - Phase 1 (2007)	6,351	Project Developer
Project activity generated electricity (EG, in MWh/year) - Phase 1 (2008-2009)	12,702	Project Developer
Project activity generated electricity (EG,in MWh/year) - Phase 2 (2010-2013)	43,624.8	Project Developer
Project activity generated electricity (EG, in MWh/year) - Phase 2 (2014)	21,812.4	Project Developer
Estimated baseline emissions reductions (tCO2e/year) – Phase 1 (2007)	1,658	Calculated
Estimated baseline emissions reductions (tCO2e/year) – Phase 1 (2008-2009)	3,316	Calculated
Estimated baseline emissions reductions (tCO2e/year) – Phase 2 (2009 - 2013)	11,390	Calculated
Estimated baseline emissions reductions (tCO2e/year) – Phase 2 (2014)	5,695	Calculated
Project activity emission (PE, in tCO2)	0	Calculated
Emissions reductions from electricity production (tCO2/year) – Phase 1 (2007)	1,658	Calculated
Emissions reductions from electricity production (tCO2/year) – Phase 1 (2008-2009)	3,316	Calculated
Emissions reductions from electricity production (tCO2/year) – Phase 2 (2010 - 2013)	11,390	Calculated
Emissions reductions from electricity production (tCO2/year) – Phase 2 (2014)	5,695	Calculated

[4] See more details in Annex 3

.

Anos	Estimated project activity emissions reductions (tCO2e)	Estimated baseline emissions reductions (tCO2e)	Estimated leakage (tCO2e)	Estimated emissions reductions (tCO2e)
2007	0	1,658	0	1,658
2008	0	3,316	0	3,316
2009	0	3,316	0	3,316
2010	0	11,390	0	11,390
2011	0	11,390	0	11,390
2012	0	11,390	0	11,390
2013	0	11,390	0	11,390
2014	0	5,695	0	5,695

Estimated amount of emission reductions in tCO_2e over the first crediting period_: 59,545

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

B.7.1 Data and parameters monitored:

This project applies methodology of monitoring that consists of metering the electricity generated by the renewable technology indicated by Appendix B of document "modalities and simplified procedures for small-scale project activities of CDM" for projects classified as Type 1, category D according to definitions of same document.

(Copy this table for each data and parameter)

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Electricity of the Project delivered to grid in a year *y*
Source of data to be used:	Energy metering connected to the grid and the annual energy generation report
Value of data	32,577.6 MWh/year (estimated average over the crediting period)
Description of measurement methods and procedures to be applied:	Explained in Annex 4
QA/QC procedures to be applied:	Explained in Annex 4
Any comment:	The electricity delivered to the baking and shredding Adami S/A – Madeiras units will be monitored by the Project and the eletricity delivered to the grid will be monitored by the Project as well as by the energy buyer

B.7.2 Description of the monitoring plan:

All measurements of electricity generation obey national regulations for electric sector that describe technical specifications of measurement, reports and storage of data. The most important value used to determine emission reductions is the quantity of electricity generated. Currently this value is manually read by an operator directly in the instruments every sixty minutes in a control room, that is totalized in the end of the day, and filed. An equipment of electronic reading is being installed that shall continually register the energy generated and digitally store the data.

All topics shall be supervised and resolved by the plant manager.

Addicionally, when the magnifying of the plant will be concluded, the data of energy generation shall also be collected at the point of interconnection with the concessionaire. These values shall be used with the proposition of invoicing in accordance to energy purchase and sale contract to be sign.

Procedures of maintenance and repairs of damages obey national regulatory specifications.
Calibration procedures obey national specifications regulated by ONS (National System Operator).

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

Date of completing the final draft of this baseline section *(MM/DD/YYYY):* 01/05/2007.

Company:	CARBOTRADER Ltda.
Address:	Rua 23 de Maio, Nº 790, sala 22A
City :	Jundiaí
State:	São Paulo
Zip code :	13.207-070
Country:	Brasil
Telefon:	(55) 11 4522 - 7180
Fax:	
E-mail:	carbotrader@carbotrader.com
URL:	www.carbotrader.com
Represented by:	
First Name:	Arthur
Last Name:	Moraes
Job title:	Director

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

21 years

C.1.1. Starting date of the project activity:

The starting date of project activities is considered the date on which the same shall begin to dispatch energy to ADAMI S/A- Madeiras and to integrated grid, feeding them clean and renewable energy, in this manner reducing the relation tCO_2/MWh generated by grid. This date can be defined as July 01, 2007.

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

30 years - 0 mounth

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:

07/01/2007

C.2.1.2. Length of the first crediting period:

7 years – 0 mounth

C.2.2. Fixed crediting period:

Not applicable.

