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

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Ouro Small Hydropower Plant – Brennand CDM Project Activity.

PDD version number: 06.

Date (DD/MM/YYYY): 22/12/2010.

A.2. Description of the project activity:

The primary objective of Ouro Small Hydropower Plant Project Activity (Ouro SHPP Project) is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to environmental, social and economic sustainability by increasing renewable electricity consumption share in Brazil (and the region of Latin America and the Caribbean).

The Latin America and the Caribbean region countries have expressed their commitment towards achieving a target of 10% renewable energy of the total energy use in the region. Through an initiative from the Ministers of the Environment in 2002[1], a preliminary meeting of the World Summit for Sustainable Development (WSSD) was held in Johannesburg in 2002. In the WSSD final Plan of Implementation no specific targets or timeframes were stated, however, their importance was recognized for achieving sustainability in accordance with the Millennium Development Goals[2].

The privatization process initiated in 1995 commenced with an expectation of adequate tariffs (fewer subsidies) and better prices for generators. It drew the attention of investors to possible alternatives not available in the centrally planned electricity market. Unfortunately, the Brazilian energy market lacked a consistent expansion plan with political and regulatory uncertainties as major problems. In the late 1990's, a strong increase in demand contrasted with a less-than-average increase in installed capacity caused the outbreak of supply crisis/rationing from 2001/2002. One of the solutions the government provided was flexible legislation favoring smaller independent energy producers. Furthermore, the possible eligibility under the Clean Development Mechanism of the Kyoto Protocol drew the attention of investors to small hydropower projects.

This indigenous and cleaner source of electricity will also have an important contribution to environmental sustainability by reducing carbon dioxide emissions that would otherwise have occurred in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding

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[1] UNEP-LAC (2002). Final Report of the 7th Meeting of the Inter-Sessional Committee of the Forum of Ministers of Environment of Latin America and the Caribbean. United Nations Environment Programme, Regional Office for Latin America and the Caribbean. 15 to 17 May, 2002, São Paulo (Brazil).

[2] WSSD Plan of Implementation, Paragraph 19 (e): "*Diversify energy supply by developing advanced, cleaner, more efficient, affordable and cost-effective energy technologies, including fossil fuel technologies and renewable energy technologies, hydro included, and their transfer to developing countries on concessional terms as mutually agreed. With a sense of urgency, substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply, recognizing the role of national and voluntary regional targets as well as initiatives, where they exist, and ensuring that energy policies are supportive to developing countries' efforts to eradicate poverty, and regularly evaluate available data to review progress to this end.*"

electricity generation from fossil fuel sources (and CO_2 emissions), which would be generated (and emitted) in the absence of the project.

The project consists of the construction of a small hydroelectric power plant ("PCH", from the Portuguese *Pequena Central Hidrelétrica*) with 16 MW[3] of installed capacity and a reservoir area of 0.09 km^2[4]. The plant is located in Barracão municipality, Rio Grande do Sul State, Southern region of Brazil. Commercial operations started in July 2009[5]. Ouro Energética S.A., the company that controls the Ouro Small Hydropower Plant, is owned by BK Energia Participações Ltda., which is owned by Brennand Group.

Brennand Group started its activities related to energy generation projects with the construction of three small hydropower plants: Antônio Brennand, Indiavaí and Ombreiras, which all together are already registered under CDM Project Activity (ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, CDM 0530[6]).

Prior to the implementation of the project activity no SHPP or other project activity was operational in the location where SHPP Ouro is being built. As per ACM0002, the project activity consists on the installation of a new grid-connected renewable power plant and, then, the baseline scenario is the "*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 generation sources, as reflected in the combined margin (CM) calculations described in the 'Tool to calculate the emission factor for an electricity system*'". In conclusion, the baseline scenario and the scenario prior to the implementation of the project activity are the same.

Ouro SHPP Project can be seen as a solution by the private sector to the Brazilian electricity crisis of 2001, contributing to sustainable development of the country and having a positive effect for the country beyond the evident reductions in GHG.

The CDM revenues will also help the Project Activity to support the community providing social and environmental benefits. Income distribution will be derived from this project due to job creation, employees' salaries and package of benefits such as social security and life insurance, and credits of emission reductions. Additionally, lower expenditure is achieved due to the fact that money will no longer to be spent in the same amount of electricity supplied by other plants from other regions in the country. Through the Project Activity implementation, the revenues will stay in the region and be used for providing the population better services and improve the availability of basic needs.

Although Ouro project does not have a relevant positive impact in the host country given its electric system size, it is undoubtedly part of a greater idea. The project contributes to sustainable development since it meets the needs of the present without compromising the ability of future

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[3] Operation License nr. 1109/2009-DL, issued by the Environmental Agency of Rio Grande do Sul State on March 13th, 2009.

[4] See Construction License nr. 39/2007-DL, issued on January 16th, 2007, which establishes the water level of 590m for Ouro project. In addition, see the project design "Project Básico" dated July 2008, which establishes the reservoir area of 0.09km^2 based on the 590m water level.

[5] ANEEL Ordinance nr. 2,455 issued on July 7th, 2009. Information available at ANEEL's website: <http://www.aneel.gov.br/>.

[6] Source: United Nations Framework Convention on Climate Change (UNFCCC) website. Available at: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1152891235.76/view.

generations to meet their own needs, as defined by the Brundtland Commission (1987). In other words, small hydroelectric power plants implementation ensures renewable energy generation, avoids negative social and environmental impact caused by the construction of large hydros with large reservoirs and fossil fuel thermo power plants, and drives regional economy, increasing quality of life in local communities.

Therefore, it is evident that the project has reduced negative environmental impacts and developed regional economy, resulting, consequently, in better quality of life. In other words, environmental sustainability combined with social and economic justice, undeniably contributing for the host country's sustainable development.

A.3. Project participants:

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

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved whishes to be considered as project participant (Yes/No)
Brazil (host)	Ouro Energética S.A. (private entity)	No
	Ecopart Assessoria em Negócios Empresariais 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.		

Detailed contact information on party(ies) and private/public entities involved in the project activity listed in Annex 1.

A.4. Technical description of the project activity:

By legal definition established by the Brazilian Power Regulatory Agency - ANEEL – through the Resolution nr. 652/2003[7], a small hydro consists of a utility with an installed capacity between 1 MW, and 30 MW, and have a reservoir area smaller than 3 km².

Ouro Small Hydropower Plant Project Activity is under construction in Marmeleiro River (annual average flow rate of 11.40 m^3/s[8]), Uruguay River Basin, located in the municipality of Barracão, State of Rio Grande do Sul. It has an installed capacity of 16 MW and a reservoir area 0.09 km^2 (power density of

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[7] ANEEL – *Agência Nacional de Energia Elétrica*. Resolução Nr. 652, de 9 de Dezembro de 2003. Available at < http://www.aneel.gov.br/cedoc/res2003652.pdf> .

[8] Source: Project design report (from the Portuguese *Projeto Básico Consolidado*) of Ouro small hydropower plant prepared by Intertechne dated July 2008. Revision 3.

177.77 W/m^2)[4], which stores water in order to generate electricity for short periods of time. Hence, it complies with ANEEL's definition. Moreover, it is also classified as a new hydro electric project, according to ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Additionally, because of its small reservoir the plant is considered a run-of-river project which are those that do not include significant water storage, and must therefore make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually located on swift flowing streams (Figure 1).

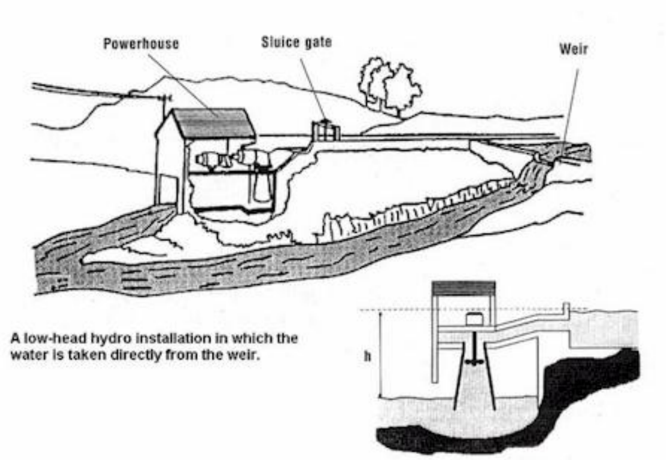

Figure 1 - Schematic view of run-of-river power plant

According to the definition of the World Commission of Dams[9], run-of-river projects are defined as "*dams that create a hydraulic head in the river to divert some portion of the river flows. They have no storage reservoir or limited daily poundage. Within these general classifications there is considerable diversity in scale, design, operation and potential for adverse impacts."*

Considering the small reservoir of Ibirama (0.09 km^2), resulting in a power density of 177.77 W/m^2, the project can be considered as a run-of-river project.

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil.

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

Rio Grande do Sul.

A.4.1.3. City/Town/Community etc:

Barracão.

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

Ouro Small Hydroelectric Power Plant project activity is located at Barracão municipality, Rio Grande do Sul State, Southern region of Brazil (**Erro! Fonte de referência não encontrada.**).

The SHPP explores the hydrological potential of Marmeleiro River. Project's geographical coordinates and the places they were taken from are described below according to ANEEL technical summary[10]:

- Dam: 27° 38' 12'' South Latitude and 51° 29' 23'' West Longitude;
- Power house: 27º 37' 41'' South Latitude and 51º 29' 8" West Longitude.

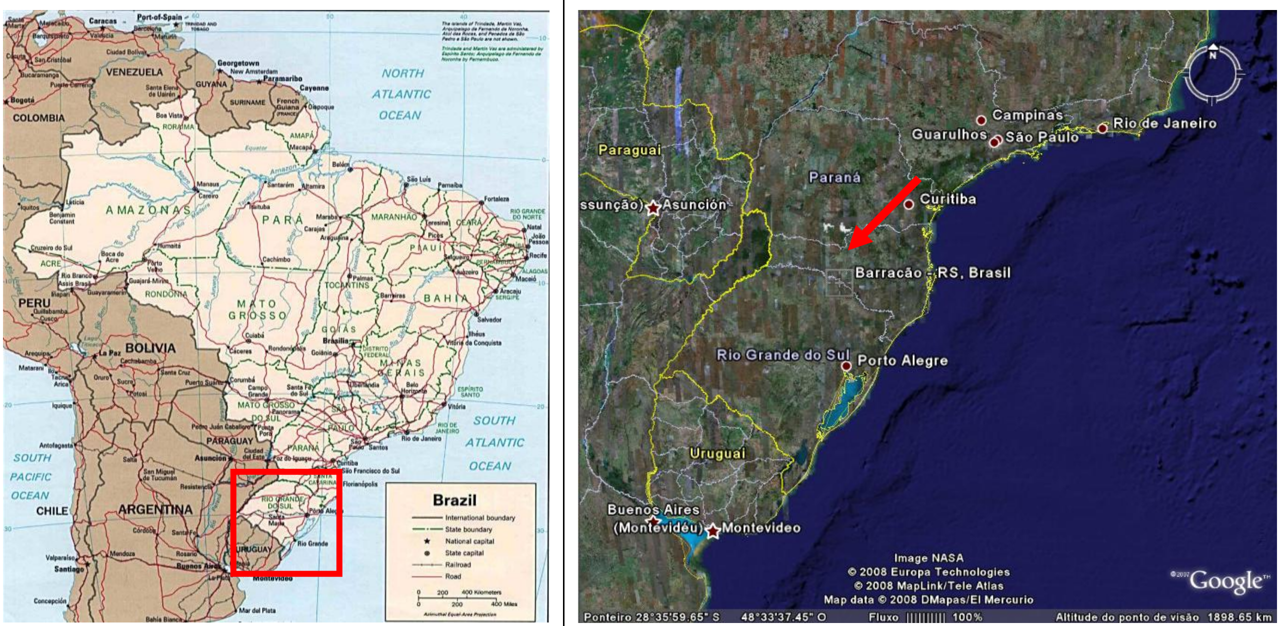

Figure 2 - Geographical location of Rio Grande do Sul state and Barracão municipality

Source: City Brazil, 2008[11]; Google Earth, 2008

[9] World Commission on Dams – WCD (2000). Dams and development: a new framework for decision making. Earthscan Publications. London, U.K.

