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:

Title: Malagone SHP CDM Project, Minas Gerais, Brazil (JUN1122)
Version: 3
Date: 07 July 2010

A.2. Description of the project activity:

The present project activity consists in eletricity generation by renewable sources – hydro potential, through the construction of a Small Hydro Power plant (SHP) called Malagone, under development by the Special Purpose Entity: Hidrelétrica Malagone S.A which has the present project activity being the first project in the power sector.

With an installed capacity of 19MW, the SHP is located in the Uberabinha river in the Uberlândia city , Minas Gerais State – south-east region, Brazil.

This enterprise has as main goal the electricity generation to be delivered in the National Interconnected Grid System (SIN) compensating the thermal generation from fossil fuels in the system with the generation of renewable sources of energy. The construction of Malagone also helps to meet the growing demand ofr energy/electricity in Brazil.

Moreover, help with the supply of electricity contributing to the environmental sustainability by increasing the share of renewable energy in relation to the total electricity consumption in Brazil. Thus, the project activity supports the construction of new renewable energy project as environmentally sustainable alternative to the electricity energy generation.

Considering that the project activity consists in a SHP with a small reservoir (1.27 km^2) , it represents a virtually zero environmental impact when compared to large hydroelectric facilities. This fact is very important because the construction of Small Hydro Power plants can really contributes to the efficient use of the environmental and natural resources, thus avoiding the growth of the environmental and social liabilities caused by new large hydroelectric power plants.

In this way, the investment in modern technology for small hydropowers contributes for an efficient use of the water resources as a relevance factor to be emphasized, adding value to the natural resources.

In regard to the contribution of the Project in mitigation of the Greenhouse Gas emissions (GHG), the project activity reduces emissions of these gases preventing the entry into operation of thermoelectric plants that use fossil fuels as energy input.. In the absence of the project activity, fossil fuels would be burned in thermoelectric plants grid connected. The project activity initiative helps Brazil to meet its goals of promoting sustainable development.

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

- It contributes to environmental sustainability as reduce the use of fossil energy (non-renewable sources). Thus the project contributes to the best use of natural resources and makes use of clean and efficient technologies;
- It contributes to better working conditions and increases the opportunity for employment in rural areas where the projects are located;
- It contributes to better conditions of the local economy, because the use renewable energy reduces our dependence on fossil fuels, reduce the amount of pollution and the associated social costs related to it.

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)	**Hidrelétrica Malagone S.A** (Private Entity)	**No**
	Carbotrader Assessoria e Consultoria em Energia Ltda (Private Entity)	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM- PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

South-East Region / Minas Gerais State

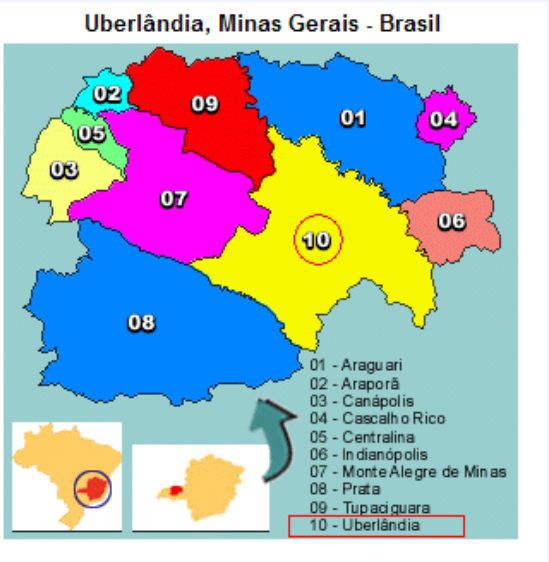
A.4.1.3. City/Town/Community etc.:

Uberlândia city

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

The project activity is located in the Uberabinha River in the municipality of Uberlândia, Minas Gerais State, Brazil. The geographical coordinates of the location of the dam are: 18º 40' 50´´ S e 48º 29´ 57´´ W. Below the Figure 1 illustrates the location of the enterprise:

Figure 1: Geographical location of Uberlândia city.



Source: Wikipedia - pt.wikipedia.org and City Brazil - www.citybrazil.com.br[1]

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

Grid-connected electricity generation from renewable sources.
Sectoral Scope 1 – Energy Industries (Renewable / Non-renewable Sources)

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

(a) The scenario existing prior to the start of the implementation of the project activity:

Prior to implementation of the proposed project, the electricity continues to be generated with the actual power plant mix that have a strong fossil fuel power plants in operation. The project activity reduces GHG emissions prevent the entry into operation of thermoelectric plants that use fossil fuels as energy

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

inputs. In the absence of the project activity, fossil fuels would be burned in thermoelectric plants which are interconnected to the grid.

(b) The scope of the activities/measures that are being implemented within the project activity:

The technology used in the enterprise is the Uberabinha River (Paranaíba River Basin) hydro energy potential for the electricity generation by the gravitational energy of the water, which is used to move the turbines and by doing this, trigger generators that enable the generation of electricity. This is a source of clean energy and renewable that presents minimal impact on the environment.

The Malagone SHP is a venture classified as Small Hydro Power Plant because according to the Brazilian Resolution no. 652, 09/12/2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area must be less than 3 Km^2 (300 ha) and the total installed capacity between 1 MW to 30 MW. The Malagone SHP has 1.27 Km^2 of reservoir area and total installed capacity of the 19 MW, thus this the Power density should be 14.96 W/m^2 (in accordance with CDM meth rules). The venture is also called a **"run of river"** plant which does not include significant water stocks.

The Malagone SHP will dispatch generated energy to the National Interconnected Grid (SIN - Sistema Interligado Nacional) trhough the Uberlândia SE Substation – 1 (CEMIG SE-1, which line extension has 34 Km, in 138 KV) located in the Uberlândia city, Minas Gerais state, Brazil. The CEMIG, is also the local distributor.

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

The emissions sources and GHGs involved are CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity and emissions of CH_4 from the reservoir.

The technical characteristics of equipment that will be implemented in SHP can be seen in Table 1 below:

Table 1 : SHP technical characteristics

SHP	Malagone
Installed Power (MW)	19
Reservoir (Km^2)	1.27
Assured Generation (MW)	10.11
Flow Rate River Average (m^3/s)	25
Turbines	Francis
Quantity	2
Power (kW)	9,800
Flow rate (m^3/s)	26.36

Spin (rpm)	400
Generator	
Quantity	2
Nominal Power (kVA)	10,560
Effective Power (MW)	9.5
Voltage (kV)	6.9
Power factor	0.9
Frequency (Hz)	60

(c) The baseline scenario:

The baseline scenario to the project activity is the same as the scenario existing prior to the start of implementation of the project activity.

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

Table 2 : Estimation of Emission Reductions

Years	Estimation of annual emission reductions in tonnes of CO2 e
2011 (January)	27,552
2012	27,552
2013	27,552
2014	27,552
2015	27,552
2016	27,552
2017 (December)	27,552
Total estimated reductions (tonnes of CO_2e)	192,864
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period	27,552

A.4.5. Public funding of the project activity:

There is no public funding provided by Annex I parts so the carbon credits revenue are the option chosen.

SECTION B. Application of a baseline and monitoring methodology

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

The methodology tool used to the baseline calculation is the **"Tool to calculate the emission factor for an electricity system" - version 02 (valid from the Executive Board meeting 50).**

The monitoring tool used is the ACM0002: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" - version 11 (valid from 26 February 2010 onwards).**

The methodology tool used to the additionality assessment is the **"Tool for the demonstration and assessment of additionality" - version 05.2 (valid from 26 August 2008 onwards).**

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

The ACM0002 methodology **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"**, states that:

> "*Applicability:*
>
> *This methodology 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).*"

So, the item (a) above is applicable to the present project activity.

Also the project activity involves the installation of a hydro power plant, so the methodology is applicable under the following condition:

> "*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}".