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

With respect to regulatory permits:

The Salto Santo Antônio Small Hydro Power Plant has authorizations issued by ANEEL:

- Dispatch from ANEEL no. 642, issued on March 27, 2006, clearing start-up of operation tests from March 28, 2006 with installed power of 1,736 kW.
- ANEEL Proceedings No. 00000.702382/78-05 referring to expansion to 6,740 KW.

With respect to environmental permits legislation requires issuing of following licenses:

- **Preliminary License (LP):** preliminary phase of planning activity in which concept and location of enterprise are evaluated. In this phase Environmental Impact Study (EIA) and Environmental Impact Report (RIMA) are analyzed, or, depending on the case, the Environmental Control Report (RCA).

- **Installation License (LI):** authorizes implementation of enterprise. In this phase, the Environmental Control Plan (PCA) is analyzed, it contains projects for systems of treatment and/or disposing of liquid and atmospheric effluents and solid residue etc.

- **Operation License (LO):** authorizes operation of enterprise after verification of compliance with measures determined in phases of LP and LI

The project has obtained the necessary environmental licenses.
The Salto Santo Antônio Small Hydro Power Plant has the following licenses:

- LAO No. 063/2006 Environmental Operation License from FATMA –Environmental Foundation, issued on March 9, 2006 for operation, phase 1.
- LAI No. 984/2006 Environmental Installation License from FATMA –Environmental Foundation, issued on October 27, 2005 for expansion, phase 2.

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

The Salto Santo Antônio Small Hydro Power Plant has a small 0.05 km^2 reservoir.
It is a source of clean and renewable energy presenting a minimum impact on the environment.
According to the reply from the Environmental Protection Bureau (FATMA), the impacts on the environment are not significant.

SECTION E. Stakeholders' comments

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

In accordance to Ruling No.1, dated September 11, 2003, of the Inter-Ministry Commission on Global Climate Change (CIMGC), any CDM projects shall send a letter describing the project and request commentaries by local interested parties.

The invitation letter shall be addressed to the following agents involved and affected by activities of the project:

- City Hall and City Councils;
- State environmental body;
- Municipal environmental body;
- Brazilian Forum of NGOs and Environmental and Development Social Movements:
- Community associations;
- Government Prosecutors Office.

In order to satisfy and comply with this ruling the project proponents sent invitation letters describing the project, and requested commentaries by the following interested parties:

- City Hall of Municipality Água Doce;
- Environment Secretary of Municipality Água Doce;

- City Council of Municipality Água Doce;
- Shop owners Council of Água Doce;
- Rural Workers Union of Água Doce;
- State Environment Foundation -FEAM;
- Brazilian Forum of NGOs and Environmental and Development Social Movements – FBOMS;
- State Prosecutors Office of State of Santa Catarina (Environmental Operation Support Center).

The interested parties above were invited to present their concerns and provide comments on project activity during a period of 30 days after receipt of the invitation letter.

E.2. Summary of the comments received:

The City Hall of Municipality Água Doce sent a letter supporting the CDM project activity.
Also presented the "Programa Municipal de Menejo Integrado de Conservação do Solo e Recursos Hídricos", (PROHIDRO) AGUA DOCE and requested the support of ADAMI S.A.- Madeiras in the same.

FBOMS also sent a letter suggesting the use of Gold Standard or similar tools as sustainable indicators .

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

The project paticipants sent a new letter to the City Hall of Municipality Água Doce extending its support to the PROHIDRO program.

About FBOMS suggestions the project participants consider that requests made by the Brazilian Government are sufficient to be used as sustainable indicators which are attended by this CDM project aciticity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	ADAMI S/A-MADEIRAS
Street/P.O.Box:	Rua Nereu Ramos, 196
City:	Caçador
State/Region:	Santa Catarina
Postfix/ZIP:	89.500-000
Country:	Brasil
Telephone:	+ 55 (49) 3561 3091
FAX:	
E-Mail:	edson.pereira@adami.com.br
Represented by:	
Title:	
Salutation:	
Last Name:	Pereira
Middle Name:	De Assis
First Name:	Edson
Department:	
Mobile:	
Direct FAX:	
Direct tel:	+ 55 (49) 3561 3091
Personal E-Mail:	edson.pereira@adami.com.br

Organization:	CARBOTRADER LTDA.
Street/P.O.Box:	Rua Vinte e Tres de Maio, nº 790 , sala 22
City:	Jundiaí
State/Region:	São Paulo
Postfix/ZIP:	13.207-070
Country:	Brasil
Telephone:	+ 55 (11) 4522 7180
FAX:	+ 55 (11) 4522 7180
E-Mail:	moraes.arthur@carbotrader.com
Represented by:	
Title:	
Salutation:	
Last Name:	Moraes
Middle Name:	Augusto Clessie
First Name:	Arthur
Department:	
Mobile:	
Direct FAX:	+ 55 (11) 4522 7180
Direct tel:	+ 55 (11) 4522 7180
Personal E-Mail:	moraes.arthur@carbotrader.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the present project.