[10] Annex 2 of the final report (from the Portuguese *Projeto Básico Consolidado*) of Ouro small hydropower plant prepared by Intertechne dated July 2008. Revision 3.

The city of Barracão has 5,306 inhabitants and an area of 516 km^2[12]. Rio Grande do Sul has approximately 90% of the Brazilian mineral coal reserves with a total of 28,802 millions of tonnes[13].

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

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

Category: Renewable electricity generation for a grid.

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

The Francis turbines, used in Ouro Small Hydropower Plants Project Activity, are the most widely used among water turbines (**Erro! Fonte de referência não encontrada.**).

The Francis turbine is a type of hydraulic reaction turbine in which the flow exits the turbine blades in the radial direction. They are common in power generation and are used in applications where high flow rates are available at medium hydraulic head. Water enters the turbine through a spiral tank and is directed onto the blades. The low momentum water then exits the turbine through a ducting known as suction tube. In the model, water flow is supplied by a variable speed centrifugal pump. A load is applied to the turbine by means of a magnetic brake, and torque is measured by observing the deflection of calibrated springs. The performance is calculated by comparing the output energy to the energy supplied.

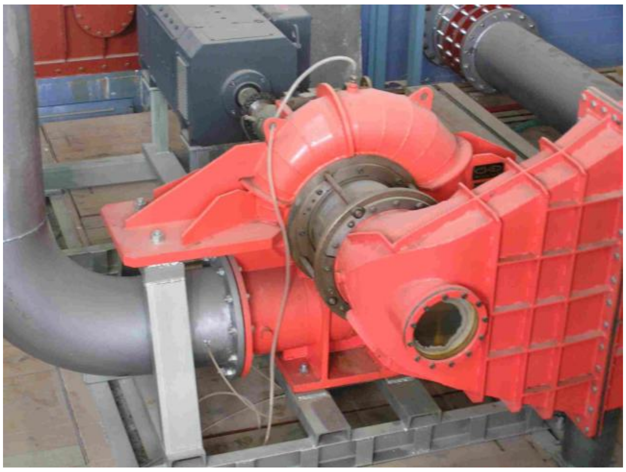

Figure 3 - Example of a Francis Turbine

Source: NTUA, 2009[14]

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[11]Available at: <www.citybrazil.com.br>. Accessed on April 22nd, 2008.

[12] IBGE (2008). Banco de dados Cidades. Instituto Brasileiro de Geografia e Estatística. Available at: http://www.ibge.gov.br/home/.

[13] Associação Brasileira do Carvão Mineral (ABCM). Available at: http://www.carvaomineral.com.br/carvaomineral/historia.asp. Accessed on March 07th, 2008.

As mentioned earlier on section A.2., in the absence of the project activity all the energy would be generated by the operation of grid-connected power plants and by the addition of new generation sources. Hence, the baseline scenario is identified as the scenario existing prior to the implementation of the project activity.

The equipment and technology used in Ouro Small Hydropower Plants CDM Project Activity has been successfully applied to similar projects in Brazil and around the world. Technical description of the facility follows according to equipment's TAG:

Table 2 - Technical configuration of Ouro SHPP[15]

Description		Ouro SHPP
Turbines	Type	Francis
	Quantity	3
	Nominal power (kW)	5,919
	Turbine speed (rpm)	900
	Nominal turbine flow rate (m^3/s)	6.252
	Lifetime (year)	30
	Manufacturer	HISA – Hidráulica Industrial S.A.
	Year of manufacture	2007
Generators	Type	Synchronous
	Quantity	3
	Frenquency (Hz)	60
	Rotation (rpm)	900
	Nominal power (kVA)	6,060
	Lifetime	30
	Year of manufacture	2008
	Manufacturer	Weg Equipamentos Elétricos S.A.
Transformer	Quantity	1
	Frequency (Hz)	60
	Nominal power (kVA)	15000/20000
	Nominal tension (kV)	6.9/138
	Lifetime (year)	25
	Year of manufacture	2007

[14] NTUA (2009). Department of mechanical engineering. Fluids section. National Technical University of Athens. Available at: <http://www.fluid.mech.ntua.gr/lht/PB0303011.JPG>. Accessed on April 30th, 2009.

[15] Although the nominal power of turbines and generators is higher than the ones described in the PDD the SHPP is authorized only to operate with an installed capacity of 16 MW due to the river flow. Besides, the company won't generate more energy than the established by ANEEL since it can only commercialize the total energy assured, which is also authorized by the same agency.

	Manufacturer	Weg Equipamentos Elétricos S.A.
Diesel generator	Model	6.10T
	Power (CV)	180
	Rotation (rpm)	1,800
	Manufacturer	MWM

The transmission line of Ouro SHPP has an extension of approximately 14 km (according to ANEEL resolution nr. 537) and crosses the municipalities of Barracão and Capinzal, Rio Grande do Sul and Santa Catarina States respectively. The SHPP is connected to the National Grid at Campos Novos substation, in Santa Catarina State, which is owned by Eletrosul - Centrais Elétricas S.A.

It is important to highlight that all the equipments used at the Ouro SHPP were produced in Brazil. This contributes to the development of the electricity sector resulting in more research and capacity of the industrial sector.

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

The emission factor estimated from the data published by the Brazilian DNA and used to estimate the Emission Reductions by the plant is equal to 0.1842 tCO_2e/MWh. Please refer to Annex 3 for details on the calculation of the emission factor used in the ex-ante estimative. The results are presented in the table below.

Table 3 – Estimated emission reductions of the project

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
Year 1 - (2012)	13,875
Year 2 - (2013)	13,875
Year 3 - (2014)	13,875
Year 4 - (2015)	13,875
Year 5 - (2016)	13,875
Year 6 - (2017)	13,875
Year 7 - (2018)	13,875
Total estimated reductions (tonnes of CO_2e)	97,128
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	13,875

A.4.5. Public funding of the project activity:

There is no recourse to any public funding by the PPs in the proposed project activity. The project proponents hereby confirm that there is no divergence of Official Development Assistance (ODA) to the proposed 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 project activity:

ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 12.1).

ACM0002 also refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system (version 2);
- Tool for the demonstration and assessment of additionality (version 5.2);
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2);
- Combined tool to identify the baseline scenario and demonstrate additionality (version 2.2).

The *tool to identify the baseline scenario and demonstrate additionality* and the *combined tool to calculate project or leakage* CO_2 *emissions from fossil fuel combustion* are not applicable to the project activity, and therefore are not used.

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

The methodology ACM0002 is applicable to projects consisting of "*the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit*".

Moreover, the power density of hydropower plants with new reservoirs shall be greater than 4 W/m^2. Also the geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

Ouro Small Hydropower Plant Project meets all the criteria established by the ACM0002 methodology, consisting of a new small hydro project interconnected to the Brazilian electricity grid with a run-of-river reservoir and with power density 177.77 W/m^2 - greater than 4 W/m^2 (for details please refer to section B.6.3). Brazilian Interconnected Grid is clearly identified and information about this system is publicly available at the Brazilian DNA website.

It is important to mention that the project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activity and does not consist of a biomass fired power plant.

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

As described in ACM0002, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system which the CDM project power plant is connected to. On May 26th, 2008, the Brazilian Designated Authority published Resolution nr. 8, which defines the Brazilian Interconnected Grid as a single system[16].

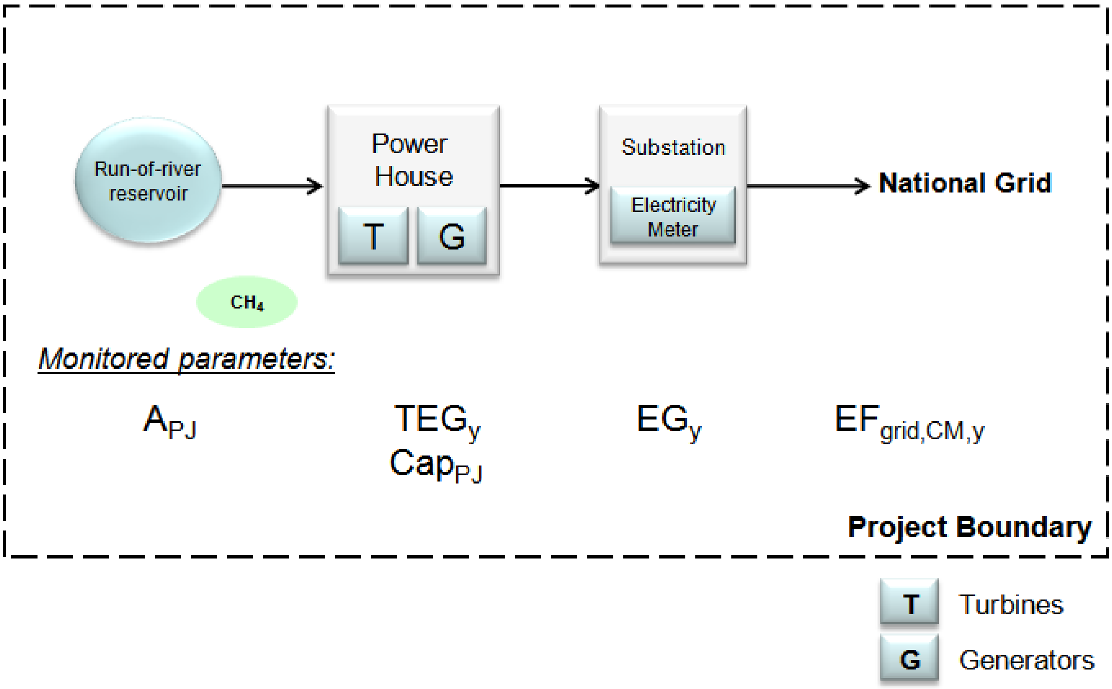

Figure 4 - Project Boundary of the project activity.

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

Table 4 – GHG and emissions sources included in or excluded in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small

[16] CIMGC's Resolution nr. 8 from May 26th, 2008. Available at: <http://www.mct.gov.br/upd_blob/0024/24719.pdf>.

Project Activity	Emissions of CH_4 from the reservoir.	CO_2	No	Excluded for simplification. This emission source is assumed to be very small
		CH_4	No	Considering that the power density of Ouro is 177.77 W/m^2, there are no project emissions from reservoir according to ACM0002.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small

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

The project activity is the installation of a new grid-connected renewable power plant. Hence, accordingly to ACM0002 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 generation sources, as reflected in the combined margin (CM) calculations as described in the "Tool to calculate the emission factor for an electricity system".

In the absence of the project activity, all the energy would be imported from the interconnected grid. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation by fossil fuel sources (and CO_2 emissions), which would be generated (and emitting) in the absence of the project. According to ANEEL (2011)[17], 67.9% of the Brazil's installed capacity is composed by hydro and 26.3 % by thermal power stations.

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):

(i) Starting date

The CDM glossary of terms defines the starting date of a non A/R project activity as "*the earliest date at which either the implementation or construction or real action of a project activity begins*".

From the above definition, the following dates were analyzed:

Table 5 – Dates related to the starting date of Ouro project

Date	Actions
10/04/2006	Rija Investimentos Energéticos Ltda. minutes of meeting for the acquisition of Ouro small hydropower plant considering

[17] ANEEL (2011). Banco de Informações de Geração. Data updated on January 24th, 2011. Agência Nacional de Energia Elétrica. Available at: < http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp>.