Considering that Malagone SHP is a grid-connected construction which is considered a renewable power generation plant with 14.96 W/m^2 of Power Density, so, greater than 4 W/m^2 and results in a new reservoir, the ACM0002 is applicable to the present project activity.

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

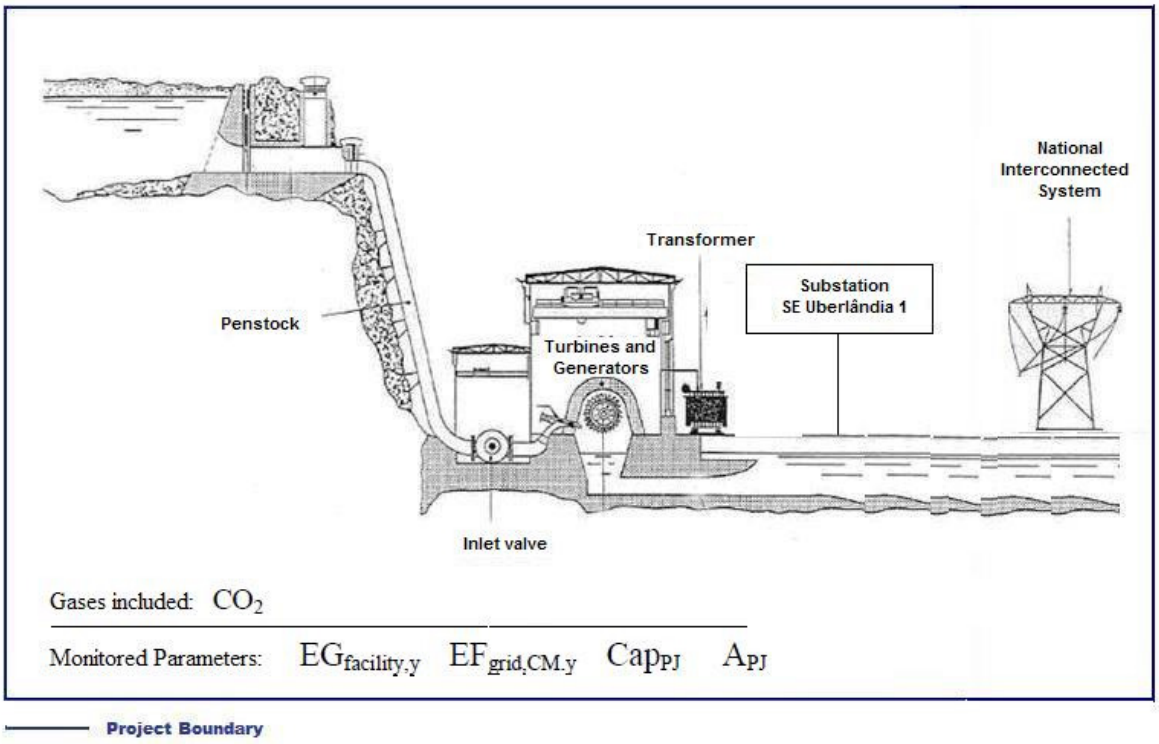
According to ACM0002 "*the spatial extent of the project boundary includes the project power plant and all power plants physically connected to the electricity system that the CDM project power plant is connected to*", which in this case is the SIN (National Interconnected Grid – NIS).

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

Table 3: Sources and Gases included in the Project Limits

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is 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 hydro power plants, emissions of CH4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	Considering that the Power Density of the Malagone SHP is 14.96 W/m^2 so greater than 10 W/m^2, emissions from the reservoir are not considered.
		N_2O	No	Minor emission source.

The diagram below shows the project boundary, main equipments, monitored parameters and gases included:



Considering the connection location of project to the grid, the electricity will be dispatched to the SE Uberlândia – 1, located in the Uberlândia municipality, Minas Gerais State, Brazil. The substation will be the grid connection point, where the CEMIG is the local distributor. The energy meters will be installed

in the substation or next to the power house of the SHP, which are included in the project boundary.

The baseline emissions are described in the section B.6.1. using the tool to calculate the grid-connected emission factor[2].

As the Power Density is greater than 10W/m^2 the project activity doesn't need to consider the emissions related to the reservoir. (More details can be viewed in the B.6.1. item).

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

According to the methodology ACM0002, "if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> "*Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generating sources, as reflected in the combined margin (CM) from 'Tool to calculate the emission factor for an electricity system'*", described in the item B.6.1.

Also the baseline emissions are the kWh produced by the renewable generating unit multiplied by an emission coefficient, calculated in a conservative and transparent manner.

So in the Project activity absence, the electricity should be provided by the other grid-connected power plants included the fossil fuel based Power plants.

Therefore, the project activity alternatives scenarios, which is aligned with national regulations and laws, are:

Scenario 1: The proposed project activity undertaken without being registered as a CDM project activity.

Scenario 2: The continuation of the current situation, with the electricity being provided by the SIN which has a high participation of fossil fuel plants.

Also, the project activity use as data source for the Emission Factor calculation to the National Interconnected System (SIN), operating margin and the build margin coefficients provided by the Designated National Authority (DNA) of the host country.

The Emission Factor of CO2 resulting from the generation of electric energy in the system checked in the National Interconnected System (SIN) in Brazil is calculated based on generating records from plants centrally operated by the National Electric System Operator (ONS), which includes thermoelectric plants that use fossil fuels as energy.

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[2] Interministerial Comission on Global Climate Change (CIMGC). CO_2 Emission Factors according to the "Tool to calculate the emission factor for an electricity system" approved by the CDM Executive Board - http://www.mct.gov.br/index.php/content/view/74689.html

The method used to make this calculation is the dispatch method analysis, This information is needed for renewable energy projects connected to the electric grid and implanted in Brazil under the Clean Development Mechanism (CDM) of the Kyoto Protocol.

The data result from the work of the Electrical System Operator (ONS) of the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology, which are available to the CDM project proponent . Thus, they can be applied in calculating ex-ante emissions avoided by the project activity, where the emission reduction will be calculated ex-post. Further details of the development of the project baseline can be viewed through the link: http://www.mct.gov.br/index.php/content/view/73318.html.

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):

This item was elaborated based on **"Tool for the demonstration and assessment of additionality – version 05.2".**

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

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

1 - The proposed project activity undertaken without being registered as a CDM project activity.

2 - The continuation of the current situation, with the electricity being generated to the SIN which has a high participation of fossil fuel plants.

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

Both the project and the alternative scenario are in compliance with all regulations according the following entities: National Electric System Operator (ONS - Operador Nacional do Sistema Elétrico), Electricity Regulatory Agency (ANEEL - Agência Nacional de Energia Elétrica), Minas Gerais Environmental Agency (FEAM - Fundação Estadual do Meio Ambiente) and the CDM Executive Board.

Step 2: Investment analysis

Determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a: Determine appropriate analysis method

To the investment analyses there are the options below, according to the meth:

- Option I - Apply simple cost analysis,
- Option II - Apply investment comparison analysis,
- Option III - Apply benchmark analysis

The III option was chosen.

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

The suitable financial indicator chosen for the proposed CDM project activity is the project's Internal Rate of Return (IRR), where such data is considered adequate for this kind of Project as well decision context.

The analysis of the financial/economic indicator is based on parameters that are standard in the energy market in Brazil and around the world, considering the specific characteristics of the project type – investments in energy projects.

The benchmark analysis is performed comparing the project's IRR with a benchmark. The established benchmark for this comparison is the average yield on a Government Bond rate available at or prior the project activity starting date, which is traded in public markets, plus a conservative risk premium. The Government Bonds considered are long-term indicators, reflecting long-term perspectives of the market, with maturity above than 10 years – as long as the present project activity lifecycle, both considered long-term investments.

With respect to the benchmark chosen for the additionality analysis / benchmark analysis, the yield on Government Bonds that was available by a longer period, which in this case is at least five years prior to the project start date were used to determine the benchmark.