Annex 3

BASELINE INFORMATION

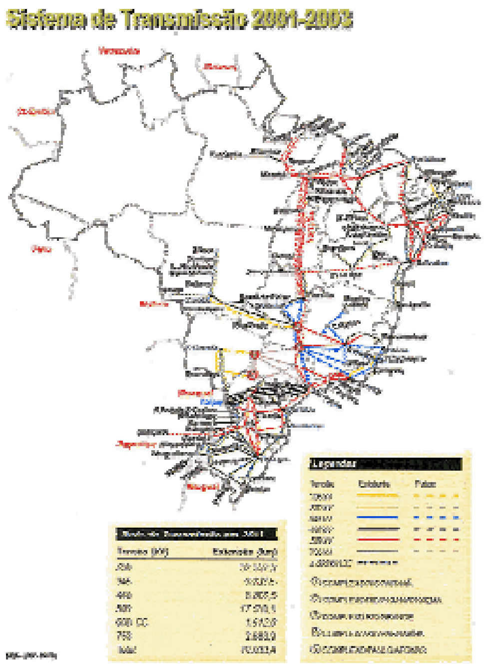
The Brazilian electric system has been historically divided into two sub-systems: the North – Northeast (N-NE) and the South-Southeast-Midwest (S-SE-CO). This is mainly due to the historical evolution of the physical system itself, which developed naturally around the large consumption centers in the country.
The natural evolution of both systems is showing that this integration is increasingly close. In 1998, the Brazilian government announced the first phase of the interconnection line between N-NE and S-SE-CO. With investments of about US$ 700 million, this connection has as its main objective, at least from the government point of view, to help solve instability of energy in the country if necessary, the S-SE-CO region could supply energy to N-NE region and vice-versa.

In similar fashion, even after the interconnection having been established, technical bulletins still divide the Brazilian system in two (Bosi, 2000):

"…where the Brazilian electric system is divided into three separate subsystems:

(i) system south/southeast/midwest, interconnected;
(ii) system north/northeast; and
(iii) Isolated systems (which represent 300 localities electrically isolated from interconnected systems)"

Moreover, Bosi (2000) presents a strong argument in favor of having the so-called "Multi-projects base line":
"For large countries with different situations within its limits and different energy grids located in different regions, the "base line for different types of energy sources" in electric sector can need to be divided below level of each country to supply trustworthy representation of "what could have happened to date'".



Sistema interconectado brasileiro (Fonte: ONS)

Finally, it should be taken into consideration that even if today's systems are interconnected; the energy generated between N-NE and S-SE-CO is limited by capacity of transmission lines. Thus, only a fraction of the total energy generated in both subsystems is sent one way or another. It is natural that this fraction can change direction and grandeur (due to capacity of transmission line) depending on hydrologic model, climate and other factors that are not controlled. However, this should not represent a significant quantity of each demand of electricity of subsystems. It should also be considered that only in 2004 the interconnection between SE and NE was concluded, which means if the proponents of project are coherent with the generated data base they have available until the time of submitting for validation of DCP, a situation in which electricity emerges between sub-systems is still more restricted to be considered.
Currently the Brazilian electric system encompasses about 104.3 GW of the installed capacity, in a total of 1,593 enterprises of electricity generation. Of this, approximately 70.5% are hydroelectric plants, 10.35% are gas-fired plants, 4.28% are diesel and vegetable fuel oils, 3.54% are biomass sources (sugar cane pulp, sulfate liquor, wood, rice husks, and biogas) 1.92% are nuclear plants, 1.36% charcoal, 0.23 windfarm and there are also 8.1 GW of installed capacity in neighboring countries (Argentina, Uruguay, Venezuela and Paraguay) which can dispatch electricity to Brazilian grid (http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp).
The last capacity is in fact encompassed by mainly 6.3 GW from Paraguay side of Bi-national Itaipu, a hydroelectric plant for both countries, Brazil and Paraguay, more than almost all energy is sent to Brazilian grid.

The approved methodology ACM0002 needs proponents of project to take into consideration "all generating sources that serve system.". Thus, when this methodology is applied, the proponents of project in Brazil should seek and research all plants that serve Brazilian electric system.
In fact, the information of such generating sources is not publicly available in Brazil. The national dispatch center ONS – National System Operator – argue that information from dispatch is a strategy for energy agents,

thus this information cannot be made available. On the other hand, ANEEL, electricity agency, supplies information of energy capacity and legal topics about electric sector, but no dispatch information can be provided through this entity.

Considering this, the proponents of the project seek a plausible solution to be able to more accurately calculate the emission factor in Brazil. As long as real information from dispatch is above all necessary, ONS was contacted to let participants have knowledge of degree of detailed information that can be supplied. After several months of conversation, information about daily dispatches of plants was provided referring to years 2003, 2004 and 2005.