	CDM revenues
01/08/2006	ANEEL transferred the authorization to explore the hydro potential of Ouro SHPP from Guascor Geratec Ltda. to Ouro Energética S.A.
16/01/2007	Construction permit (installation license)[18]
24/07/2007	ANEEL authorized the incorporation of Rija Investimentos Energéticos Ltda. (company from Brennand Group) by Ouro Energética S.A.[19]
28/02/2007	Turbines and generators purchase[20]
05/07/2007	Engineering, Procurement and Construction contract (EPC) signature[21]
01/08/2007	Start of construction[22]
17/10/2007	Project sponsor request for the increase of Ouro installed capacity[23]
01/12/2007	PPA signature[24]
20/03/2008	ANEEL's letter confirming that documents submitted in October 2007 by project sponsor was received[25]
25/08/2008	Financial closure[26]
22/09/2008	ANEEL's approval for the increase of the installed capacity of Ouro[27]
23/05/2009	Commissioning start[28]
08/07/2009	Commercial operation start[29]

[18] Construction License nr. 39/2007-DL issued on January 16th, 2007

[19] ANEEL Resolution nr. 988, dated July 24th, 2007. Available at: <http://aneel.gov.br/>.

[20] Contract signed between Ouro Energética S/A and Hidráulica Industrial S/A Indústria e Comércio – HISA on February 28th, 2007.

[21] EPC is a type of contract in which all contracts related to the construction of a power plant are centralized (construction, implementation, and others). Information available at: <http://www.cndpch.com.br/zpublisher/paginas/bom_negocio.asp>. The evidence used for this project action is the Contract between Ouro Energética S/A and Bucagrans – Construtora de Obras Ltda. signed on July 5th, 2007.

[22] ANEEL Report "Acompanhamento das Pequenas Centrais Hidrelétricas com Licença de Instalação". Version 2. Available at: <http://aneel.gov.br/>.

[23] Letter nr. PR-OUR-001-07 issued by project sponsor on October 17th, 2007. See ANEEL letter nr. 649/2008-SGH/ANEEL, which mentions request for the increase of the installed capacity of Ouro project.

[24] Power Purchase Agreement between Ouro Energética S/A and Sadia S/A signed on December 1st, 2007.

[25] Letter nr. 649/2008-SGH/ANEEL (Process 48500.000692/2002-62) issued by ANEEL on March 20th, 2008. In this letter, ANEEL considered the increase of the installed capacity positive.

[26] Contract between Banco Itaú BBA S/A and Ouro Energética S/A signed on August 25th, 2008.

[27] See ANEEL technical,note nr. 211/2008-SGH/ANEEL dated September 22nd, 2008 and Ordinances nr. 608 dated February 16th, 2009 and 2,452 dated July 7th, 2009.

[28] ANEEL Ordinance nr. 1880, issued on May 22nd, 2009.

[29] ANEEL Ordinance nr. 2455 issued on July 7th, 2009.

According to 41st EB Meeting Report, the Board clarified that:

> "*the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. This, for example, can be the date on which contracts have been signed for equipment or construction/operation services required for the project activity. Minor pre-project expenses, e.g. the contracting of services/payment of fees for feasibility studies or preliminary surveys, should not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the project*".

Considering the above definition, the turbines and generators purchase shall be considered as the project starting date, since previous actions do not represent that the project would be constructed and implemented[30]. Therefore, the project starting date is February 28th, 2007. All documented evidence related to the starting date presented above is available with the Project Participants and DOE.

(ii) CDM consideration

The consideration of CDM incentive is dated April 10th, 2006. This can be evidenced through the Minutes of the Meeting held by Rija Investimentos Energéticos Ltda., in which company decided to buy the SHPP from Guascor Geratec Ltda., considering the revenues of the CDM.

In the meeting mentioned above, all Board members, besides of the president Mr. Mozart de Siqueira Campos Araújo and its secretary Mr. Pedro Pontual Marletti, were present. From this meeting, the Board members decided for the project acquisition, considering the fact that the project could be registered as a CDM project activity and, being capable to generate carbon credits. The revenues obtained with the selling of the carbon credits of the Project were considered essential to overcome risks related to the high volatility of energy price in Brazil.

Two conditions were important for the project's approval by the company: legal and regulatory aspects and the possibility to generate CERs, which would make the project feasible. After the commercialization of the CERs generated by the ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project[31] (three small hydropower plants – Antônio Brennand, Indiavaí and Ombreiras – registered under CDM), owned by the same project participant, concluded with the signature of the ERPA (Emission Reduction Purchase Agreement) in December 2006, the CDM process was better known and the decision to implement another project considering the CDM revenues was done.

Rija Investimentos Energéticos Ltda., the company that held the meeting, is a company from Brennand Group. On July 24th, 2007, Rija Investimentos Energéticos Ltda. was incorporated by Ouro Energética S.A., the owner of the SHPP currently. This can be evidenced through ANEEL Resolution nr. 988, dated July 24th, 2007. All documents were presented to DOE and are publicly available. It is important to mention that Ouro Energética S/A had already contracted Ecopart Assessoria em Negócios Empresariais Ltda. (formerly Ecoinvest Carbon Assessoria Ltda.) for advising them with the CDM

[30] Actually, it is not uncommon the issuance of construction permits more than once. In addition, the project could be sold after the construction license obtainment.

[31] Ref.: CDM 0530. Available at UNFCCC's website: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1152891235.76/view

process for the SHPP project on July 6th, 2005. For a better understanding, a timeline for the CDM consideration of the project is presented as follows:

Table 6 - Dates related to the CDM consideration of Ouro project

Date	Actions
06/07/2005	Signature of the contract between Ouro Energética S/A and Ecopart Assessoria Negócios Empresariais Ltda., the CDM process advisor of the project (Ouro Energética S/A was owned by Guascor Geratec Ltda. that time)
10/04/2006	Rija Investimentos Energéticos Ltda. minutes of meeting for the acquisition of Ouro small hydropower plant considering CDM revenues
24/10/2007	E-mails exchange between Brennand Group and Ecopart Assessoria em Negócios Empresariais Ltda. for the CDM process starting
15/02/2008	Validation proposals request
17/06/2008	Letters sent for local stakeholders consultation
19/06/2008	Signature of the Validation Services Contract with TÜVSÜD
10/09/2008 – 09/10/2008	Global Stakeholder Process starting

Although at the time of the project acquisition project sponsor knew that Ouro Energética S/A (owned at that time by Guascor Geratec Ltda.) signed a contract with Ecopart on July 6th, 2005 to advise them with the CDM process for Ouro project, for conservative reasons, the date in which Rija Investimentos Energéticos Ltda. held a meeting for buying the Ouro small hydropower plant from Guascor Geratec Ltda. on April 10th, 2006 was considered for the project participants awareness of the CDM. Continuing actions to secure the CDM status are presented in the table above.

As mentioned above, project participants stress that Brennand Group has already registered a CDM Project Activity. This also confirms Brennand Group’s confidence in the CDM and in the certified emission reductions potential to help projects overcoming implementation barriers.

(iii) Demonstration of additionality

For the demonstration of additionality, the proposed baseline methodology refers to the Additionality Tool (version 5.2 is the most recent one at the time PDD is being developed) approved by the Executive Board. The tool considers some important steps necessary to determine whether the project activity is additional and to demonstrate how the emission reductions would not occur in the absence of Ouro SHPP Project. The application of the above mentioned tool is described in the next paragraphs.

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

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

Scenario 1: The alternative to the project activity is the continuation of the current (previous) situation of electricity supplied by the existing power plants from the interconnected system.

Scenario 2: The proposed project activity undertaken without being registered as a CDM project activity.

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

Both alternatives, the project activity and the alternative scenarios are in compliance with all regulations according the following entities:

- The National Electric System Operator *(ONS* from the Portuguese *Operador Nacional do Sistema Elétrico);*
- The Electricity Regulatory Agency *(ANEEL* from the Portuguese *Agência Nacional de Energia Elétrica);*
- The Mines and Energy Ministry (*MME* from the Portuguese *Ministério de Minas e Energia);*
- The Chamber of Electrical Energy Commercialization *(CCEE* from the Portuguese *Câmara de Comercialização de Energia Elétrica – CCEE);*
- The Rio Grande do Sul Environmental Agency *(FEPAM* from the Portuguese *Fundação Estadual de Proteção Ambiental Henrique Luiz Roessler);*
- The CDM Executive Board.

SATISFIED/PASS – Proceed to Step 2

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method:

Once the project activity generates other financial benefit other than CDM related income (sale of energy) Option I could not be chosen. Option III is more appropriate when compared to Option II because there are no other options of investment from the project owner perspective. Therefore, additionality is demonstrated through an investment benchmark analysis (option III).

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

Financial indicator identified for Ouro Project Activity is the project Internal Rate of Return – IRR. The benchmark considered in this analysis is the cost of equity (Ke) based on Capital Asset Pricing Model (CAPM).

Cost of Equity (Ke)

The Capital Asset Pricing Model (CAPM) is one of the most widely accepted models used to determine the (theoretically appropriate) required rate of return on equity. The CAPM calculates a newly introduced asset’s non-diversifiable risk. CAPM takes into account the asset's sensitivity to non-diversifiable risk, better referred to as beta (**β**). Embedded in the model is also the market premium which can be tracked using historical data from the local or relevant equity market.

The rate which should be charged for the equity component of a project is calculated through the formula: **Ke = Rf + β x Rm + Rc),** where **Ke** represent the suggested rate of return for equity investments. **Rf** stands for the risk free rate and beta, or **β,** stands for the average sensitivity of comparable companies in that industry to movements in the underlying market.

Rc represents the market premium, or higher return, expected by market participants in light of historical spreads attained from investing in equities versus risk free assets such as the US treasury.

The risk-free rate used for **Ke** calculation was based on the US Treasury bond, which are long term titles of a mature market. Over this rate, Brazilian country risk have been considered and resulted in the risk-free rate applied to the calculation.

β derives from the correlation between returns of US companies from the sector and the performance of the returns of the US market. **β** have been adjusted to the leverage of Brazilian companies in the sector, reflecting both structural and financial risks. **β** adjusts the market premium to the sector.

The market premium (**Rm**) is estimated based on the historical difference between the S&P 500 returns and the long term US bonds returns. The spread over the risk-free rate is the average of the difference between those returns.

Table 7 – Parameters used for the Cost of Equity calculation

Cost of Equity	
(Rf) Risk-free rate[32]	1.96%p.a.
(Rm) Equity Risk Premium[33]	6.47%p.a.
(Rc) Estimated Country Risk Premium[34]	5.23%p.a.
(β) Adjustment to Market Equity Risk[35]	3.21%p.a.
Cost of Equity with Brazilian Country Risk	14.99%p.a.

Considering the table above, cost of equity is 14.99% p.a.[36] Each assumption made and all data used to estimate the **Ke** through CAPM were presented to the DOE. The spreadsheet used for calculation of the **Ke** was also provided to the DOE.

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[32] 20-year US Treasury Yield. Adjusted with the US inflation historical Source: Yahoo finance, available at: : <http://finance.yahoo.com/q/hp?s=%5ETYX> and Federal Reserve, available at: <http://www.federalreserve.gov/econresdata/researchdata.htm>..

[33] International Market Equity Risk Premium Historical S&P500 premium over US-Treasury Bond. Source: Damodaran's website: <http://pages.stern.nyu.edu/~adamodar/>.

[34] Emerging Markets Bond Index (EMBI) + Brazil. Source: JP Morgan, available at: <http://www.cbonds.info/all/eng/index/index_detail/group_id/1/>.

[35] Average unlevered Beta of Electric-Generators in the USA re-levered to the Brazilian leverage. Source: Damodaran's website: <http://pages.stern.nyu.edu/~adamodar/>.

Financial Indicator, Internal rate of return (IRR)

As mentioned above, the financial indicator identified for Ouro SHPP Project Activity is the project Internal Rate of Return (IRR). The project cash flow demonstrates that the IRR of Ouro is 8.06% considering 28 years of project timeline[37].

All input values considered in the financial analysis are based on documented evidence as mentioned in the financial spreadsheets and as presented to DOE. In addition, all values can be easily cross-checked against third-party or public available sources[38].

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

As mentioned above, the IRR of the project (8.06%) is lower than the benchmark used in this financial analysis, demonstrating that the project is not financially attractive to the investor:

Table 8 – Comparison of financial indicators

SHPP	IRR (%)	Cost of Equity (%)
Ouro SHPP	8.06	14.99

Although the tool guidance states "*in general a minimum period of 10 years and a maximum of 20 years will be appropriate*", the initial 15-year analysis was extended to cover a 28-year period (project lifetime) as requested by DOE.