An average yield over five years was used to calculate the benchmark (from the 2003 to 2007), in this way since the beginning of the commercialization of the government bond NTN-C with maturity for April 1st 2021.

The following table summarizes the most conservative brazilian government bond available:

Table 4: Brazilian Government bond available at the project activity starting date.

Government bond rates in Brazil
Source: http://www.tesouro.fazenda.gov.br/tesouro_direto/balanco_tesouro_direto.asp

Government bond	Index	Maturity	Yield on maturity					
			2003	2004	2005	2006	2007	Average
NTN-C	IGP-M	1/4/2021	39.12%	25.66%	5.84%	19.47%	21.00%	**22.22%**

Sources: http://www.tesouro.fazenda.gov.br/tesouro_direto/download/balanco/2003/balanco_1203.pdf
http://www.tesouro.fazenda.gov.br/tesouro_direto/download/balanco/2004/balanco_1204.pdf
http://www.tesouro.fazenda.gov.br/tesouro_direto/download/balanco/2005/balanco_1205.pdf
http://www.tesouro.fazenda.gov.br/tesouro_direto/download/balanco/2006/balanco_1206.pdf
http://www.tesouro.fazenda.gov.br/tesouro_direto/download/balanco/2007/balanco_1207.pdf

For the calculation of the average yield on brazilian Government Bond, was used the yield from the years 2003, 2004, 2005, 2006 and 2007, in order to have a non punctual benchmark, enabling to construct a benchmark with temporal consistency.

In this way, the NTN-C government bond (Valid until 01/04/2021) was established as the benchmark, which is the most conservative option among other. The average yield on the NTN-C is 22.22% per year.

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

The Project participants has presented the project cash-flow, which results in the project´s Internal Rate of Return (IRR), in a separated document with all information necessary to role out the financial calculations. Thus the cash flow and assumptions of the spreadsheet will be presented to the Deginated Operational Entity where will acomplish the validation. These data will be available for any CDM agent that asks for this information in order to asesses the Project adictionality. Also, all parameters used in the financial calculations are available in the same separated spreadsheet.

The cash flow was established for all project operational lifetime, resulting in a Internal Rate of Return (IRR) equal 16.58% per year. This result takes into account the evolution on prices and costs over the years presented in the IRR project activity spreadsheet.

Comparing the project's IRR (16.58% per year) with the benchmark above mentioned, is possible to observe that project indicator (IRR) is considerably lower than the established benchmark.

The table below summarizes the results of the benchmark analysis:

Table 5: Comparition between the Benchmark and the project activity IRR.

	Benchmark (% p.y.)	**IRR (% p.y.)**
Malagone SHP	22.22	16.58

As it is possible to observe above, the project's IRR has stayed below the benchmark, so the project activity is unlikely to be the most financially/economically atractive.

The CERs (Certified Emission Reduction) are highly significant instruments for entrepreneurs in overcoming barriers, improving investment quality and hence stimulating future investments in clean energy generation.

Sub-step 2d: Sensitivity analysis

In order to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions, a sensitivity analysis was done.

As recommended by the "Guidance on the Assessment of Investment Analysis" of the mentioned tool above, "only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation". However, the PPs has extended the sensitivity analysis on the parameter "O&M" even it does not contitute more than 20%

of total project costs or revenues, but it will be the main cash out value over the years after the investment. The results of this variation is presented below and is also reproducible in the associated spreadsheets submited to the DOE.

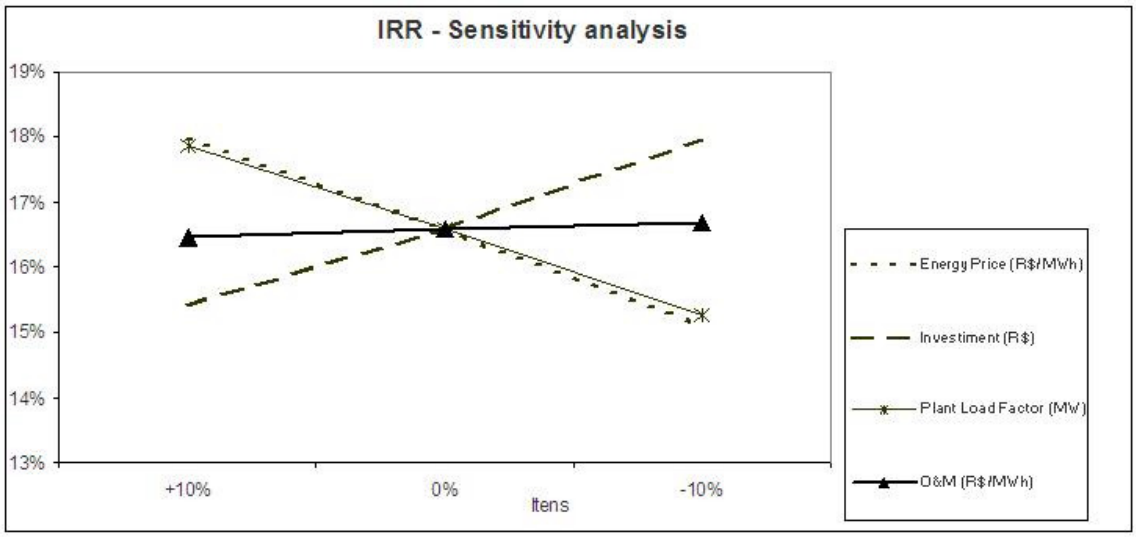
According to the last paragraph, was established as critical variables the: (1) Investment costs (2) Plant Load Factor, (3) Energy Price and (4) O&M.

In order to check the financial impacts over the project activity a 10% variation over the critical parameters was done and the results are demonstrated in the table and graphic below:

Table 6: Results of the sensitivity analysis - table.

Sensitivity Analisys						
No.	Item	Value	+10%	0%	-10%	Obs
1	Energy Price (R$/MWh)	169.10	186.01	169.10	152.19	without CERs Revenue
	IRR		17.99%	16.58%	15.11%	
2	Investiment (R$)	92,137,018.75	101,350,720.625	92,137,018.75	82,923,316.875	
	IRR		15.40%	16.58%	17.97%	
3	Plant Load Factor (MW)	10.11	11.12	10.11	9.10	
	IRR		17.86%	16.58%	15.25%	
4	O&M (R$/MWh)	13.20	14.52	13.20	11.88	
			16,46%	16.58%	16,70%	

Graphic 1: Results of the sensitivity analysis - graphic.



With the sensitity analysis presented above, even the parameter variation which presents the better IRR – higher IRR, 17.99% per year through 10% increase in the energy price, does not enable the benchmark to be overcome. So, after +/-10% variation, the project remains additional.

Although the sensitivity analysis has already shown that the benchmark cannot be overcome by the project´s IRR, another analysis was prepared in order to find the breakeven point between the project´s IRR and the established benchmark. This will strengthen the project activity is not in an investment scenario, where there is a possibility of becoming financially/economically attractive through changes in the input values (in other words, changes in the parameters used in the financial calculation) of the financial spreadsheet.

The results of the "breakeven point" analysis are presented below:

Table 7: Breakeven point between the project´s IRR and the established benchmark.

Breakeven point					
Parameter variated	Original Value	Breakeven Point	Original IRR	% of deviation	Benchmark
Energy Price (R$/MWh)	169.1	239.41	16.58	41.58%	22.22%
Investiment (R$)	92,137,018.75	62,514,736.47	16.58	-32,15%	22.22%
Plant Load Factor	10.11	14.75	16.58	45.86%	22.22%
O&M	13.20	-52.28	16.58	-496.17%	22.22%

From the table presented above, the project participants consider the scenarios for the breakeven point between the project´s IRR and the benchmark unlikely to occur. Because the percentage of deviation or variation between the breakeven point and the original value (data from the financial calculations - project´s IRR) shall have severe changes and it is not possible as the following analysis about the likelyhood/probability of scenarios occur.