The proponents of project discussed possibility of utilizing such information, concluding that it was the most adequate information to be considered on determining emission factor for Brazilian grid. In accordance to ANEEL, in fact, ONS centralized the dispatch of plants estimated at 75,547MW of installed capacity on 31 December 2004, within 98,848.5 MW of total installed in Brazil on same date.
(http://www.aneel.gov.br/arquivos/PDF/Resumo_Gráficos_mai_2005.pdf), which includes exported capacity supplied by neighboring countries and emergency plants, which are dispatched only during season of limited electric system. Thus, even though the calculation of emission factor was made without taking into account all sources that serve the system, approximately 76.4% of installed capacity that serves Brazilian system is considered, where this is a just quantity taking into consideration the difficulty of obtaining information about dispatch in Brazil. Moreover, 23.6% are plants that don't have their own dispatch coordinated by ONS, as long as one of them operates based on an energy purchase agreement, which is not under the control of the dispatch authority; or they are located in non-connected systems that ONS has no access to. Thus, this portion shall probably not be affected by CDM project and this is another reason not to take into account on determining emission factor.

Thus, considering all rationality explained, the developers of the project decided for the base only with ONS data, by the fact of being able to track the matter of determining emission factor and doing so in a more conservative form.

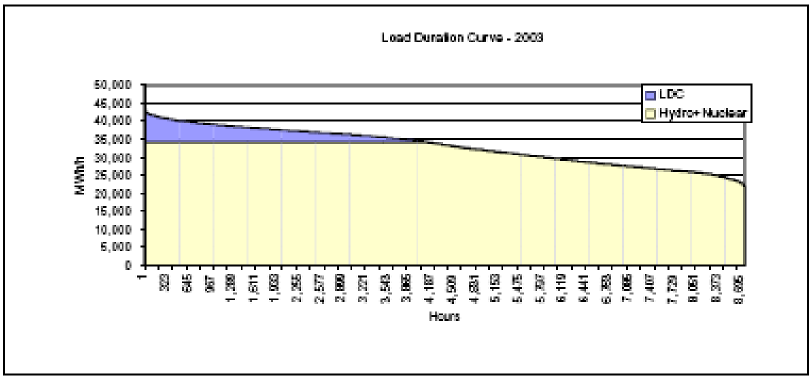
The aggregate hourly data of dispatch collected from ONS were utilized to determine the lambda factor related to each one of years available (2003, 2004 and 2005). The low cost/inflexible generation was determined as total generation less the generation of fossil fuel fired thermoelectric plants, this determined by degree of daily dispatch supplied by ONS. All this information was provided to validation agents considered, in order to have total transparency.

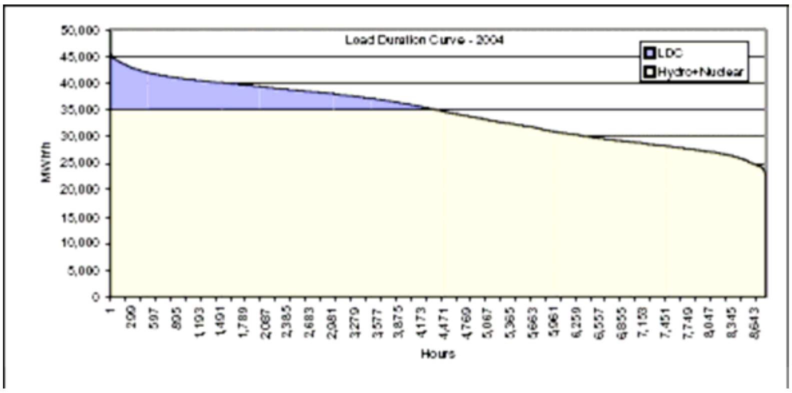
The figures below show the load duration curves for the three relevant years, besides the calculated lambda.

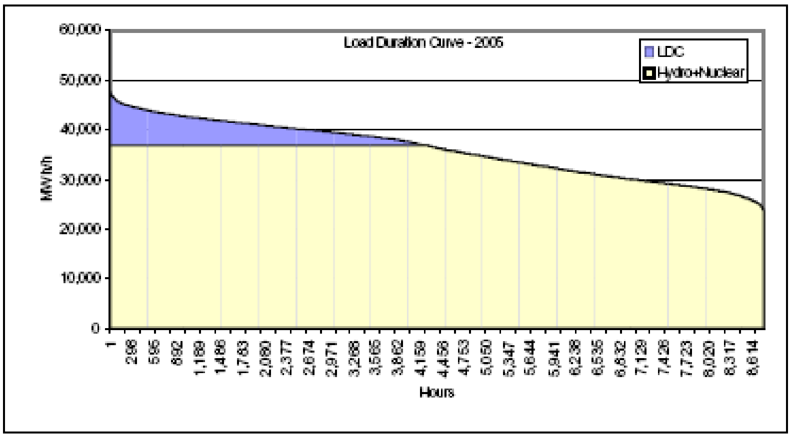
Table 3 – Emission Factors for the Brazilian South-Southeast-Midwest interconnected grid (simple adjusted operating margin factor)