The Additionality Tool clearly states that "*input values in all investment analysis should be valid and applicable at the time of the investment decision*". Since values considered in the investment analysis shall be based on data valid and applicable at the time of investment decision, the crossing-check shall be based on documented evidence also available at that time (as made by PPs in the spreadsheet). However, as insistently requested by DOE, PPs made an analysis of the IRR based on actual values of the project. Actual values can be checked through PPA, balance sheet, sales of receipt, financing contract, and others. All source of information used in this analysis is presented in the financial spreadsheet and was checked by DOE[39]. The result is a IRR of 12.08%.

[36] The result of the Cost of Equity calculation is very similar to the minimum return considered by Brazilian Federal Government at the decision of the Program of Incentives to Alternative Energy Sources (from the Portuguese *Programa de Incentivo às Fontes Alternativas de Energia Elétrica – PROINFA*) release. The government rate is 14.89% and can be used for cross-checking purposes.

[37] According to ANEEL Resolution nr. 537 dated October 14th, 2003, Ouro project is authorized to operate for 30 years from the date of the authorization publication. Therefore, the project lifetime is until October 2033. This value was used for the financial analysis.

[38] Detailed information is presented in the PPs response in CAR 12 of the Validation Protocol.

[39] Detailed information is presented in the PPs response in CAR 12 of the Validation Protocol.

Sub-step 2d: Sensitivity analysis

The sensibility analysis, as established by the "*Guidance on the assessment of investment analysis*" (EB 41, Annex 45), is to be conducted considering variables that constitute more than 20% of either total project costs or total project revenues. Hence, the sensitivity analysis considered the variation of the following parameters:

- For project revenues: An increase in project's revenues can be obtained when energy generation/plant load factor of the plant is higher than expected or the energy price increases over the forecasted in the investment analysis.
- For running costs: Running costs are expected to decrease due to a reduction in the operation costs of the plant or in the construction costs.

In addition, according to the guidance, "*variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances*". Therefore, financial analyses were performed altering each of these parameters by 10%, and assessing what the impact on the project IRR would be.

It is important to mention that the average Brazilian inflation in 2006 was equal to 3.14%[40]. The use of 10% of variation, around three times the 2006 inflation rate, in the variation of costs and revenues of the project activity is very conservative.

Results of the sensitivity analysis are shown in the table below. As it can be seen, the project IRR remains below the benchmark in cases where the parameters change in favor of the project.

Table 9 - Sensitivity analysis

Scenario	**% change**	**IRR (%)**	**Cost of Equity (%)**
Original	-	8.06	14.99
Increase in the energy generation and price	+10	11.18	
Reduction in the project costs	-10	9.93	
Reduction in the project investments	-10	10.91	

Another sensitivity analysis was conducted in the case of Ouro project based on the taxes regime/conditions as requested by DOE. The "presumed profit" (in a free translation from the Portuguese *lucro presumido*) was chosen by the project sponsor at the time of the decision-making process. However, as requested by DOE, the "taxable income" (in a free translation from the Portuguese *lucro real*) scenario was analyzed. In the taxable income scenario, the IRR of Ouro is 5.46%, *i.e.* 32% lower than the one

[40] The IPCA is used as a parameter for the inflation targeting system. In 2006 IPCA's accumulated growth was equal to 3.14%. This index is published by several institutions in the country. One of these institutions is the Central Bank of Brazil in its annual bulletins available at: <http://www.bcb.gov.br/?BOLETIM2006>.

considered for the investment decision. Therefore, the IRR calculation used in this PDD is very conservative.

Furthermore, PPs conduct a sensitivity analysis of the electricity price (for the period not covered by the signed PPAs) until the "actual" IRR (12.08%) reaches the benchmark as requested by DOE. Although PPs do not agree with this approach since, to the understanding of the PPs, there is no sensitivity analysis for actual values and, therefore, the sensitivity analysis should be conducted only in the IRR available at the time of the investment decision, PPs made this analysis as requested by DOE.

In this case, the electricity price should be approximately to BRL 210/MWh. In order to demonstrate that this price is not a reasonable scenario, PPs analyzed the historical prices in the spot market from the operation start of the project (July 2009) to the most recent information available (January 2011). During this period, the highest price paid for the South region was BRL 169.53/MWh. This is public information available at CCEE's website: <http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=2a8ca5c1de88a010VgnVCM100000aa01a8c0RCRD>. Therefore, a price of BRL 210/MWh (to the "actual" IRR reaches the benchmark) is not reasonable in the project activity context.

Outcome: The IRR of the project activity without being registered as a CDM project is still below the benchmark, evidencing that project activity is not financially attractive to the investor, even if parameters vary in favor of the project. The knowledge of the CDM registering benefits was the key point in decision-making to implement the project activity.

SATISFIED/PASS – Proceed to Step 3

Step 3. Barrier analysis

Not applicable.

Step 4. Common practice analysis

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

According to the additionality tool (version 5.2), "*projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc*". Thus, the following criteria were considered in order to choose the projects that are similar to Ouro project:

- **Country/region:** Brazil has an extension of 8,514,876.599 square kilometers[41] (with over 4,000 km distance in the north-south as well as in the east-west axis) and 6 distinct climate regions: sub-tropical, semi-arid, equatorial, tropical, highland-tropical and Atlantic-tropical (humid tropical)[42].

[41] Available at:< http://www.ibge.gov.br/english/geociencias/cartografia/default_territ_area.shtm>.

[42] Information available at: <http://www.suapesquisa.com/clima/>.

According to the Brazilian Instutute of Geography and Statistics (from the Portuguese *Instituto Brasileiro de Geografia e Estatística – IBGE*), the climate zones of Brazil are[43]:

(i) Equatorial, also known as Tropical Rainforest climate (in a free translation from the Portuguese *Equatorial)*: characterized by the high temperature (the average temperature of the coldest month is higher than 18ºC) with distributed precipitation in almost all months of the year. This type of climate covers the Northern region of Brazil, which is has a dense and an extent forest area ("Floresta Equatorial Amazônica");

(ii) Tropical Equatorial climate (from the Portuguese *Tropical Zona Equatorial*): characterized by the high temperature (the average temperature of the coldest month is higher than 18ºC) with two distinct seasons – rainy summer and dry winter. This type of climate covers the Northern and Northeastern regions of Brazil;

(iii) Eastern Northeast-Tropical, also known as Warm Semi-arid climate (from the Portuguese *Tropical Nordeste Oriental*): characterized by the deficit of precipitation, since precipitation rate is lower than the evaporation rate. This climate is characteristic of the Northeastern region of Brazil ("sertão nordestino"), determining the "caatinga" vegetation;

(iv) Warm Subtropical climate (from the Portuguese *Tropical Brasil Central*): characterized by the tropical climate with two distinct seasons – rainy summer and dry winter, however, the average temperature of the coldest month is lower than 18ºC. This type of climate covers the Southeastern region and parts of the Midwestern and Northeastern regions of Brazil;

(v) Temperateness, also knonw as Humid Subtropical climate (in a free translation from the Portuguese *Temperado*): characterized by the distributed precipitation during the year and the average temperature of the coldest month is lower than 18ºC. This type of climate covers the Southern region of Brazil.

[43] IBGE. Elementos de geografia e cartografia para o agente de estatística. Colaboration: Conselho Naiconal de Geografia, 1959. Available at: <http://biblioteca.ibge.gov.br/visualizacao/monografias/GEBIS%20-%20RJ/Elementos%20de%20Geografia%20e%20Cartografia%20para%20o%20Agente%20de%20Estatistica.pdf>

Figure 5 – Climate zones of Brazil

Source: IBGE, 2002[44]

These varieties of climate obviously have strong influence in the technical aspects related to a small hydropower plant implementation since meteorological events have strong influence in hydrologic process[45]. "*Climate affects all major aspects of the electric power sector from electricity generation, transmission and distribution system to consume demand for power*"[46].

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[44] Instituto Brasileiro de Geografia e Estatística (IBGE). Mapa Brasil Climas. Available at: <ftp://geoftp.ibge.gov.br/mapas/tematicos/mapas_murais/clima.pdf>.

[45] PINTO, J. A. Climatic indicators study for long term prediction in the river flow of Alto São Francisco basin (in a free translation from the Portuguese *Estudo de indicadores climáticos para a previsão de longo termo de vazões na bacia do Alto São Francisco*). Universidade Federal de Minas Ferais: Belo Horizonte, 2005. Available at: <http://www.smarh.eng.ufmg.br/defesas/20D.PDF>.

[46] VESELKA, T. D. Balance power: A warming climate could affect electricity. Geotimes. Earth, energy and environment news. American Geological Institute: August, 2008. Available at: < http://www.agiweb.org/geotimes/aug08/article.html?id=feature_electricity.html>.

Just for reference, Project Participants compared the annual average of precipitation (mm) of the state capitals from different regions of Brazil[47], based on data from 1961 to 1990.

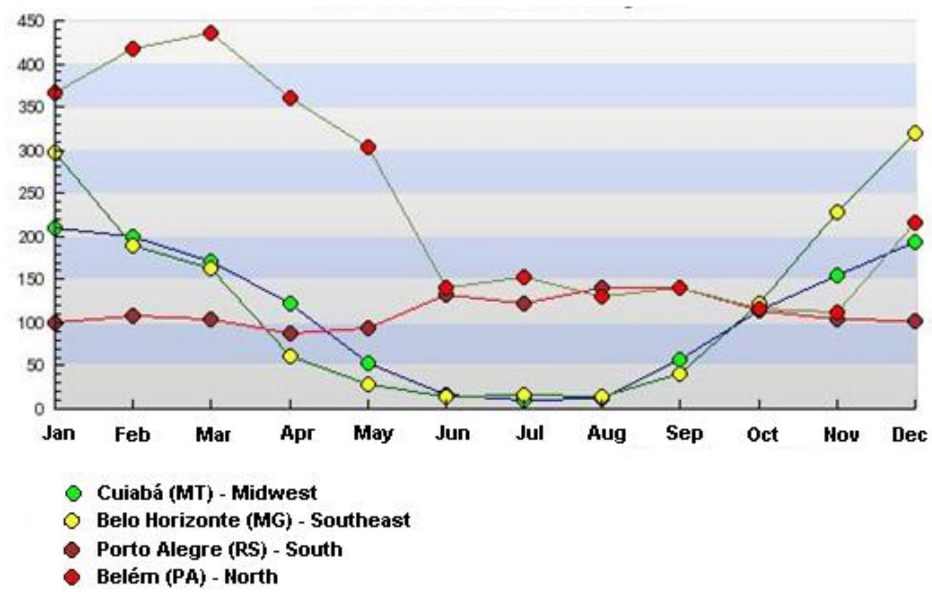

Figure 6 – Average of precipitation (mm) in the Northern, Southern, Southeastern and Midwestern regions of Brazil from 1961 to 1990

Source: INMET, 2010

Precipitation is one of the meteorological elements with great importance for region analysis/comparison, and therefore, its distribution in the region of the countries determines the agriculture, infrastructure, habitation, economy, and others. As can be seen in the figure above, precipitation in Rio Grande do Sul state differs from the other regions of the country; the Southern region presents the most regular precipitation curve[48].

Besides of precipitation, temperature, humidity and evaporation parameters were analyzed as indicators to describe differences of region climates.

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[47] Climate conditions of Porto Alegre (capital of state where Ouro project is located – Rio Grande do Sul) were compared with Belém (North), Cuiabá (Midwest) and Belo Horizonte (Southeast). These capital states were chosen since if the entire Host Country was used for the common practice anal-ysis, small hydropower plants located in these regions were the ones “left” (which do not receive CDM and/or PROINFA incentives) to be compared with proposed project activity. However, as can be seen in the figures 6 to 9, projects located in different regions of Brazil cannot be compared and, therefore, cannot be considered similar to the proposed project activity considering the large extension of Brazil and climate conditions, which have influence in the technical and, consequently, in the in-vestment aspects of hydropower projects implementation (specially that ones which have small reservoirs, which is the case of Ouro project with 177.7 W/m^2 power density). More explanations are presented in the Validation Protocol (CAR 14).