Likelihood of occurence of scenarios of the breakeven point

Investment analysis

The investment value presented in the spreadsheet is based on the Eletrobrás Standard Budget – OPE, which is considered a reliable source of data for the investment value. Moreover, the current investment costs are pointing to values above the input value of the IRR calculations.

Therefore, the scenario above is unlikely to occur.

Energy Price

The original value for the energy price used in the financial calculations is considered adequate because it was established in a Power Purchase Agreement signed by the project owners, where the price was defined in January 2009 as R$169.1/MWh and should be adjusted every year by the IGP-M inflation index. This value cannot change, since it is a signed value / contracted value, and mainly because is unlikely to occur an increase by 41.58% in the energy price as calculated and presented above.

So, as the energy price is established in a Power Purchase Agreement, the Internal Rate of Return cannot increase enough to make the project's IRR higher than benchmark.

Plant Load Factor

This is an oficial value calculated and made public available by ANEEL (Brazilian Electricity Regulatory Agency) and the value takes into account the historical river flow series. The source of the value can be viewed in the following link: http://www.aneel.gov.br/cedoc/prt2008010spde.pdf. It is not probable to occur the scenario for the breakeven point, since it leave the plant load factor to a value 45.86% higher than the original value from ANEEL.

O&M

Considering that in the breakeven point analysis the Project's IRR has not presented significantly changes by deviating the O&M costs, because it is necessary to have a negative value (-52.28 R$/MWh) of O&M to the Project IRR reach benchmark, and even considering zero as input value, the IRR just reach 17.77% per year (benchmark is 22,22% per year), Therefore, is reasonable to conclude that this parameter does not affect the project additionality.

Conclusion

In the light of the analysis provided and all sub-steps above we can conclude that the project activity is unlikely to be the most financially/economically attractive option, because there are financially more atractive alternatives, which would led to higher emissions.

In this way, it is evident that the project has to become a CDM project and the carbon credits revenue are a inevitable part of the project cash-flow. It makes the project´s revenues better for the project participants as in the point of view of financial resources, because with the carbon credits the project´s IRR goes to 17.10%, as in the point of view of intangible benefits that in Brazil has agregating value to companies.

Step 3: Barrier analysis

Not necessary. As concluded in the sensitivity analysis the Project activity is not financially attractive.

Step 4: Common practice analysis

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

For the Common practice analysis, was performed an analysis of activities that become operational and which are similar to the present project activity. In this way, the selected similar activities shall be in the same country, region, has to be implemented with the same technology, with similar scale, and than activities that has been implemented in a comparative environment on the point of view of regulations, investment climate, access to technology, among other issues.

Based on this, were selected renewable energy generation projects, through Small Hydro Power Plants (SHPs) with installed capacity between +/- 50% of Malagone SHP (19MW), which results approximately in activities from 9 to 28.5 MW, but considering the limit of 30MW corresponding to the superior limit of installed capacity for SHPs in Brazil according to brazilian regulations for the electricity sector (please

see the definition for SHPs in Brazil mentioned in this PDD – section A.4.3), the common practice analysis was extended from 9 to 30MW of installed capacity.

Other CDM project activities (registered projects under UNFCCC and other projects which have been published on the UNFCCC website for global stakeholders consultation– as part of the validation process of a project activity) were not included in the Common practice analysis[3].

Considering the approach to be performed in this item of the project additionality, we have to consider that there are two main sources / mechanisms of incentives for projects in Brazil: the Clean Development Mechanism (CDM) under the Kyoto Protocol and the PROINFA – from the Portuguese: *Programa de Incentivo às Fontes Alternativas de Energia Elétrica*.

The PROINFA is a governmental program of incentives which has as main goal to stimulate and provide incentives, through financial sources the development of entrepreneurships of energy generation and renewable technologies.

This program was established due to the difficulties faced by entrepreneurs to access financial resources to implement projects, difficulties to offer guarantees for financial and capital suppliers / banks, etc, and with respect to other issues related to the scale of such kind of projects and also the size of some implementation companies (mainly because of their credit capacity to access sources of capital). This way, the Federal Government tries to motivate projects through differentiated lines of finance, besides the guarantees of minimal revenues through the compromise of establishing Power Purchase Agreements (PPAs), to be firmed with a mixed economy society, Eletrobrás, which will secure to the entrepreneur a minimal revenue of 70% of the energy purchased during the financing period and complete protection to the risks of exposure in the short-term market. The SHPs projects are one of the types eligible to participate in the PROINFA.

Projects qualified by the PROINFA are eligible to participate in the CDM, agreeing to the decision of the UNFCCC regarding project eligibility for project activities derived from public policies. The legislation which had created the PROINFA considered the CDM revenues to belong and implement the program. Therefore, 100% of similar activities (inside or outside PROINFA) have considered the additional incentives from CDM as a condition to overcome financial obstacles.

Considering the explanation above, the similar activities to the project activity were raised and listed in the table 8 below. In the *Sub-step 4.b*, a colunm referencing the incentives shared by similar projects was inserted beside the name of the plant indicating if the activity has become operational using financial incentives. Similar activities which were CDM activities were excluded of the analysis.

Table 8: Similar activities to the present project activity which has become operational since 2005.

Year	SHP	State

[3] The sources for the research based on public information available são:
UNFCCC website – http://unfccc.int
UNEP Risoe website - http://cdmpipeline.org/ (July/2009)
ANEEL Fiscalization Datas of the Generation (May/2009) - http://www.aneel.gov.br/area.cfm?id_area=37
ANEEL SHPs under PROINFA program - http://www.aneel.gov.br/area.cfm?id_area=37

2005		
	Excluding the CDM´s SHP, no other become operational.	n/a
2006		
1	Carlos Gonzatto	RS
2	Esmeralda	RS
3	Mosquitão	GO
4	Piranhas	GO
5	São Bernardo	RS
2007		
1	Buriti	MS
2	Flor do Sertão	SC
3	José Gelásio da Rocha	MT
4	Ludesa	SC
5	Ponte Alta	SC
6	Rondonópolis	MT
7	Santa Laura	SC
2008		
1	Alto Irani	SC
2	Alto Sucuriú	MS
3	Boa Sorte	TO
4	Bonfante	MG/RJ
5	Caçador	RS
6	Cachoeira da Lixa	BA
7	Calheiros	RJ/ES
8	Carangola	MG
9	Colino I	BA
10	Colino II	BA
11	Cotiporã	RS
12	Da Ilha	RS
13	Funil	MG
14	Irara	GO
15	Jataí	GO
16	Lagoa Grande	TO
17	Mambaí II	GO
18	Plano Alto	SC
19	Riacho Preto	TO
20	Santa Fé I	MG/RJ

21	Santa Rosa II	RJ
22	São Joaquim	ES
2009		
1	Linha Emília	RS
2	Monte Serrat	RJ/MG
3	São Simão	ES
4	Cocais Grande	MG
5	São Lourenço	MT

Among SHPs that become operational from 2005 (moment at which the Kyoto Protocol has become operational and CDM becomes effective) until May 2009, we have that none of them were implemented without PROINFA incentives. This fact can evidence that SHPs construction in Brazil is not a common practice, i.e, the common practice in Brazil is the SHPs implementation through financial incentives. It will be better addressed in the *Sub-step 4b*.

The Brazilian Electricity Regulatory Agency (ANEEL) presents the "Porto Góes SHP" as a plant that becomes operational in 2005. However, this is a power plant that has passed by an expansion of 14.3MW, totaling 24.8MW installed. This expansion was authorized in 06 May 2003, by the ANEEL's resolution Nº 255[4] to the "Empresa Metropolitana de Águas e Energia S.A. – EMAE". Before the expansion, the plant was operating since 01 December 1982, where the company "ELETROPAULO - Eletricidade de São Paulo S.A." was authorized to produce electricity in such hydro potential, by the Decree Nº 87.884[5]. So this is not a similar activity to the present project activity considering their different designs, and was not considered in the common practice analysis.