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid				
Baseline (including imports)	EFOM [tCO2/MWh]	Load [MWh]	LCMR [MWh]	Imports [MWh]
2003	0,9823	288.933.290	274.670.644	459.586
2004	0,9163	302.906.198	284.748.295	1.468.275
2005	0,8086	314.533.592	296.690.687	3.535.252
	Total (2003-2005) =	906.373.081	856.109.626	5.463.113
	EFOM, simple-adjusted [tCO2/MWh]	EFBM,2005	Lambda	
	0,4349	0,0872	λ2003	
	Alternative weights	Default weights	0,5312	
	wOM = 0,75	wOM = 0,5	λ2004	
	wBM = 0,25	wBM = 0,5	0,5055	
	Alternative EFy [tCO2/MWh]	Default EFy [tCO2/MWh]	λ2005	
	0,348	0,2611	0,5130	

Graphics 1 - Load duration curve for the S-SE-CO system (2003, 2004 e 2005)







.

Table 4 – PlantPower plants database for the Brazilian South-Southeast-Midwest interconnected grid

	Power plant name	Subsystem	Fuel source	Operation start	Installed capacity	Fossil fuel conversion efficiency	Fraction carbon oxidized	Baseline
					[MW]	[%]	[%]	[tCO_2/MWh]
1	TermoRio	SE-CO	natural gas	Nov-2004	423.3	50%	99.5%	0.402
2	Candonga	SE-CO	hydro	Sep-2004	140.0	100%	-	-
3	Queimado	SE-CO	hydro	May-2004	105.0	100%	-	-
4	Norte Fluminense	SE-CO	natural gas	Feb-2004	860.2	50%	99.5%	0.402
5	Jauru	SE-CO	hydro	Sep-2003	121.5	100%	-	-
6	Guaporé	SE-CO	hydro	Sep-2003	120.0	100%	-	-
7	Três Lagoas	SE-CO	natural gas	Aug-2003	306.0	32%	99.5%	0.628
8	Funil (MG)	SE-CO	hydro	Jan-2003	180.0	100%	-	-
9	Itiquira I	SE-CO	hydro	Sep-2002	156.1	100%	-	-
10	Araucária	S	natural gas	Sep-2002	484.5	32%	99.5%	0.628
11	Canoas	S	natural gas	Sep-2002	160.6	32%	99.5%	0.628
12	Piraju	SE-CO	hydro	Sep-2002	81.0	100%	-	-
13	N. Piratininga	SE-CO	natural gas	Jun-2002	384.9	32%	99.5%	0.628
14	PCT CGTEE	S	fuel oil	Jun-2002	5.0	33%	99.0%	0.902
15	Rosal	SE-CO	hydro	Jun-2002	55.0	100%	-	-
16	Ibirité	SE-CO	natural gas	May-2002	226.0	32%	99.5%	0.628
17	Cana Brava	SE-CO	hydro	May-2002	465.9	100%	-	-
18	Sta Clara	SE-CO	hydro	Jan-2002	60.0	100%	-	-
19	Machadinho	S	hydro	Jan-2002	1,140.0	100%	-	-
20	Juiz de Fora	SE-CO	natural gas	Nov-2001	87.0	32%	99.5%	0.628
21	Macaé Merchant	SE-CO	natural gas	Nov-2001	922.6	32%	99.5%	0.628
22	Lajeado	SE-CO	hydro	Nov-2001	902.5	100%	-	-
23	Eletrobolt	SE-CO	natural gas	Oct-2001	379.0	32%	99.5%	0.628
24	Porto Estrela	SE-CO	hydro	Sep-2001	112.0	100%	-	-
25	Cuiaba (Mario Covas)	SE-CO	natural gas	Aug-2001	529.2	32%	99.5%	0.628
26	W. Arjona	SE-CO	natural gas	Jan-2001	194.0	32%	99.5%	0.628
27	Uruguaiana	S	natural gas	Jan-2000	639.9	50%	99.5%	0.402
28	S. Caxias	S	hydro	Jan-1999	1,240.0	100%	-	-
29	Canoas I	SE-CO	hydro	Jan-1999	82.5	100%	-	-
30	Canoas II	SE-CO	hydro	Jan-1999	72.0	100%	-	-
31	Igarapava	SE-CO	hydro	Jan-1999	210.0	100%	-	-
32	P. Primavera	SE-CO	hydro	Jan-1999	1,540.0	100%	-	-
33	Cuiaba (Mario Covas)	SE-CO	diesel oil	Oct-1998	529.2	33%	99.0%	0.800
34	Sobragi	SE-CO	hydro	Sep-1998	60.0	100%	-	-
35	PCH EMAE	SE-CO	hydro	Jan-1998	26.0	100%	-	-
36	PCH CEEE	S	hydro	Jan-1998	25.0	100%	-	-
37	PCH Enersul	S	hydro	Jan-1998	43.0	100%	-	-
38	PCH CEB	SE-CO	hydro	Jan-1998	15.0	100%	-	-
39	PCH Escelsa	SE-CO	hydro	Jan-1998	62.0	100%	-	-
40	PCH Celesc	S	hydro	Jan-1998	50.0	100%	-	-
41	PCH CEMAT	SE-CO	hydro	Jan-1998	145.0	100%	-	-
42	PCH CELG	SE-CO	hydro	Jan-1998	15.0	100%	-	-
43	PCH CERJ	SE-CO	hydro	Jan-1998	59.0	100%	-	-
44	PCH Copel	S	hydro	Jan-1998	70.0	100%	-	-
45	PCH CEMIG	SE-CO	hydro	Jan-1998	84.0	100%	-	-
46	PCH CPFL	SE-CO	hydro	Jan-1998	55.0	100%	-	-
47	S. Mesa	SE-CO	hydro	Jan-1998	1,275.0	100%	-	-
48	PCH Eletropaulo	SE-CO	hydro	Jan-1998	26.0	100%	-	-
49	Guilmam Amorim	SE-CO	hydro	Jan-1997	140.0	100%	-	-
50	Corumbá	SE-CO	hydro	Jan-1997	375.0	100%	-	-
51	Miranda	SE-CO	hydro	Jan-1997	408.0	100%	-	-
52	Nova Ponte	SE-CO	hydro	Jan-1994	510.0	100%	-	-
53	Segredo	S	hydro	Jan-1992	1,260.0	100%	-	-
54	Taquaruçu	SE-CO	hydro	Jan-1989	554.0	100%	-	-
55	Manso	SE-CO	hydro	Jan-1988	210.0	100%	-	-
56	D. Francisca	S	hydro	Jan-1987	125.0	100%	-	-
57	Itá	S	hydro	Jan-1987	1,450.0	100%	-	-
58	Rosana	SE-CO	hydro	Jan-1987	369.2	100%	-	-
59	Angra	SE-CO	nuclear	Jan-1985	1,874.0	100%	-	-
60	T. Irmãos	SE-CO	hydro	Jan-1985	807.5	100%	-	-
61	Itaipu 60 Hz	SE-CO	hydro	Jan-1983	6,300.0	100%	-	-
62	Itaipu 50 Hz	SE-CO	hydro	Jan-1983	5,375.0	100%	-	-
63	Emborcação	SE-CO	hydro	Jan-1982	1,192.0	100%	-	-
64	Nova Avanhandava	SE-CO	hydro	Jan-1982	347.4	100%	-	-