[48] HALLAL, M. O. C. Variability analysis of climatic indicators for precipitation in Rio Grande do Sul state (in a free translation from the Portuguese *Análise de variabilidade de indicadores climáticos para a precipitação pluvial no Rio Grande do Sul*). Graduation work. Universidade Federal de Pelotas, Rio Grande do Sul: Dec 2007. Available at: <http://www.ufpel.tche.br/meteorologia/pos-graduacao/dissertacoes/dissertacoes_completas/dissertacao_marcia_curi_hallal.pdf>

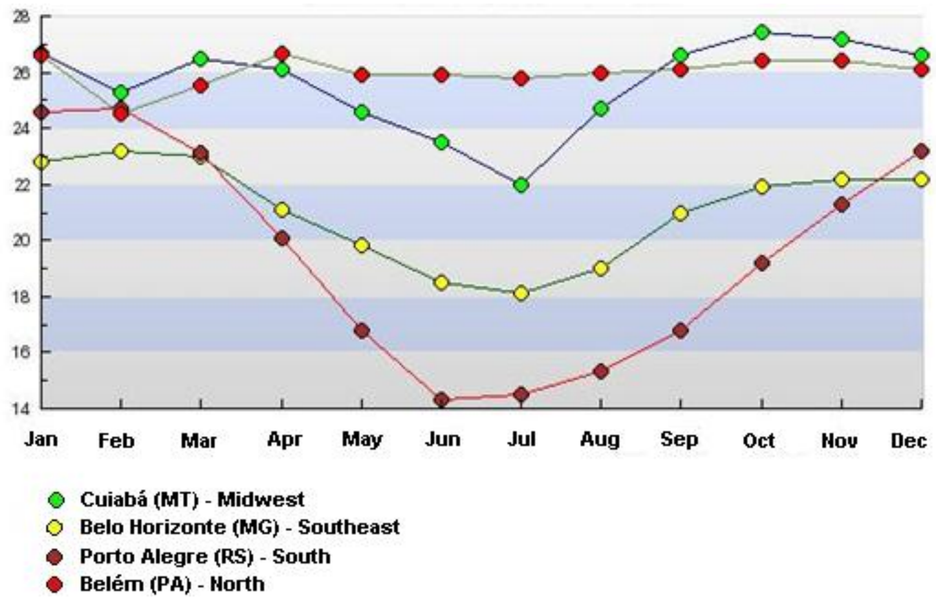

Figure 7 - Average of temperature (ºC) in the Northern, Southern, Southeastern and Midwestern regions of Brazil from 1961 to 1990

Source: INMET, 2010

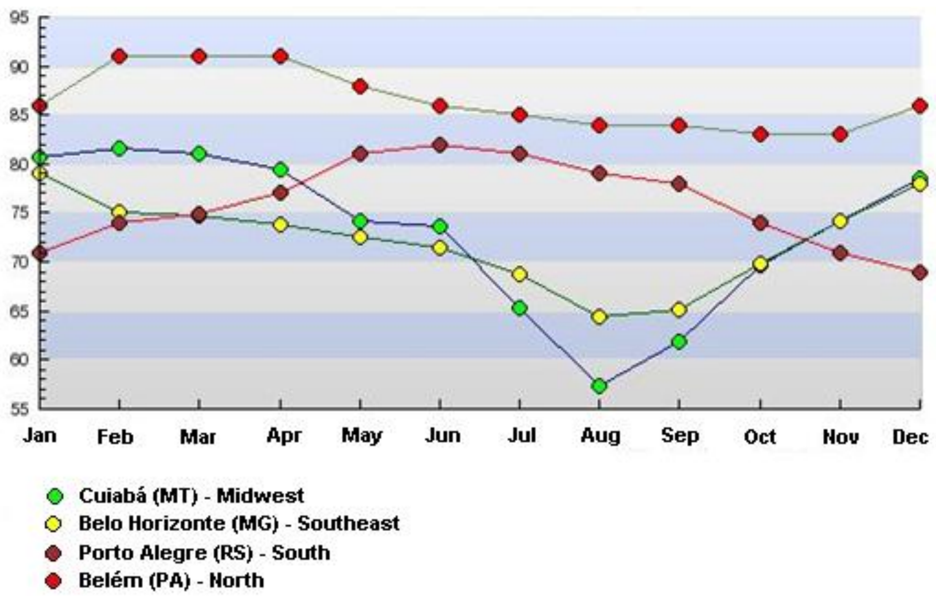

Figure 8 - Average of humidity (%) in the Northern, Southern, Southeastern and Midwestern regions of Brazil from 1961 to 1990

Source: INMET, 2010

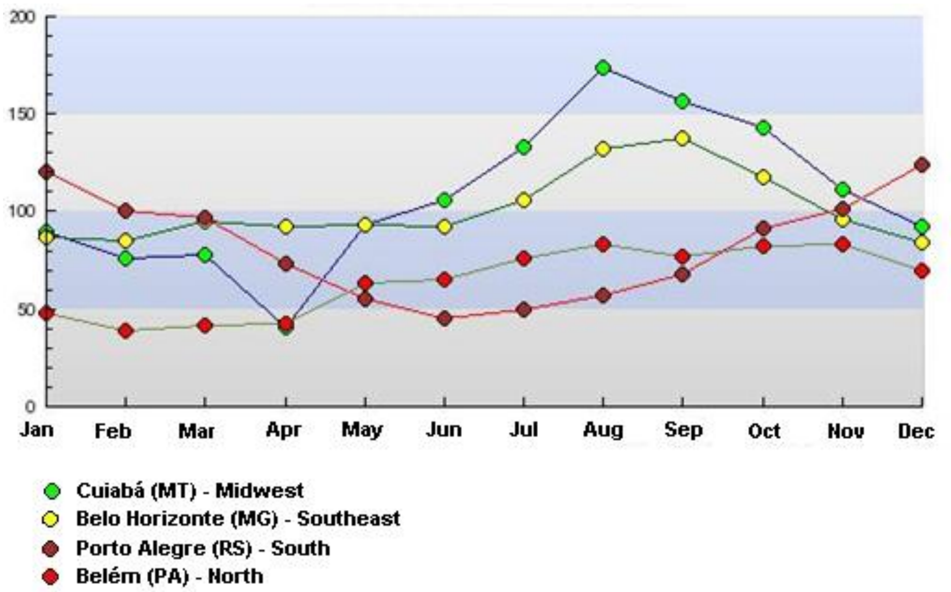

Figure 9 - Average of evaporation (mm) in the Northern, Southern, Southeastern and Midwestern regions of Brazil from 1961 to 1990

Source: INMET, 2010

Hydroelectric projects can differ significantly from each other considering the region to be implemented, climate, topography, availability of transmissions lines, river flow regularity, etc. For those reasons alone it is extremely difficult and not reasonable to compare different hydropower potential and plants. Moreover, hydro-power plants cannot be optimally placed (close to load centers and transmission lines) and easily transferred (moved to a new region where a better tariff is offered) as, for example, modular fossil-fuel-fired (diesel, natural gas) power plants. Differences may be even larger if no big water storage is possible, as in the case of small hydropower plants.

Considering information above, only small hydropower plants located in the same region of Ouro project – Southern region of Brazil (Paraná, Santa Catarina and Rio Grande do Sul states) – were analyzed.

- ***Scale:*** As mentioned in section A, according to Brazilian regulations, small scale hydropower plants are defined as plants with an installed capacity within 1 and 30MW[49]. Therefore, no large scale hydropower plants (*e.g.* installed capacity over 30MW) were considered. Furthermore, only plants with installed capacity 50% lower and 50% higher than Ouro project were analyzed (*i.e.* between 8 and 24 MW).
- ***Same environment with respect to regulatory framework*:** Until the beginning of the 1990's, the energy sector was composed almost exclusively of state-owned companies. From 1995 onwards, due to the increase in international interest rates and the lack of state investment capacity, the government started the privatization process. However, by the end of 2000 results were still modest. Further initiatives, aiming to improve electric generation in the country, were taken between the 1990's and 2003; however it did not attract new investment to the sector. In 2003 the

[49] *ANEEL – Agência Nacional de Energia Elétrica. Resolution # 652, issued on December 9th, 2003.*

recently elected government decided to fully review the electricity market institutional framework in order to boost the investments in the electric energy sector. The market rules were changed and new institutions were created such as Energetic Research Company (in a free translation from the Portuguese *Empresa de Pesquisa Energética – EPE*) – an institution that would become responsible for the long term planning of the electricity sector with the role of evaluating, on a perennial basis, the safety of the supply of electric power – and Chamber for the Commercialization of Electric Power (CCEE) – an institution to manage the commercialization of electric power within the interconnected system. This new structure was approved by the House of Representatives and published in March of 2004[50]. Given the new *regulatory framework and investment climate PP* considered only projects starting after March of 2004.

- ***Same environment with respect to investment climate, access to technology and financing***: As mentioned in the item "country/region" above, depending on the project location, differences related to the technical aspects of a small hydropower plant project, even if small hydro projects are located in the same region. These technical differences obviously have an influence in the investment/financing of a project. Also, it has to be taken into account that project sponsors have different investment capacity. Then, financial information should be considered when small hydro projects were analyzed. However, Project Participants decided to do their upmost in making a reasonable comparison for the purpose of common practice analysis even without investment information available.

Considering information above, Project Participants researched about the generating units of small hydro power plants in Brazil that started operations from April 2004 (reform of the electric sector) to October 2010 (the most complete data available until the elaboration of this PDD) in the Southern region of Brazil. In addition, small hydropower plants that received some kind of incentive (PROINFA[51], and/or CDM) were identified.

Table 10 – Operations start of PCHs from April 2004 to October 2010

Year	Project	State	Installed capacity (MW)	Incentive?
2004	-			
2005	Furnas do Segredo	RS	9.80	CDM

[50] http://www.planalto.gov.br/CCIVIL/_Ato2004-2006/2004/Lei/L10.848.htm.

[51] Alternative Electricity Sources Incentive Program (in a free translation from the Portuguese *Programa de Incentivo às Fontes Alternativas de Energia Elétrica – PROINFA*), created through the Law # 10,438 dated April 26th, 2002. Among others, one of the initiative's goals is to increase the renewable energy sources share in the Brazilian electricity market, thus contributing to a greater environmental sustainability. In order to achieve such goals, the Brazilian government has designated the federal state-owned power utility Eletrobrás (Centrais Elétricas Brasileiras S/A) to act as the primary off-taker of electric energy generated by alternative energy facilities in Brazil, by entering into long-term Power Purchase Agreements with alternative energy power producers, at a guaranteed price of at least 80% of the average energy supply tariff charged to ultimate consumers. Also, the Brazilian Decree # 5,025 dated March 30th, 20041, which regulates the Law # 10,438, states that PROINFA aims for the reduction of greenhouse gases as established by the United Nations Framework Convention on Climate Change (UNFCCC) under Kyoto Protocol, contributing to the sustainable development. Therefore, the program is clearly a "Type E-" policy.

2006	Carlos Gonzatto	RS	9.00	PROINFA
	Esmeralda	RS	22.20	
	São Bernardo	RS	15.00	
2007	Flor do Sertão	SC	16.50	
	Santa Laura	SC	15.00	
2008	Alto Benedito Novo I	SC	15.00	CDM
	Alto Irani	SC	21.00	PROINFA
	Caçador	RS	22.50	
	Cotiporã	RS	19.50	
	Plano Alto	SC	16.00	
2009	Linha Emília	RS	19.50	
	Eng. Ernesto Jorge Dreher	RS	17.47	-
	Rodeio Bonito	SC	14.68	CDM
2010	Arvoredo	SC	13.00	
	Criúva	RS	23.95	

Source: ANEEL (2010)[52], UNFCCC (2010)[53], and ELETROBRÁS (2010)[54]

Spreadsheet with complete research for the common practice analysis is available with the Project Participants and was presented to DOE during validation[55].