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

In order to have basis for the discution, is necesary to provide the clarifications regarding the brazilian electric sector and its risks, in this way a short overview about the below:

History of the Brazilian Electric Sector

In recent decades, the Brazilian Electric Sector has undergone several changes until the current model. The energy sector was composed almost exclusively of government-owned companies, but since 1995, due to an increase in international interest rates and the incapacity of investment, the government was forced to seek for alternatives. The recommended solution was to begin a privatization process and deregulation of the market.

The table below shows the summary of the main changes between the pre-existing models and the current model, which ultimately result in changes in the activities of some agents of the sector.

[4] ANEEL's resolution Nº 255 available at: http://www.aneel.gov.br/cedoc/res2003225.pdf

[5] Decree Nº 87.884 available at: http://www.aneel.gov.br/cedoc/dec198287884.pdf

Table 9: Summary of the several changes in the Brazilian Electric Sector.

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
Financing using public funds	Financing using public and private funds	Financing using private and public funds
Verticalized Companies	Companies classified by activity: generation, transmission, distribution and commercialization	Companies classified by activity: generation, transmission, distribution, commercialization, imports and exports.
Predominantly State-controlled companies	Opening up of the market and emphasis on the privatization of the Companies.	Coexistence between State-controlled and Private Companies.
Monopolies – No competition	Competition in generation and commercialization.	Competition in generation and commercialization.
Captive Consumers	Both Free and Captive Consumers	Both Free and Captive Consumers
Tariffs regulated throughout all sectors	Prices are freely negotiated for the generation and commercialization.	In a free environment: Prices are freely negotiated for the generation and commercialization. In a regulated environment: auctions and bids for the least tariffs.
Regulated Market	Free Market	Coexistence between Free and Regulated Markets.
Determinative Planning – Coordinator Group for the Planning of Eclectic Systems (GCPS)	Indicative Planning accomplished by the National Council for Energy Policy (CNPE)	Planning accomplished by the Energy Research Company (EPE)
Hiring: Market 100%	Hiring : Market 85% (until August/2003) and Market 95% (until December/2004)	Hiring: Market 100% + reserve
Energy Surplus/Deficit shared between the buyers.	Energy Surplus/Deficit sold in the Wholesaler Energy Market (MAE)	Energy Surplus/Deficit sold in the CCEE. Distributors Energy Surplus/Deficit compensation mechanism (MCSD).

Based on the data raised in the last sub-step, other similar options to the project activity are observed in the brazilian scenario.

Thus, is necessary to demonstrate that the existence of those identified activities does not contradict that the present project activity is not a financially/economically attractive. And it is strongly demonstrated below, as the common practice is not the construction of SHPs without incentives. In the following

paragraphs will be presented reasons demonstrating the essential distinctions among similar activities which has been occurring comparing to the Malagone SHP.

One of the key points that should be taken into account is the PROINFA program from the Brazilian Federal Government. The program is considered an alternative for project financing, making projects more feasible for project owners and as mentioned earlier, it provides Contract of Purchase and Sale of Energy (from the portuguese: Contratos de Compra e Venda de Energia (CCVE) in long term-conditions; or Power Purchase Agreements - PPA), long-term conditions of loan and special financing. The Malagone SHP is not participating in the program.

Both the process of negotiating a PPA with the utility companies and as obtaining financing has been very difficult because the enterpreneurs have to present guarantees that in some cases become too much to provide funding. Other risks and barriers are related to technical and operational issues associated with small dams, the ability to carry out the contract (CCVE/PPA) and possible fines/penalties for breach of contract and regulatory risks inherent in the sector.

Comparing the proposed project activities with other similar activities, we can clearly see that all other similar options participates in incentive programs that lead to the implementation of a project financially and / or economically attractive.

In the table below, we can see that 100% of similar activities are part of PROINFA

Table 10: Similar projects and respective incentives for its implementation.

Year	SHP	State	Incentive
2005			
	Excluding the CDM´s SHP, no other become operational.	n/a	n/a
2006			
1	Carlos Gonzatto	RS	Proinfa
2	Esmeralda	RS	Proinfa
3	Mosquitão	GO	Proinfa
4	Piranhas	GO	Proinfa
5	São Bernardo	RS	Proinfa
2007			
1	Buriti	MS	Proinfa
2	Flor do Sertão	SC	Proinfa
3	José Gelásio da Rocha	MT	Proinfa
4	Ludesa	SC	Proinfa
5	Ponte Alta	SC	Proinfa
6	Rondonópolis	MT	Proinfa

7	Santa Laura	SC	Proinfa
2008			
1	Alto Irani	SC	Proinfa
2	Alto Sucuriú	MS	Proinfa
3	Boa Sorte	TO	Proinfa
4	Bonfante	MG/RJ	Proinfa
5	Caçador	RS	Proinfa
6	Cachoeira da Lixa	BA	Proinfa
7	Calheiros	RJ/ES	Proinfa
8	Carangola	MG	Proinfa
9	Colino I	BA	Proinfa
10	Colino II	BA	Proinfa
11	Cotiporã	RS	Proinfa
12	Da Ilha	RS	Proinfa
13	Funil	MG	Proinfa
14	Irara	GO	Proinfa
15	Jataí	GO	Proinfa
16	Lagoa Grande	TO	Proinfa
17	Mambaí II	GO	Proinfa
18	Plano Alto	SC	Proinfa
19	Riacho Preto	TO	Proinfa
20	Santa Fé I	MG/RJ	Proinfa
21	Santa Rosa II	RJ	Proinfa
22	São Joaquim	ES	Proinfa
2009			
1	Linha Emília	RS	Proinfa
2	Monte Serrat	RJ/MG	Proinfa
3	São Simão	ES	Proinfa
4	Cocais Grande	MG	Proinfa
5	São Lourenço	MT	Proinfa

Source: The data source used in this research, based on public information available are the following:
UNFCCC website – http://unfccc.int
UNEP Risoe website - http://cdmpipeline.org/ (July/2009)
ANEEL Fiscalization Data and Generation (May/2009) - http://www.aneel.gov.br/area.cfm?id_area=37
ANEEL SHPs under PROINFA Program - http://www.aneel.gov.br/area.cfm?id_area=37

Projects that are participants of PROINFA[6], has shared, besides the financial benefits mentioned above, the following[7]:

[6] http://www.mme.gov.br/programas/proinfa/

- Protection on the liquidity risk: Eletrobrás is the liable company for the contracted energy in a fixed price, where the liquidity risk can be neglected, since the volume to be transacted is guaranteed by the contract;
- No legal risk (e.g. the agreement between the parties): With the PROINFA established by law, the legal risk can neglected, because legally the institution is fully supported;
- No credit risks: With the issuance of the Eletrobrás papers, which has a local classification "AA" indicated by Standard & Poor's, it is considered that the company ability to honor commitments financial is very high; (source: http://www.acionista.com.br/home/investimentos/120805_fidc.htm)
- No market risk or protection regarding the market risks: With PROINFA, which has predetermined value (pre-fixed the energy price) for the energy prices during the 20-year contract, the volatility can not be considered part of risks, and the investor now has a certainty about the future revenues. Therefore, PROINFA participants has full protection of short-term market risks exposure.

In this way, it is possible to observe that the essential distinctions among the project activity and the other activities that are occuring are clearly evidenced by the fact of they has been enjoying incentives related to the PROINFA Program, unlike what happens in the project activity.

In light of above explantion provided, we can conclude that as the outcome of the sub-steps 4.a and 4.b, the present project activity is not a common practice. Therefore, it is clear that without the incentive created by the CDM, this project would not be the most atractive scenario, which could lead to higher emissions.

Therefore, the project is additional

Chronology of the project activity

The prior consideration of the CDM by the Project Proponents were seriously considered in the decision to proceed with the project activity as a CDM project.

In order to provide information regarding the chronology of the project activity's implementation and also regarding the real actions and events in order to become and maintain the project with status of a CDM project, the table below shows the main events related to the entrepreneurship.