[1] Agência Nacional de Energia Elétrica. *Banco de Informações da Geração* (http://www.aneel.gov.br/, data collected in november 2004).
[2] Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. *Road testing baselines for greenhouse gas*
[3] Intergovernamental Panel on Climate Change. *Revised 1996 Guidelines for National Greenhouse Gas Inventories.*
[4] Operador Nacional do Sistema Elétrico. Centro Nacional de Operação do Sistema. *Acompanhamento Diário da Operação do SIN* (daily reports
[5] Agência Nacional de Energia Elétrica. Superintendência de Fiscalização dos Serviços de Geração. *Resumo Geral dos Novos Empreendimentos de*
[6] Centrais Elétricas Brasileiras S/A. Plano anual de combustíveis - Sistema interligado S/SE/CO 2005 (released December 2004).

65	Gov. Bento Munhoz	S	hydro	Jan-1980	1,676.0	100%	-	-
66	S. Santiago	S	hydro	Jan-1980	1,420.0	100%	-	-
67	Itumbiara	SE-CO	hydro	Jan-1980	2,280.0	100%	-	-
68	Igarapé	SE-CO	fuel oil	Jan-1978	131.0	33%	99.0%	0.820
69	Itauba	S	hydro	Jan-1978	512.4	100%	-	-
70	A. Vermelha	SE-CO	hydro	Jan-1978	1,396.2	100%	-	-
71	S. Simão	SE-CO	hydro	Jan-1978	1,710.0	100%	-	-
72	Capivara	SE-CO	hydro	Jan-1977	640.0	100%	-	-
73	S. Osório	S	hydro	Jan-1975	1,078.0	100%	-	-
74	Marimbondo	SE-CO	hydro	Jan-1975	1,440.0	100%	-	-
75	Promissão	SE-CO	hydro	Jan-1975	264.0	100%	-	-
76	Pres. Medici	S	coal	Jan-1974	446.0	33%	98.0%	1.019
77	Volta Grande	SE-CO	hydro	Jan-1974	380.0	100%	-	-
78	Porto Colombia	SE-CO	hydro	Jun-1973	320.0	100%	-	-
79	Passo Fundo	S	hydro	Jan-1973	220.0	100%	-	-
80	Passo Real	S	hydro	Jan-1973	158.0	100%	-	-
81	Ilha Solteira	SE-CO	hydro	Jan-1973	3,444.0	100%	-	-
82	Mascarenhas	SE-CO	hydro	Jan-1973	131.0	100%	-	-
83	Gov. Parigot de Souza	S	hydro	Jan-1971	252.0	100%	-	-
84	Chavantes	SE-CO	hydro	Jan-1971	414.0	100%	-	-
85	Jaguara	SE-CO	hydro	Jan-1971	424.0	100%	-	-
86	Sá Carvalho	SE-CO	hydro	Apr-1970	78.0	100%	-	-
87	Estreito	SE-CO	hydro	Jan-1969	1,050.0	100%	-	-
88	Ibitinga	SE-CO	hydro	Jan-1969	131.5	100%	-	-
89	Jupiá	SE-CO	hydro	Jan-1969	1,551.2	100%	-	-
90	Alegrete	S	fuel oil	Jan-1968	66.0	33%	99.0%	0.820
91	Campos	SE-CO	natural gas	Jan-1968	30.0	32%	99.5%	0.628
92	Santa Cruz (RJ)	SE-CO	natural gas	Jan-68	766.0	32%	99.5%	0.628
93	Paraibuna	SE-CO	hydro	Jan-1968	85.0	100%	-	-
94	Limoeiro	SE-CO	hydro	Jan-1967	32.0	100%	-	-
95	Cacaonde	SE-CO	hydro	Jan-1966	80.4	100%	-	-