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

Considering research above, almost of all projects that have started operation since April 2004 publicly receive some kind of incentive (CDM, and/or PROINFA). The only small hydropower plant that does not receive CDM or PROINFA incentive is Eng. Ernesto Jorge Dreher. However, this project receives incentive from the Special Incentive for the Development of New Infrastructure (in a free translation from the Portuguese *Regime Especial de Incentivos para o Desenvolvimento da Infra-Estrutura – REIDI*)[56]. This type of incentive was created through Law nr. 11,488 dated June 15th, 2007 for the reduction of taxes destined to transportation, energy, irrigation, ports and sanitation projects[57].

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[52] ANEEL (2010). Resumo Geral do Acompanhamento das Usinas de Geração Elétrica. Agência Nacional de Energia Elétrica. Available at: <http://www.aneel.gov.br/area.cfm?idArea=37&idPerfil=2>.

[53] UNFCCC (2010). Project activities. Validation. United Nations Framework Convention on Climate Change. Available at: <http://cdm.unfccc.int/index.html>.

[54] ELETROBRÁS (2010). Relação de empreendimentos contratados e extratos dos contratos e termos aditivos celebrados. Programas: Proinfa. Centrais Elétricas Brasileiras S/A Web-site: < <http://www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm>.

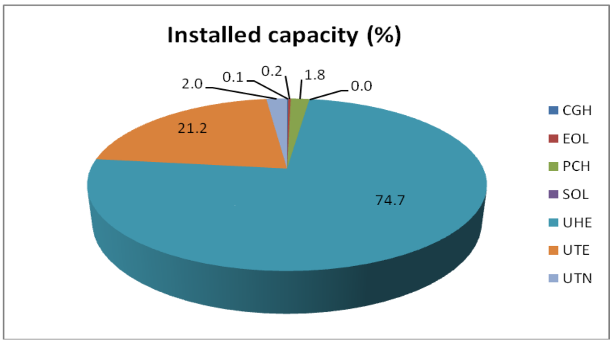
[55] Detailed explanation related to the common practice analysis is presented in the Validation Protocol 14.

[56] See information available at the Federal Revenue Service's website: http://www.receita.fazenda.gov.br/Legislacao/RegimeReidi/RelacaodasPJIN758.htm.

[57] More information is available at: <http://www.receita.fazenda.gov.br/legislacao/legisassunto/reidi.htm>.

This result demonstrates that risks related to this type of project are higher, as discussed in Step 2 – Investment Analysis, and that a strong incentive is required to promote the construction of renewable energy projects in Brazil, where it includes small hydropower plants.

It is worth mentioning that 67.9 % of Brazil's generation is composed of large hydro and 26.3 % of thermal power stations. Only 3% of Brazil's installed capacity comes from small hydropower sources (3.4 GW out of a total of 113 GW).



Legend	
CGH	Hydroelectric Generator Center
EOL	Wind Generator Center
PCH	**Small Hydroelectric Power Plant**
SOL	Solar Generation Center Photovoltaic
UHE	Hydroelectric Power Plant
UTE	Thermoelectric Power Plant
UTN	Thermonuclear Power Plant

Figure 10 – Share of installed capacity

Source: ANEEL, 2011[58]

Moreover, in the most recent energy auctions, which took place between 2005 and 2007 from the total of 9,594 MW sold, 5,888 MW (61.3%) will come from fossil fuel fired thermal power plants, from which 2,152 MW come from natural gas and 2,514 MW fuel oil fired thermal power plants, i.e., 22.4% and 26.2% of the total sold respectively (ESPARTA, 2008)[59].

In summary, this project activity is not the common practice, because no similar project started operation during the above mentioned period without some kind of incentive. The business-as-usual scenario in the country is the implementation of large hydro with large reservoirs and fossil fuel fired thermal power projects represent the majority of new installed capacity. With the financial benefit derived from the CERs, it is anticipated that other project developers would benefit from this new source of revenue and then would decide to develop such projects. CDM has made it possible for some investors to set up their small hydro plants and sell their electricity to the grid.

SATISFIED/PASS – Project is ADDITIONAL

[58] ANEEL (2011). Banco de Informações de Geração. Data updated on January 24th, 2011. Agência Nacional de Energia Elétrica. Available at: < http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp>.

[59] ESPARTA, A. R. J. (2008). Redução de emissões de gases de efeito estufa no setor elétrico brasileiro: a experiência do Mecanismo de Desenvolvimento Limpo do Protocolo de Quioto e uma visão futura. PhD Thesis, Universidade de São Paulo.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission reductions (ER_y)

The emission reductions by the project activity (ER_y) are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ **Equation 1**

Where:

ER_y = Emission reductions in year y (t CO_2e/yr);

BE_y = Baseline emissions in year y (t CO_2e/yr);

PE_y = Project emissions in year y (t CO_2e/yr);

LE_y = Leakage emissions in year y (t CO_2e/yr).

Baseline emissions (BE_y)

According to the selected approved methodology (ACM0002) baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = EG_{\mathrm{PJ,y}} \cdot EF_{grid,CM,y}$$ **Equation 2**

Where:

BE_y = Baseline emissions in year y (tCO_2/yr);

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*".

For Greenfield projects installed at a site where no electricity generation occurred previously, as it is the case of the proposed project activity, the calculation of $EG_{PJ,y}$ is as follows:

$$EG_{PJ,y} = EG_{facility,y}$$ **Equation 3**

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr);

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

Combined margin CO_2 emission factor for the grid (EF_y)

The baseline emission factor was estimated using the methodological tool "Tool to calculate the emission factor for an electricity system". According to this tool Project Participants shall apply the following six steps to the baseline calculation:

STEP 1 - Identify the relevant electricity systems;

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.

- **STEP 1 -** Identify the relevant electric power system

According to the tool, "*If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used*".

The Brazilian DNA has recently published the Resolution nr. 8 issued on 26th May, 2008[60] that defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). Hence, this figure will be used to calculate the baseline emission factor of the grid. More information is available at the Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/4016.html).

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

[60] Tough the resolution is dated from May, it only took effect on 19 July 2008 which is the date of its publication in the "Diário Oficial da União" (Official Gazette of the Federal Executive, available at http://www.in.gov.br/).

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

Option (i): only grid power plants are included in the calculation;

Option (ii): both grid power plants and off-grid power plants are included in the calculation.

The Brazilian DNA made available the emission factor calculation based on information of the grid power plants only – option (i) – following the "*Tool to calculate the emission factor for an electricity system*". More information of the methods applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html).

- **STEP 3 -** Select a method to determine the operating margin (OM)

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

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The Brazilian DNA made available the operating margin emission factor calculated following the "Tool to calculate the emission factor for an electricity system", approved by the CDM Executive Board. The calculation uses option c – Dispatch data analysis OM. This option does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore, the chosen option was ***ex-post*** calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. More information of the methods applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html) and vintage will be used in the project activity.

- **STEP 4 -** Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$.

It will be calculated using the below formulae:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$ **Equation 4**

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of the year *y* (MWh)

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh)

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

The CO_2 emission factor for power units in the top of the dispatched order ($EF_{EL,DD,h}$) parameter can be obtained through hourly fuel consumption or hourly emission factor calculated based on the energy efficiency of power units and fuel types. As checked by DOE, the $EF_{EL,DD,h}$ is calculated by the Brazilian DNA through the hourly fuel consumption according to the following equation:

$$EF_{EL,DD,y} = \frac{\sum_{i,n} FC_{i,n,h} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{n} EG_{n,h}}$$ **Equation 5**

Where:

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh);

$FC_{i,n,h}$ = Amount of fossil fuel type *i* consumed by power unit *n* in hour *h* (Mass or volume unit);

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);

$EG_{n,h}$ = Electricity generated and delivered to the grid by power unit *n* in hour *h* (MWh);

n = Power units in the top of the dispatch (as defined below);

i = Fossil fuel types combusted in power unit *n* in year *y*;

h = Hours in year *y* in which the project activity is displacing grid electricity;

y = Year in which the project activity is displacing grid electricity.

To determine the set of power units *n* that are in the top of the dispatch, obtain from a national dispatch centre:

- The grid system dispatch order of operation for each power unit of the system including power units from which electricity is imported; and
- The amount of power (MWh) that is dispatched from all power units in the system during each hour *h* that the project activity is displacing electricity.

At each hour *h*, stack each power unit's generation using the merit order. The group of power units *n* in the dispatch margin includes the units in the top x% of total electricity dispatched in the hour *h*, where x% is equal to the greater of either:

(a) 10%; or

(b) The quantity of electricity displaced by the project activity during hour *h* divided by the total electricity generation in the grid during that hour *h*.

According to information provided by DOE, the option used by the Brazilian DNA in order to obtain the units in the top x% is (a) 10%, as presented in its meeting with the Brazilian DNA office occurred in the beginning of 2009 year. As mentioned above, the host country's DNA will provide $EF_{EL,DD,h}$ in order to Project Participants calculate the operating margin emission factor. Hence, this data will be updated annually applying the number published by the Brazilian DNA. For estimation purposes, the data of the most recent year available in the DNA website will be used.

- **STEP 5 -** Identify the group of power units to be included in the build margin (BM)

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

(a) The set of five power units that have been built most recently, or

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

- **STEP 6** – Calculate the build margin mission factor ($EF_{grid, BM, y}$)

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

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

Equation 6

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh);

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year *y* (tCO_2/MWh);

m = Power units included in the build margin;

y = Most recent historical year for which power generation data is available.

The CO_2 emission factor of power unit m in year *y* ($EF_{EL,m,y}$) parameter is calculated as determined as per the guidance in step 3 (a) for the simple OM, option B1, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$ **Equation 7**

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year *y* (tCO_2/MWh);

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit);

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

m = All power units serving the grid in year y except low-cost / must-run power units;

i = All fossil fuel types combusted in power unit m in year *y*;

y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

The Brazilian DNA made available the build margin emission factor calculated following the “Tool to calculate the emission factor for an electricity system”, approved by the CDM Executive Board. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. The number is published on the website and for estimation purposes the data for the most recent year will be used.

- **STEP 7 –** Calculate the combined margin (CM) emissions factor $EF_{grid,CM,y}$

The combined margin is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \cdot w_{OM} + EF_{grid,BM,y} \cdot w_{BM}$$ **Equation 8**

Where:

w_{OM} = weighting of operating margin emissions factor (%);

$EF_{OM\,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh);

w_{BM} = weighting of build margin emissions factor (%);

$EF_{BM,\,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh).

Weights are determined by the emission factor calculation tool. Alternative weights can be proposed for consideration by the Executive Board, as long as w_{OM} + w_{BM} = 1, and the values applied by project participants should be fixed for a crediting period and may be revised at the renewal of the crediting period.

For the calculation of the emission factor of the national grid numbers provided by the Brazilian Designated National Authority were applied. For details of its calculation and how the above steps were considered please refer to Annex 3.

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

Estimated quantity of net electricity generation supplied by the project plant/unit to the grid is presented in section B.6.3 below.

Project emissions (PE_y)

The proposed project activity may involve project emissions that can be significant. In this sense, according to the selected CDM methodology, these emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HI}$$ **Equation 9**

Where:

PE_y = Project emissions in year *y* (tCO2e/yr);

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO2/yr);

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO2e/yr);

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO2e/yr).

Emissions from fossil fuel combustion ($PE_{FF,y}$)

Considering that there is no fossil fuel combustion in the proposed project activity, $PE_{FF,y}$ = 0 tCO_2/year.

Emissions from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Considering that the proposed project activity consists on the construction of a small hydropower plant, there are no emissions of non-condensable gases from the operation of geothermal power plants. Therefore, $PE_{GP,y}$ = 0 tCO_2/year.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

According to ACM0002, new hydro electric power projects with reservoirs shall account for project emissions from reservoirs, following the below conditions:

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

$$PE_y = \frac{EF_{\mathrm{Res}} \cdot TEG_y}{1000}$$ **Equation 10**

Where:

PEy = Emission from reservoir expressed 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 (*PD*) of the project is greater than 10W/m^2, PEy = 0.