[7] referência: http://www.cerpch.unifei.edu.br/Adm/artigos/619c3388da6cf7c7a73c9b6ae4c7ec09.pdf

Table 11: Chronology of significant events related to the Malagone SHP.

Timeline Malagone	
2006	
August	Prior CDM consideration. Wanerg Energética has indicated that the CDM benefits were necessary for the project feasibility, in this way the Carbon Credits obtention was decisive for the project implementation. Reference: Minutes of meeting from 31th August 2006.
2007	
November	Beginning of the hiring for consultants to develop the CDM project. Start of work between Carbotrader and Malagone. E-mail dated on 20th November 2007.
2008	
February	Starting date of the project activity. Date on which contracts have been signed for equipment services required for the project activity. The date refers to the comitment of the project participant to expenditures related to the implementation of the project activity. Reference: Contract for Turbines, generators and other services dated on 27th February 2008.
July	Communications between the CDM consultant and Malagone Energética.
	Project Proponent had authorized the CDM consultant to develop the PDD. Proposal aceptance dated on 29th July 2008.
September	Letter of project presentation from Wanerg Energética to the brazilian DNA. Letter from 08th September 2008.
December	Brazilian DNA response to the project developer regarding the receipt of the letter. Letter from 05th December 2008.
2009	
April	Validation proposal for the Malagone SHP. Proposal dated on 21th April 2009.
2010	
March	The Brazilian Electricity Regulatory Agency has authorized the SHP to operate in test, through the Dispatch No. 783 issued on 26th March 2010. Also, comissiong was occuring.
	The Brazilian Electricity Regulatory Agency has authorized the SHP's commercial operation, through the Dispatch No. 837 issued on 31th March 2010.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the methodology ACM0002 version 11, for hydro power project activities that result in new reservoirs , project proponents shall account for CH4 and CO2 emissions from the reservoir, estimated as follows:

a) If the power density of project (PD) is greater than 4W/m^2 and less than or equal to 10W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where :

$PE_{HP,y}$ Emission from water reservoir as tCO_2e/year;

EF_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e /MWh;

TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

b) If power density of the project is greater than 10W/m^2,

$PE_{HP,y} = 0$.

The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD Power density of the project activity, in W/m^2.

Cap_{PJ} Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

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 (m^2).

A_{BL} 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). For new reservoirs, this value is zero.

$$PD = \frac{19{,}000{,}000 - 0}{1{,}270{,}000 - 0} = 14.96$$

The reservoir Project Emissions are zero to the Malagone SHP because the Power Density is 14.96 W/m^2, so greater than 10 w/m^2.

The baseline is the kWh produced by renewable generation unit multiplied by an emission coefficient (measured in tCO_2e/MWh) 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 methodological tool "Tool to calculate the emission factor for an electricity system".

For the calculation of the baseline, the six steps below should be followed:

STEP 1. Identify the relevant electricity system.
STEP 2. Choose whether 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.

As mentioned in the section B.4, all steps required to calculate the grid emission factor are carried out by the brazilian DNA, thus the operating margin and the build margin are made publicly available in the brazilian DNA website.

The weights w_{OM} and w_{BM} are default 0.5.

Baseline Emissions

Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) multiplied by the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh), as follows:

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

Where:

BE_y = Baseline emissions in year y (tCO_2e/year);

$EG_{PJ,y}$ = 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/year);

$EF_{grid,CM,y}$ = 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" (tCO_2/MWh).

Calculation of $EG_{PJ,y}$

The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, thus classified as a Greenfield renewable energy power plant, then:

$$EG_{PJ,y} = EG_{facility,y}$$

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/year);

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/year).

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

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.

Source of data used:	Project site.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determine the installed capacity based on recognized standards.
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). For new reservoirs, this value is zero.
Source of data used:	Project site.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured from topographical surveys, maps, satellite pictures, etc.
Any comment:	-

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

The baseline methodology considers the determination of the emissions factor to the grid which the project activity is connected as the core data to be determined in the baseline scenario. In Brazil, the grid is interconnected by the National Interconnected System (SIN) in a single system[8]

"Operating Margin *OM* Emission Factor" calculation ($EF_{grid,OM-DD,y}$)

The Dispatch Data emission factor (OM), is summarized as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

For effect of *ex-ante* operation margin emission factor calculation will be used, like a good estimation to $EF_{grid,OM-DD,y}$ value, the arithmetic average of the 12 last monthly emission factors published by the DNA (ultimate datas available). http://www.mct.gov.br/index.php/content/view/74689.html

[8] http://www.mct.gov.br/upd_blob/0024/24834.pdf

Operating Margin												
Average Emission Factor (tCO_2/MWh) - **Monthly**												
2008	Month											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5727	0.6253	0.5794	0.4529	0.4579	0.5180	0.4369	0.4258	0.4102	0.4369	0.3343	0.4686

So the Operating Margin Emission Factor is:

$EF_{grid,OM\text{-}DD,y} = 0.4766$

"Build Margin Emission Factor BM" calculation ($EF_{grid,BM,y}$)

According to the used methodology, the build margin emission factor (BM) also needs to be calculated:

$$EF_{grid,BM,y} = \frac{\sum_{i,m} EG_{m,y} . EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

For the build margin emission factor $EF_{grid,BM,y}$ will be adopted the 2008 year value published by the DNA (ultimate data available). http://www.mct.gov.br/index.php/content/view/307492.html

Build Margin
Average Emission Factor (tCO_2/MWh) - **ANNUAL**
2008
0.1458

So, the Build margin is:

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

"Baseline Emission Factor" calculation ($EF_{grid,CM,y}$)

Finally the baseline emission factor (EFy) is calculated through a weighted-average formula, considering both the EF_{OMy} and the EF_{BMy} weighted 50% each, by definition, that gives:

$$EF_{grid,CM,y} = 0.4766 * 0.5 + 0.1458 * 0.5 = 0.3111 \quad (tCO_2/MWh)$$

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 ($EF_{grid,CM,y}$) with the electricity generation of the project activity.

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

$$BE_y = 0.3111 * 88,564 = 27,552 \ (tCO_2)$$

The $EG_{PJ,y}$ used in the calculation above is based on the net annual electricity estimated to be delivered to the grid, which takes into account the plant load factor provided by the Brazilian Electricity Regulatory Agency and Mines and Energy Ministry from the Brazilian government - in this way a source provided by a third part[9].

The emission reductions (**ER**) of this project activity are calculated as following:

$$ER_y = BE_y - PE_y$$

Where:
ER_y = Emission reduction in year y (tCO_{2e}/year);
BE_y = Baseline emissions in year y (tCO_2/year);
PE_y = Project emission in year y (tCO_2e/year)

The present project activity is a new project to be implemented, therefore, there is no energy generating equipment transferred from another activity.

The power density is greater than 10 W/m2, so the value for the emission of the reservoir is zero. Thus, the emission reductions are calculated as following:

$$ER = 27,552 - 0 = 27,552 \ (tCO_{2e})$$

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

Table 12: Ex-ante estimative on emission reduction

Years	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)
2011 (January)	0	27,552	0	27,552
2012	0	27,552	0	27,552
2013	0	27,552	0	27,552
2014	0	27,552	0	27,552
2015	0	27,552	0	27,552
2016		27,552		27,552
2017 (December)	0	27,552	0	27,552

[9] http://www.aneel.gov.br/cedoc/prt2008010spde.pdf

Total (tonnes of CO_2e)	0	192,864	0	192,864

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/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Project site - Energy Meters
Value of data:	88,564
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the electricity meters. The meter must comply with national standards and industry regulation to ensure the accuracy. The meter will be sealed for safety after calibration.
Monitoring frequency:	Hourly measurement and monthly recording.
QA/QC procedures to be applied:	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the invoice of energy sales or with the CCEE databank in order to verify the coherency of the data.
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Brazilian grid emission factor.
Source of data:	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". Based on data provided by DNA (Designated National Authority).
Value of data:	0.3111
Measurement procedures (if any):	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} default 0.5. As per the "Tool to calculate the emission factor for an electricity system".
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	This data will be applied in the project emission reductions calculation.
Any comment:	-

Data / Parameter:	$EF_{grid,OM-DD,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Operating Margin emission factor of the grid, in a year *y*
Source of data:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data:	0.4766
Measurement procedures (if any):	The Operating Margin Emission Factor will be collected in the DNA website, which is responsible for this calculation.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data, updated, will be applied in *ex-post* calculation of the Emission Factor.
Any comment:	-

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data:	0.1458
Measurement procedures (if any):	The Build Margin Emission Factor will be collected in the DNA website, which is responsible for this calculation.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data, updated, will be applied in *ex-post* for the calculation of the Emission Factor.
Any comment:	-

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:	Project site.
Value of data:	19,000,000
Measurement procedures:	Technical specifications on the installed equipments.
Monitoring frequency:	Yearly monitoring frequency.
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must also be authorized and made available to the public. Thus, annually, any new authorization to increase the installed capacity of plan will be monitored.