96	J. Lacerda C	S	coal	Jan-1965	363.0	33%	98.0%	1.019
97	J. Lacerda B	S	coal	Jan-1965	262.0	33%	98.0%	1.019
98	J. Lacerda A	S	coal	Jan-1965	232.0	33%	98.0%	1.019
99	Bariri	SE-CO	hydro	Jan-1965	143.1	100%	-	-
100	Funil (RJ)	SE-CO	hydro	Jan-1965	216.0	100%	-	-
101	Figueira	S	coal	Jan-1963	20.0	33%	98.0%	1.019
102	Furnas	SE-CO	hydro	Jan-1963	1,216.0	100%	-	-
103	Barra Bonita	SE-CO	hydro	Jan-1963	140.8	100%	-	-
104	Charqueadas	S	coal	Jan-1962	72.0	33%	98.0%	1.019
105	Jurumirim	SE-CO	hydro	Jan-1962	97.7	100%	-	-
106	Jacui	S	hydro	Jan-1962	180.0	100%	-	-
107	Pereira Passos	SE-CO	hydro	Jan-1962	99.1	100%	-	-
108	Tres Marias	SE-CO	hydro	Jan-1962	396.0	100%	-	-
109	Euclides da Cunha	SE-CO	hydro	Jan-1960	108.8	100%	-	-
110	Camargos	SE-CO	hydro	Jan-1960	46.0	100%	-	-
111	Santa Branca	SE-CO	hydro	Jan-1960	56.1	100%	-	-
112	Cachoeira Dourada	SE-CO	hydro	Jan-1959	658.0	100%	-	-
113	Salto Grande, SP	SE-CO	hydro	Jan-1958	70.0	100%	-	-
114	Salto Grande (MG)	SE-CO	hydro	Jan-1956	102.0	100%	-	-
115	Mascarenhas de Moraes	SE-CO	hydro	Jan-1956	478.0	100%	-	-
116	Itutinga	SE-CO	hydro	Jan-1955	52.0	100%	-	-
117	S. Jerônimo	S	coal	Jan-1954	20.0	33%	98.0%	1.019
118	Carioba	SE-CO	fuel oil	Jan-1954	36.2	33%	99.0%	0.820
119	Piratininga	SE-CO	fuel oil	Jan-1954	472.0	33%	99.0%	0.820
120	Canastra	S	hydro	Jan-1953	42.5	100%	-	-
121	Nilo Peçanha	SE-CO	hydro	Jan-1953	378.4	100%	-	-
122	Fontes Nova	SE-CO	hydro	Jan-1940	130.3	100%	-	-
123	H. Borden Sub.	SE-CO	hydro	Jan-1926	420.0	100%	-	-
124	H. Borden Ext	SE-CO	hydro	Jan-1926	469.0	100%	-	-
125	I. Pombos	SE-CO	hydro	Jan-1924	189.7	100%	-	-
126	Jaguari	SE-CO	hydro	Jan-1917	11.8	100%	-	-

[1] Agência Nacional de Energia Elétrica. *Banco de Informações da Geração* (http://www.aneel.gov.br/, data collected in november 2004).
[2] Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. *Road testing baselines for greenhouse gas*
[3] Intergovernamental Panel on Climate Change. *Revised 1996 Guidelines for National Greenhouse Gas Inventories.*
[4] Operador Nacional do Sistema Elétrico. Centro Nacional de Operação do Sistema. *Acompanhamento Diário da Operação do SIN* (daily reports
[5] Agência Nacional de Energia Elétrica. Superintendência de Fiscalização dos Serviços de Geração. *Resumo Geral dos Novos Empreendimentos de*
[6] Centrais Elétricas Brasileiras S/A. Plano anual de combustíveis - Sistema interligado S/SE/CO 2005 (released December 2004).