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

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

Equation 11

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.

Leakage emissions (LE_y)

Indirect emissions can result from project construction, transportation of materials and fuel and other upstream activities. However, according to the methodology, Project Participants do not need to consider these emission sources.

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.
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology for new hydro power plants, this value is zero.
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.
Source of data used:	Project site
Value applied:	0

Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology, for new reservoirs, this value is zero.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions (BE_y)

Combined margin CO_2 emission factor for the grid (EF_y)

The Brazilian DNA, through its Resolution nr. 8 dated May 26th, 2008, determined the Brazilian electricity system, for the purpose of CDM activities, as a single interconnected system comprehending the five geographical regions of the country (North, Northeast, South, Southeast and Midwest).

Also, the Brazilian DNA made available the build margin and the operating margin emission factors. This last one is calculated using option c – Dispatch data analysis OM. The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$. More information of the methods applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html). Then, data provided by the Brazilian DNA will be used in project's verification.

For estimation purposes, the emission factor of the year of 2007 provided by the Brazilian DNA was applied. When applying the published numbers in the formula presented in step 3 of Annex 3 the $EF_{grid,OM-DD,y}$ obtained was:

$$EF_{grid,OM-DD,\,2007} = 0.2909\ tCO_2e/MWh.$$

The building margin for the considered years is:

$$EF_{BM,\,2007} = 0.0775\ tCO_2e/MWh.$$

With these numbers, applying in the formula presented in step 6 of section B.6.1, we have:

$$EF_{2007} = 0.5 \times 0.2909 + 0.5 \times 0.0775$$

$$EF_{2007} = 0.1842\ tCO_2e/MWh.$$

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

Future electricity supplied by the project to the grid is estimated based on the energy assured of the hydropower plant (8.6 MW-ave) as presented in the project design "Projeto Básico" prepared by Intertechne in July 2008. Therefore, the energy exported to the grid of Ouro is 75,336 MWh/year (8.6 MW-ave x 8,760 hours of operation).

The plant load factor of a hydropower plant can be obtained by dividing the energy assured to the installed capacity of the plant. In the case of Ouro project, the plant load factor is 54% (8.6MW-ave/16MW). Since the energy assured of Ouro project was established in the project design by Intertechne (engineering company), the item b of Annex 11 (EB 48) was chosen for the ex-ante determination of Ouro plant load factor.

CO_2 emission factor (tCO_2/MWh)	0.1842

Table 11 - Net energy generation and baseline emissions

Year	**Net electricity produced (MWh)**	**Baseline emissions (tCO_2e)**
2012	75,336	13,875
2013	75,336	13,875
2014	75,336	13,875
2015	75,336	13,875
2016	75,336	13,875
2017	75,336	13,875
2018	75,336	13,875
TOTAL	**527,352**	**97,128**

Project emissions (PE_y)

Emissions from fossil fuel combustion ($PE_{FF,y}$)

Considering that there is no fossil fuel combustion in the proposed project activity, $PE_{FF,y}$ = 0 tCO_2/year.

Emissions from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Considering that the proposed project activity consists on the construction of a small hydropower plant, there are no emissions of non-condensable gases from the operation of geothermal power plants. Therefore, $PE_{GP,y}$ = 0 tCO_2/year.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

Considering equation 4, in section B.6.1, the power density of Ouro project is 177.77 W/ m^2 (or MW/km^2). Therefore, **PEy = 0**.

Emission reductions (ER_y)

Estimated emission reductions by the project activity are presented in section below.

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

Table 12 - Total emission reduction of the project in tCO_2

Years	**Estimation of project activity emissions** (tonnes of CO_2e)	**Estimation of baseline emissions** (tonnes of CO_2e)	**Estimation of leakage** (tonnes of CO_2e)	**Estimation of overall emission reductions** (tonnes of CO_2e)
Year 1 - (2012)	0.0	13,875	0.0	13,875
Year 2 - (2013)	0.0	13,875	0.0	13,875
Year 3 - (2014)	0.0	13,875	0.0	13,875
Year 4 - (2015)	0.0	13,875	0.0	13,875
Year 5 - (2016)	0.0	13,875	0.0	13,875
Year 6 - (2017)	0.0	13,875	0.0	13,875
Year 7 - (2018)	0.0	13,875	0.0	13,875
Total (tonnes of CO_2e)	**0.0**	**97,128**	**0.0**	**97,128**

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

B.7.1 Data and parameters monitored:

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data:	Project activity site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	75,336
Measurement procedures (if any):	Hourly measurement and monthly recording.
QA/QC procedures to be applied:	Electricity supplied by the project activity to the grid. Double checked by internal control and sales receipt or by the reports issued by *Câmara Comercializadora*

	de Energia Elétrica – CCEE.
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 and official documents.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	16,000,000
Measurement procedures (if any):	Determine the installed capacity based on recognized standards.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data:	Official source.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	90,000
Measurement procedures (if any):	The reservoir are will be monitored through topographical data in the location of the project activity (made once at the time of the project design) and the reservoir level, which will yearly monitored by project sponsor.
Monitoring frequency:	Yearly.
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1842
Measurement procedures (if any):	Data provided by the Brazilian DNA for the year of 2007. Once option c) for the calculation of the operating margin was chosen by the DNA, this value will be up-dated annually following the prescription of the tool.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EF_{grid.OM.y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data used:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website: (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.2909
Description of measurement methods and procedures to be applied:	The selected option to calculate the operating margin was the dispatch analysis which does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore. the chosen option was ***ex-post*** calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA.
QA/QC procedures to be applied:	
Any comment:	Option C) was chosen to calculate the operating margin. This option does not permit the *ex-ante* vintage for the calculation of the emission factor.

	Therefore, the emission factor will be calculated ***ex-post*** applying the numbers provided by the Brazilian DNA. For estimative purpose, data of 2007 year was used.

Data / Parameter:	$EF_{grid.BM.y}$
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data used:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website: (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0775
Description of measurement methods and procedures to be applied:	For estimative purpose, data of 2007 year was used. Option 2 of the tool was chosen. Hence, this parameter will be ***ex-post*** up-dated applying the numbers provided by the Brazilian DNA.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,j,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ **and** $FC_{i,n,h}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plant / unit *m, j, k* or *n* (or in the project electricity system in case of $FC_{i,y}$) in year *y* or hour *h*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the "Tool to calculate the emission factor for an electricity system".

Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$NCV_{i,y}$***
Data unit:	GJ/ mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the "Tool to calculate the emission factor for an electricity system".
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$EF_{CO2i,y}$ and $EF_{CO2m,i,y}$***
Data unit:	tCO_2/GJ
Description:	CO2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$EG_{m,y}$, EG_y, $EG_{j,y}$, $EG_{k,y}$ and $EG_{n,h}$***
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit *m, j, k* or *n* (or in the project electricity system in case of EG_y) in year *y* or hour *h*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored hourly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$EG_{PJ,h}$***
Data unit:	MWh
Description:	Electricity displaced by the project activity in hour *h* of year *y*

Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the "Tool to calculate the emission factor for an electricity system".
Description of measurement methods and procedures to be applied:	Data monitored hourly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit *m* in year *y*
Source of data us d:	Brazilian DNA (Comissão Intermi steria de Mudanç Global do Clim – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the "Tool to calculate the emission factor for an electricity system".
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	

Any comment:	

B.7.2 Description of the monitoring plan:

Ouro project will proceed according to the "Approved consolidated monitoring methodology ACM0002" – "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources". According to this methodology and as presented in this PDD, the parameters to be monitored for Ouro project are as follows:

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

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

(iii) Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (A_{PJ});

(iv) Parameters used for the calculation of the 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" ($EF_{grid,CM,y}$).

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

The project will proceed with the necessary measures for the power control and monitoring. The electricity produced by the project activity will be monitored by using a meter equipment projected to registry and verifies bidirectionally the energy dispatched by the facility (electricity exported minus imported).

There are four energy meters, all of them of the models specified by the Chamber of Electric Energy Commercialization (from the Portuguese *Câmara de Comercialização de Energia Elétrica – CCEE*). CCEE makes feasible and regulates the electricity energy commercialization.

Two of these four meters will be installed at the SHPP and the other two (principal and backup) will be located at the *SE Campos Novos* substation. Before the operations start, CCEE demands that these meters are calibrated by an entity with Brazilian Calibration Network (in a free translation from the Portuguese *Rede Brasileira de Calibração – RBC*) credential. Brennand Energia will be responsible for the calibration of meters located at the power plant and the local power utility (Centrais Elétricas de Santa Catarina S/A – CELESC) for the calibration of meters located at the substation. Calibration will be made according to the procedures established by the ONS[61] (each 2 years).

Table 13 - Description of meters

Ouro SHPP	
Manufacturer	Landis+Gyr[62]
Quantity	4
Type	SAGA 1000
Model	1681-A
Accuracy Class	0,2%

Measurements will be controlled in real time by the company's Operation and Management Center (from the Portuguese *Centro de Operações de Geração – COG*) located in Cuiabá, capital of Mato Grosso State. Measurement data will be compared between the meters, so that any problems can be detected. In case of any problem, plant personnel will be put in action. The Technical Department will be responsible for collecting and archiving of measurement data.

For invoice purposes, ONS recommendations[63] will be followed and meters measurements will be sent in default reports to CCEE (XML files). In the future, CCEE will have online access of meters measurements located at the substation.

As information from the meters located at the substation will be used for invoice purposes, it will also be used for emission reductions calculation.

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[61] Please refer to the document "*Módulo 12 do ONS, Submódulo 12.3 – Manutenção do sistema de medição para faturamento*". Available at: http://www.ons.org.br/download/procedimentos/Submodulo%2012.3_v10.0.pdf.

[62] For more information, see the website: <http://www.landisgyr.com.br/default.asp?opcao=29&subopcao=95>.

[63] Módulo 12. Invoice metering (from the Portuguese *Medição para faturamento*). Available at: <http://www.ons.org.br/procedimentos/modulo_12.aspx>.

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

Installed capacity of the power plant will be checked by DOE during on-site visit at every verification and cross-checked with official documents, *e.g.* ANEEL resolution or licenses issued by the environmental agency of Rio Grande do Sul State.

(iii) Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (A_{PJ})

The reservoir area will be monitored through topographical studies (made at the time of the project design) and water reservoir levels, which will be monitored by the project sponsors. This information will be available at the time of the project verification.

(iv) Parameters used for the calculation of the 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" ($EF_{grid,CM,y}$)

The grid emission factor presented in this PDD was calculated by the Brazilian DNA (available at: http://www.mct.gov.br/index.php/content/view/307492.html), using the Dispatch Data Analysis for the Operating Margin. The Build Margin emission factor was determined using the generation-weighted average emission factor of all power units during the most recent year for which power generation data was available. Therefore, the emission factor of 0.1842 tCO_2e/MWh was accepted just for estimating the expected emission reductions of the project activity during the crediting period. Hence, the emission factor calculation used in this PDD, for estimating purposes only, must be verified and updated accordantly using the most recent data available at the time of the verification process.

The Brennand Group, which controls Ouro Energética S.A., will be responsible for the maintenance of the monitoring equipment, dealing with possible monitoring data adjustments and uncertainties, reviewing of the reported results/data, caring out internal audits of GHG project compliance with operational requirements and for corrective actions. Also, the Group will be responsible for the project management, as well as for organising and training of the staff in the appropriate monitoring, measurement and reporting techniques. Also, Brennand is preparing an operation, maintenance and emergency manual, based on the procedures adopted in the other SHHPs of the group. Technicians will be trained previously to the start-up of the plant in the laboratories of the electrical devices supplier, Grameyer.

In the first year of operation there will be 4 operators at the plant. In the following years only one operator will be working at the plant because all the operation will be remotely controlled through COG. Also, ANEEL can visit the plant to inspect the operation and maintenance of the facilities confirming that the project follows the required procedures.

The figure below shows the chart flow with the operational and management structure for the CDM project activity.