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the water surface, after the

	implementation of the project activity, when the reservoir is full.
Source of data:	Reservoir in the Project site.
Value of data:	1,270,000
Measurement procedures:	Measured from topographical surveys, maps, satellite pictures, etc. The reservoir area can be determined depending on the reservoir level. Hydroelectric plants dispatched by ONS have to monitor their reservoir level. The data used for this purpose can be used to determine the reservoir area and will be also an measurement procedure to be considered by the project proponents.
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	Data will be monitored and recorded by project developer. This data will be applied for the Power Density calculation
Any comment:	

B.7.2. Description of the monitoring plan:

The monitoring plan for the project activity is based on the methodology ACM0002 and consist of the monitoring of the electricity generation from the proposed project activity, the surface area of reservoir at the full reservoir level, the installed capacity of the plant after project implementation and emission factors.

1) Power generation and measurement system - $EG_{facility,y}$:

General characteristics of the measurement system:

The procedures designed for monitoring electricity generation by the project activity follows the parameters and regulations of the Brazilian energy sector. The National Grid Operator (ONS) and the Electric Power Commercialization Chamber (CCEE) are the organs responsible for specification of the technical requirements of energy measurement system for billing, i.e, those bodies monitor and approve projects for accurate accounting of energy.

The Monitoring and Measurement System, called SMF, consists of a meter panel and a satellite-link to communicate and send the data to CCEE. Both SMF and link are commissioned by the local energy franchise (local energy distributor – CEMIG) and meet the technical requirements of ONS and ANEEL. SMF energy measurement panel consists of a principal meter and a back-up meter (reserve meter), simultaneously connected to the panel. If there is problem with the principal meter, the back-up meter automatically continues the measurement of energy, without any discontinuity. The SMF project should also include the location of measurement points, panels of measurement, meters and systems for local and remote measurement.

The measurement system makes the measure and records the energy. This is installed in the panels of measurement, which are located in the control room or cabins of measurement. For this system is guaranteed the inviolability of data, which must be sealed for safety after calibration or sealed with electronic passwords.

Besides electricity measurements are performed by the project owners, all the energy generated by the Malagone SHP, will be monitored online by CCEE. CCEE is responsible for the monthly readings and keeping the records of the energy generated. If any problem happens at the local meter level, the reading lecture corresponding to the amount of energy during the time of the problem will not be lost because of the online reading performed by CCEE.

The measurement system also contains a communication system that has the function of sending data of the electricity dispatched to the grid, for the CCEE.

Data monitoring:

The readings of meters are used to calculate emission reductions. The monitoring steps are as follows:

(1) The data will be measured hourly and recorded monthly;
(2) Spreadsheets containing the eletricity dispatched to the grid will be generated; CCEE data measured (from CCEE databank – SINERCON - third part) and/or sales receipts will be used to cross check the monitored data;
(3) The project owner will provide the measurement data to DOE, access to the CCEE data measured and if necessary the sales invoices;
(4) The emission reductions and any project emissions (if applicable) should be managed by the project manager responsible at Carbotrader;

Details regarding the parameter to be monitored can be founded in the sections B.7.1, B.7.2 and Annex 4.

Quality control:

(1) Calibration of meters
The calibration of meters shall be conducted by a qualified organization that must comply with national standards and industrial regulations to ensure the accuracy. After calibration, the meters must be sealed for safety and the calibration certificates must be archived with other monitoring records. The class of accuracy of the equipment that will be used in the project activity is under the national standards (NBR 14519 from Associação Brasileira de Normas Técnicas – Brazilian Association of Technical Standards). It can be viewed in the "*Grid Procedures*" from the National Grid Operator: Module 12, Sub-module12.2[10]

Deadline for meters' calibration follows the "*Grid Procedures*" from the National Grid Operator: Module 12, Sub-module12.3[11].

In the case of changes in calibration procedures, the project owners shall always follow the rules of the relevant bodies (e.g. ONS and CCEE).

Hidrelétrica Malagone S.A will be responsible for the meters calibration.

[10] http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.2_Rev_1.0.pdf

[11] http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.3_Rev_1.0.pdf

(2) Emergency treatment

In case of unavailability of measures from any point of measurement, due to maintenance, commissioning or for any other reason, will be used the methodology to estimate data as the item 14.3 of the Procedure of Energy Commercialization PdC ME.01[12]

Data Management:

All the project activity issues regarding the SHP's construction will be treated by the responsible Managers / Directors from Hidrelétrica Malagone.

The monitoring data will be stored during the project's duration. In this case this means 7 years (one period duration) plus 2 years after it ends according to the methodology. If the project is renewed for another two periods, the data will be stored for 21 years plus 2 years, making up a total of 23 monitoring years.

All data gathered in the monitoring range will be electronically filed and kept for at least 2 years after the last crediting period. The crediting to be generated will be calculated regularly by the project proponents and kept for the verification phase.

Training Procedures:

All the training necessary for the plant operational team will be provided (eventually remote or local operators) or will required from the third party service provider during the plant construction and during the plant commercial operation.

The emergency procedures related to the project activity operation (for instance: workers' safety and health, dam safety related emergency drills/exercises, etc, according to the Brazilian legislation), should be included in the training courses that the project proponent or the third party company is supposed to offer (if applicable for this type of project activity).

Furthermore, operation, maintenance and calibration procedures will follow the national guidelines set by the National Grid Operator.

2) Emission Factors - $EF_{grid,CM,y}$, $EF_{grid,OM\text{-}DD,y}$ and $EF_{grid,BM,y}$:

The Emission Factor related to this project activity ($EF_{grid,CM,y}$, $EF_{grid,OM\text{-}DD,y}$ and $EF_{grid,BM,y}$) as mentioned previously, are available by the brazilian DNA and it can be viewed at its website (www.mct.gov.br/clima). Thus, the monitoring of this data will be ex-post through periodic access to data provided by DNA.

3) Installed capacity of the hydro power plant – Cap_{PJ}:

[12] ttp://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=67778d3ef9a3c010VgnVCM1000005e01010aRCRD

The installed capacity of the hydro power plant after the implementation of the project activity will be monitored yearly through one of the following options:

- Technical specifications on the installed equipments;
- Installed plaques in the equipments;
- Factsheets.

In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must also be authorized and made available to the public. Thus, annually, any new authorization to increase the installed capacity of plan will be monitored. It will be used to installed capacity, which is also a recognized standard to assure the designed project and technical characteristics.

4) Area of the reservoir – A_{PJ}:

The area of the reservoir will be measured yearly in the surface of the water, after the implementation of the project activity, when the reservoir is full.

Measured from topographical surveys, maps, satellite pictures, etc. Also, the reservoir area can be determined depending on the reservoir level, because hydroelectric plants dispatched by ONS have to monitor their reservoir level. The data used for this purpose can be used to determine the reservoir area and will be also an measurement procedure to be considered to the project activity.