Annex 4

MONITORING INFORMATION

As it is a renewable energy project that supplies electricity to a system of distributing electricity that is fed by at least one fossil fuel-fired generating unit, it is eligible for utilization of methodology of small-scale I.D (Generation of renewable electricity to a grid). In this methodology, the monitoring shall consist of measurement of electricity generated by renewable technology.

The methodology consists of using reliable measurement equipment to register and verify energy generated by units, which is essential to verify and monitor reductions in emissions of GHGs. This monitoring plan permits calculation of emissions of GHGs generated by project activity, in a direct manner, applying the factor of base line emission.

With respect to leakage, no source of emission was identified. The electricity generating equipment is not transferred from/to any other activity.

Data to be monitored:

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.	Electricity generation of the Project consumed by the baking and shredding units from ADAMI S/A-Madeiras and electricity generation of the Project delivered to the grid	EG_y	MWh	m	Monthly	100%	Electronic and paper	During the credit period and two years after	The electricity consumed will be checked by the energy metering and back-up energy metering and the electricity delivered to the grid will be monitored by the project (CER seller) and the energy buyer. Energy metering connected to the Grid and energy generation invoices
2.	CO2 emission factor of the grid	EF_y	tCO_2e /MWh	c	At the validation	0%	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.
3.	CO2 operating margin emission factor of the grid	$EF_{OM,y}$	tCO_2e /MWh	c	At the validation	0%	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.

4.	CO2 build margin emission factor of the grid	$EF_{BM,y}$	tCO_2e /MWh	c	At the validation	0%	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.
5.	Fraction of time during which low-cost/ must-run sources are on the margin.	λ_y	admensional	c	At the validation	0%	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.

The qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data	Uncertainty level of data (High/Medium/Low)	Are there GQ/CQ procedures planned for these data ?	Explain QA/QC procedures planned for these data, or why such procedures are not necessary
1.	Low	yes	These data will be used for calculate the emission reductions.Energy generation invoices and metering protocol will be used to check plausibility.
2.	Low	yes	Data does not need to be monitored
3.	Low	yes	Data does not need to be monitored.
4.	Low	yes	Data does not need to be monitored
5.	Low	yes	Data does not need to be monitored

Annex 5

BIBLIOGRAPHY

01. MME – Plano Decenal 2003-12:
Sumário Executivo do Plano Decenal de Expansão 2003/2012
Comitê Coordenador do Planejamento da Expansão dos Sistemas Elétricos
Ministério de Minas e Energia
www.mme.gov.br

02. Ministério de Minas e Energia, 2003
Balanço Energético Nacional 2003
Secretaria de Energia
www.mme.gov.br

03. City Brasil –Percorrendo o Brasil de A a Z.
http://www.citybrasil.com.br

04. Bosi, M. 2001
An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study
OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT (2001)4
http://www.oecd.org/env/cc/

05. Kartha, S., Lazarus, M. and Bosi, M., 2002
Practical Baseline Recommendations for Greenhouse Gas Mitigation Projects in the Electric PowerSector
OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT (2002)1
http://www.oecd.org/env/cc/

06. Bosi, M. and Laurence, A., 2002
Road Testing Baselines for Greenhouse Gas Mitigation Projects in the Electric Power Sector
OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT (2002)6
http://www.oecd.org/env/cc/

07. OECD, 2005
Economic Survey of Brazil 2005
OECD, ISBN 92-64-00747-4, February, 2005
http://www.oecd.org

08. Agência Nacional de Energia Elétrica - ANEEL
Banco de informações de geração.
http://www.aneel.gov.br

09. Operador Nacional do Sistema Elétrico,
Planejamento Anual da Operação Energética – Ano 2004
ONS RE 3/036/2004
http://www.ons.org.br/ons/planejamento/index.htm

10. CDM Executive Board
Approved Consolidated Baseline Methodology ACM0002 – "Consolidated Methodology for gridconnected electricity generation from renewable sources" version 06, 19 may 2006.
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

11. CDM Executive Board

Approved SSC Methodology AMS-I.D. – "Grid connected renewable electricity generation " version 10, 23 December 2006.http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

12. IPCC (1996). *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.* Intergovernmental Panel on Climate Change.

- - - - -