Operational Board

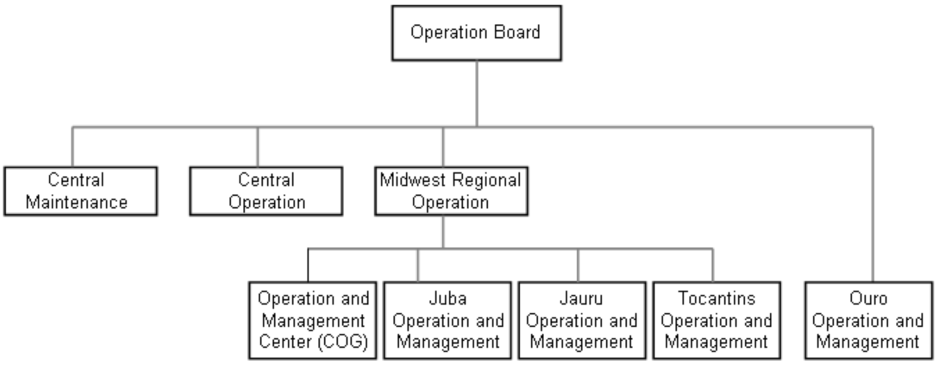

Figure 11 - Operational Board chart flow

The Brennand Group has hired expert companies to execute their environmental programs. After the beginning of the commercial operations, renovation of degraded areas and of permanent preservation areas will be done according to the regulations of the environmental agencies, through a team of environment experts, that will also monitor the compliance with the environmental agencies' regulations. Studies done during the design phase of the project activities have shown the environmental impacts and the interference on the social development in the region of the plant, indicating the mitigation measures to be adopted during the construction phase. These measures are being taken rigorously. Data about environmental impact are being archived by the SHPP and the environmental agencies.

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

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 baseline section and the monitoring methodology (DD/MM/YYYY): 16/06/2009.

Name of person/entity determining the baseline:

Company:	Ecopart Assessoria em Negócios Empresariais Ltda.
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Country:	Brazil
Contact person:	Ricardo Esparta
Job title:	Director
Telephone number:	+55 (11) 3063-9068
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Ecopart Assessoria em Negócios Empresariais Ltda. is Project Advisor and Project Participant.

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:

The CDM glossary of terms defines the starting date of a non A/R project activity as “the earliest date at which either the implementation or construction or real action of a project activity begins”.

From the above definition, the following dates were analyzed:

- Turbines and generators purchase: 28/02/2007
- EPC contract signature: 05/07/2007
- Start of construction: 01/08/2007
- PPA signature: 01/12/2007
- Financial closure: 25/08/2008

Considering the timeline above, the purchase of the main equipments of the project (turbines and generators) happened first and, therefore, it is considered as the project starting date. More information can be seen in section B.5.

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

24y-3m[64]

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:

01/01/2012 or on the date of registration of the CDM project activity, whichever is later.

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[64] According to ANEEL Resolution nr. 537 issued on October 14th, 2003, Ouro project is authorized to be constructed and operated for 30 years from the date of the authorization publication. Since the project started operations in 2009, the expected operational lifetime of the project is 24 years and 3 months. It is important to mention that the financial analysis (considered at the time of the investment decision) 25 years and 5 months of operational lifetime of the project, since the estimated date for the project start operation was 2008. PPs clarify that it is not uncommon occur delays in the construction process.

C.2.1.2. Length of the first crediting period:

7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

In Brazil, the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially polluting activity or any other capable to cause environmental degradation is obliged to secure a series of permits from the relevant environmental agency (federal and/or local, depending on the kind of project and location).

The environmental impact of the Project is considered small given the smaller dams and reservoir size. Despite of that, project sponsors have to obtain all licenses required by the Brazilian environmental regulation (Resolution CONAMA - *Conselho Nacional do Meio Ambiente* (National Environmental Council) nr. 237/97):

- The preliminary license (Licença Prévia or LP),
- The construction license (Licença de Instalação or LI); and
- The operating license (Licença de Operação or LO).

Accordingly to article 3 of this Resolution, the issuance of environmental licenses for Project with significant environmental impacts permits only occurs after the development of an Environmental Impact Assessment. For projects that do not incur in significant impacts the environmental agency establishes the boundaries of the assessment that has to be made to evaluate the project. This was the case of SHHP Ouro which activities didn’t cause significant impacts. In this sense, the environmental agency only asked for a Preliminary Assessment which was developed in August 2001.

The environmental permit process has an administrative nature and was implemented by the National Environmental Policy, established by the Law nr. 6938 dated on October 31st, 1981. Additionally, other norms and laws were issued by CONAMA and local state agencies.

In order to obtain all environmental licenses every small hydro projects shall mitigate the following impacts:

- Inundation of Indian lands and historical areas of slavery – the authorization for that depends on National Congress decision;
- Inundation of environmental preservation areas, legally formed as National Parks and Conservation Units;
- Inundation of urban areas or country communities;
- Reservoirs where there will be urban expansion in the future;
- Elimination of natural patrimony;
- Expressive losses for other water uses;
- Inundation of protected historic areas; and
- Inundation of cemeteries and other sacred places.

The process starts with a previous analysis (preliminary studies) by the local environmental department. After that, if the project is considered environmentally feasible, the sponsors have to prepare the Environmental Assessment, which is basically composed by the following information:

- Reasons for project implementation;
- Project description, including information regarding the reservoir;
- Preliminary Environmental Diagnosis, mentioning main biotic, and anthropic aspects;
- Preliminary estimation of project impacts; and
- Possible mitigating measures and environmental programs.

The result of those assessments is the Preliminary License (LP), which reflects the environmental local agency positive understanding about the environmental project concepts.

In order to obtain the Construction License (LI) it is necessary to present (a) additional information about previous assessment; (b) a new simplified assessment; or (c) the Environmental Basic Project, according to the environmental agency decision informed at the LP.

The Operation License (LO) is a result of pre-operational tests during the construction phase to verify if all exigencies made by environmental local agency were completed.

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:

For the issuance of the Construction License, the Rio Grande do Sul Environmental Agency requested the implementation of the following programs for Ouro SHPP Project, also mentioned in the Environmental Program Report of the Project:

- Seismologic monitoring;
- Reservoir cleaning;
- Vegetation and wild fauna monitoring program;

- Fauna rescue program;
- Limnology and water quality monitoring program;
- Conservation units implementation program;
- Riparian implementation program;
- Environmental optimization program;
- Environmental communication program;
- Lands acquisition program;
- Public health program;
- Inclusion of the project in the local landscape and leisure and tourism infrastructure implementation;
- Silvestre fauna and flora rescue (terrestrial and aquatic);
- Fauna and flora monitoring;
- Reforestation;
- Quality of water monitoring;
- Erosion control;
- Degraded area recuperation;
- Environmental education;
- Archaeological monitoring.

The plant possesses the preliminary, construction and operation licenses issued by the Rio Grande do Sul Environmental Agency (*FEPAM - Fundação Estadual de Proteção Ambiental Henrique Luiz Roessler*). The Operation License was issued on March, 13th, 2009 and is valid until March 12th, 2013.

The water impound permit was issued by Hydrologic Resources Department from the Environmental Agency of the state of Rio Grande do Sul (in a free translation form the Portuguese *Departamento de Recursos Hídricos da Secretaria do Meio Ambiente do Rio Grande do Sul*), on August 25th, 2008. This permit authorizes the SHPP to use Marmeleiro's river water to generate electricity.

The project does not imply negative transboundary environmental impacts, on the contrary the licenses would not be issued. All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency (FEPAM) and with the project participants.

SECTION E. Stakeholders' comments

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

Brazilian Designated National Authority "*Comissão Interministerial de Mudanças Globais do Clima*", request comments for local stakeholders, and the validation report issued by an authorized DOE according to the Resolution nr. 1, issued on 11th September 2003, in order to provide the letter of approval.

The Resolution determines the direct invitation for comments sent by the project proponents at least to the following agents involved in and affected by project activities and at least 15 days before the GSP:

- *Municipal governments and City Councils;*
- *State and Municipal Environmental Agencies;*
- *Brazilian Forum of NGOs and Social Movements for Environment and Development;*
- *Community associations;*
- *State Attorney for the Public Interest (state and federal).*

Invitation letters were sent to the following agents – by postal – on June 17th, 2008:

- City Hall of Barracão (Prefeitura Municipal de Barracão);
- Municipal Assembly of Barracão (Câmara Municipal de Barracão);
- Environmental Agency of Barracão (Secretaria de Saúde e Meio Ambiente de Barracão);
- Communitarian Association of Barracão (Colégio Estadual Jesus Menino);
- Environmental Agency of Rio Grande do Sul (Secretaria de Meio Ambiente do Rio Grande do Sul);
- Environmental Agency of Rio Grande do Sul (FEPAM – Fundação Estadual de Proteção Ambiental Henrique Luiz Roessler);
- State Attorneys for the Public Interest of Brazil and Rio Grande do Sul state (Ministério Público Federal e Ministério Público do Estado do Rio Grande do Sul);
- Brazilian Forum of NGOs and Social Movements for the Development and Environment (Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente).

Copies of the letters and post office confirmation of receipt are available upon request and were submitted to the DOE during the validation of the Project Activity.

Summary of the comments received and report on how due account was taken of any comments received are presented below.

E.2. Summary of the comments received:

A letter from the State of Attorney for the Public Interest of Rio Grande do Sul was received on April 26th, 2010. The State of Attorney requested documented evidence related to the compliance with the conditioning 10 presented in the Operation License and related to the land donation of 133 hectares for the Espigão Alto Park of Rio Grande do Sul State.

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

Considering the comments received, Project Participants responded the correspondence letter on May 26th, 2010 stating that conditioning 10 of the Operation License was fulfilled as demonstrated in the letter nr. 3729/2010 of the environmental agency of the state (FEPAM) and that 133 hectares of land was donated as demonstrated in the Conduct Term Adjustment between Ouro Energética S/A and the State of Attorney of Rio Grande do Sul. In addition, Project Participants corrected the date of the Operation License issuance presented in the PDD (version 4).

In response for the correspondence letter sent by the Project Participants, the State of Attorney for the Public Interest of Rio Grande do Sul confirmed that the response was satisfactory and no other concerns were raised.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the present project.

This project is not a diverted ODA from an Annex 1 country.

Annex 3

BASELINE INFORMATION

The Brazilian electricity system, for the purpose of CDM activities, was delineated as a single interconnected system comprehending the five geographical regions of the country (North, Northeast, South, Southeast and Midwest). This was determined by the Brazilian DNA through its Resolution nr. 8 dated May 26th, 2008. The Brazilian DNA has also published the build and operating margin for the Brazilian Interconnected System of the year of 2007 (**Erro! Fonte de referência não encontrada.**) – the most recent available information at the time of validation start.

Table 14 - Summary of operating margin (monthly) and build margin (annual) published by the Brazilian DNA

Emission factor, combined margin, Brazilian Interconnected Grid ($EF_{CM} = 0.5 \times EF_{OM} + 0.5 \times EF_{BM}$) [$tCO_2$/MWh]												
--- 2007 ---	January	February	March	April	May	June	July	August	September	October	November	December
EF_{OM}	0.2292	0.1954	0.1948	0.1965	0.1606	0.2559	0.3096	0.3240	0.3550	0.3774	0.4059	0.4865
EF_{BM}	0.0775											
EF_{CM} (monthly)	0.1533	0.1364	0.1361	0.1370	0.1190	0.1667	0.1935	0.2007	0.2163	0.2274	0.2417	0.2820
EF_{CM} (annualy)	**0.1842**											

More information is available at the Brazilian DNA website (http://www.mct.gov.br/upd_blob/0024/24719.pdf).

The option chosen by the DNA to calculate the operating margin was option c) dispatch data analysis. Therefore the emission factor has to be updated annually. Consequently, the emission factor can only be estimated *ex-ante* assuming a constant generation of the electricity by the project's plant.

Annex 4

MONITORING INFORMATION

Methodology applicable to this project is the approved consolidated monitoring methodology ACM0002 – “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”. More information can be seen at section B.7.2 – Description of the monitoring plan.