Authority and Responsibility

The Hidrelétrica Malagone S.A is responsible for the maintenance and calibration of the monitoring equipments, compliance to operational requirements and corrective actions related to the functionality of the project activity. Moreover, the company has authority and responsibility for registration, monitoring, and measurement as well as managing the project, to organize staff training to use appropriated techniques in those procedures.

The Baseline, Project Emissions (if applicable) and Emissions Reductions calculations will be performed by Carbotrader Assessoria e Consultoria em Energia Ltda which should report the results in a proper way to the entities related with the CDM process.

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

Date of completing the final draft of this baseline section: 10/05/2010.

The entity responsible for its development is:

Company:	Carbotrader Assessoria e Consultoria em Energia Ltda.
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City :	Jundiaí

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E-mail:	carbotrader@carbotrader.com
URL:	www.carbotrader.com
Represented by:	Mr
First Name:	Arthur
Last Name:	Moraes
Job title:	Director

Carbotrader is also a Project Participant listed in Annex 1.

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:

27/02/2008

Earliest date at which the implementation of the project activity begins, which the project developer has committed to major expenditures related to the project activity implementation. This date refers to the contract that has been signed for equipments supply for the project, where: turbines, generator and other required services are necessary for the project implementation.

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

30 years.

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

C.2.1. Renewable crediting period:

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

01/01/2011 or the date in which occurs the UNFCCC registration, the one that occurs later.

C.2.1.2. Length of the first crediting period:

7 years.

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:

Regarding the regulatory permits, the Malagone Small Hydro Power plant has the following authorizations issued by the ANEEL (Brazilian Electricity Regulatory Agency):

- Authorizative Resolution number 1,111, issued on 13th November 2007, applying the authorization for the project owner.
- Authorizative Resolution number 1,809, issued on 10th February 2009, tranaference for the Special Purpose Entity - Hidrelétrica Malagone S.A.
- Portaria number 10, issued on 26th February 2008, establishing the assured energy.

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 analysed, or, depending on the case, the Preliminary Environmental Report or Environmental Control Report (RCA).
- **Installation License (LI):** authorizes implementation of enterprise. In this phase, the Environmental Control Plan (PCA) is analysed, 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.

For the instance, the Malagone SHP has the following environmental licences:

- LI – Installation Licence number 005/2008 – issued by COPAM in 15/02/2008.

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 Small Hydro Power plants (SHPs) are considered an alternative for the brazilian electric matrix diversification, which use to present low negative impacts to the place of installation.

The SHP is a source of renewable energy of low impact, also considered a clean source of energy, where the the fact of the project design with a small reservoir generates low environmental impacts when compared to the business as usual in Brazil – large Hydro Power Plants.

The environmental impacts caused by the SHP are not considered significt by the project proponent. Otherwise, several environmental and social action plans for quality improvement and impacts reduction are under implementation and/or were implemented.

Studies related to the impacts were carried out and are comprised in the Relatório de Impacto no Meio Ambiente – RIMA, from the portuguese. This study compreehend the environmental assessment of the influenced area, moreover, it has contained an group of activities and programs which has as main goal to minimize the negative effects, follow the results of the installation in the water resources.

Looking forward the reduction, mitigation or the compensation of the negative effects, the Malagone SHP has set up the following actions (implemented or in order to be implemented):

- Social Communication Project;
- Environmental Education Project;
- Seminars on environmental education in schools, in the construction site, among others;
- Socioeconomic Monitoring Project;
- Monitoring Plan for Fauna (birds, reptiles, Mastofauna);
- Saving Fish – in deviation of the River at the construction time;
- Monitoring Plan for species of fishes;
- Limnological monitoring and Water Quality monitoring;
- Rescue fauna during clearing of the area;
- Rescue flora during deforestation;
- Revegetation around the reservoir;
- Project Collection of Flora and Germplasm.

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 11th September 2003 and Ruling nº7, 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 project activity applies to only one state of the federation, thus, the invitations of comments should be addressed to the following actors involved and affected by the project activities:

- City Hall and City Councils;
- State environmental body and Municipal environmental body;
- Brazilian Forum of NGOs and Environmental and Development Social Movements - http://www.fboms.org.br;
- Community associations;
- State Prosecutors Office;
- National 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:

- Uberlândia city hall;
- Uberlândia city council;
- Minas Gerais environmental agency - COPAM;
- Uberlândia Environmental Secretary;
- Brazilian Fórum of NGOs (from the portguese: *Fórum Brasileiro de ONGs e Movimentos Sociais FBOMS)*;
- Minas Gerais State Prosecutors Office - Ministério Público Estadual de Minas Gerais;
- National Prosecutors Office in Minas Gerais - Procuradoria da República no Estado de Minas Gerais;
- Communitary association from Uberlândia. Instituição Cristã de Assistência Social de Uberlândia - ICASU.
- Communitary association from Martinésia - Uberlândia.

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.

In the letter forwarded to the stakeholders, they were informed that the Project Design Document, and Annex III to Resolution No. 1 of the Inter-Ministry Commission on the Global Climate Change (CIMGC) are available for viewing on the site of Carbotrader, the participating company in the project activity: www.carbotrader.com in the following links: http://www.carbotrader.com/jun1122a3.pdf and http://www.carbotrader.com/jun1122dcp.pdf. These documents are available for consultation on the website and updated according to the latest or current version.

E.2. Summary of the comments received:

Until now, no comments were received from interested parties – stakeholders.

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

Not applicable due to the item E.2.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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First name:	Arthur
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no Kyoto Protocol Annex 1 country public fund financing this project activity.

Annex 3

BASELINE INFORMATION

The CO_2 emission factors resulting from the generation of electricity verified in Brazil's National Interconnected System (SIN) are calculated from the plants power generation records issued centrally by the National Grid Operator, especially in thermoelectric plants. This information is necessary to renewable energy projects connected to the national grid and implemented in Brazil under the Kyoto Protocol's Clean Development Mechanism (CDM).

The baseline emissions are calculated according to the "Tool to calculate the emission factor for an electricity system". With this methodology the National Grid Operator (ONS) is tasked with explaining the SIN´s (National Interconnected System) operational practices regulated by the ANEEL (Brazilian Electricity Regulatory Agency) to the work group made up by the Ministry of Science and Technology (MCT) and Ministry of Mines and Energy (MME). According to this system, the CO2 Emission Factors applicable to the project activity, will be calculated by the National Grid Operator (ONS) for the single system since May 27, 2008.

More details about baseline development of this project can be found through this links:
http://www.mct.gov.br/index.php/content/view/73318.html and
http://www.mct.gov.br/index.php/content/view/13986.html.

Annex 4

MONITORING INFORMATION

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Propotion of data to be monitored	How will the data be archived? (eletronic/paper)	Comments
$EG_{facility,y}$	Project Activity	MWh	m	montlhy	100%	electronic	The electricity delivered to the grid will be checked through the energy metering, data acquisition software and cross checked through CCEE databank.
$EF_{grid,CM,y}$	DNA	tCO_2/MWh	c	annually	100%	electronic	These data will be monitored through *ex-post* calculation. The data's will be available by the DNA (Designated National Authority) website.
$EF_{grid,OM-DD,y}$	DNA	tCO_2/MWh	m	Annually or montly	100%	electronic	The Operating Margin Emission Factor, will be monitored in the DNA website, which is responsible for this calculation.
$EF_{grid,BM,y}$	DNA	tCO_2/MWh	m	Annually	100%	electronic	The Build Margin Emission Factor, will be annually monitored in the DNA website, which is responsible for this calculation.
Cap_{PJ}	Project Activity	W		Annually	100%	electronic	The installed capacity will be checked through recognized standards as technical specifications on the installed equipments, installed plaques in the equipments, factsheets and can be assured by authorizations issued by the Brazilian Electricity Regulatory Agency.
A_{PJ}	Project Activity	m^2	m or c	Annually	100%	electronic	The reservoir area will be monitored through recognized standards as topographical surveys, maps, satellite pictures and can be determined through the reservoir level.

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