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

CONTENTS

Annexes

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Incomex Hydroelectric Project
PDD Version 14
17/11/2008

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

The Incomex Hydroelectric Project (hereafter, the Project) developed by Incomex – Indústria, Comércio e Exportação Ltda. together with Cassol, as proponents and operators of the project, consists of a bundle of three small run-of-river hydroelectric projects[1]:

- Rio Branco, located at Alta Floresta D'Oeste in Rondônia state with 6.9MW installed capacity;
- Monte Belo, located at Alta Floresta d'Oeste in Saldanha river in Rondônia state with 4.8 MW installed capacity and;
- CABIXI II, located at Comodoro, in Lambari river in Mato Grosso state with 2.8 MW installed capacity.

The units are connected to Rondônia-Acre isolated electricity system[2], which is located in Rondônia State, north region of Brazil. They are located in very remote areas, and bring electricity to develop these areas socially and economically, which has always been an important and difficult issue to be solved by the Brazilian authorities. The solution for the electricity supply problem in these areas was to set up what is known as an isolated electricity system which uses predominantly thermal power plants, fired by fossil fuels. This project will displace some of that thermal generation with a renewable source of energy.

This cleaner source of electricity will have an important impact upon environmental sustainability, by reducing carbon dioxide emissions that would have occurred otherwise in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding the use fossil fuel based thermal units.

Since it deals with Run of River hydropower plants, the project presents significantly less negative environmental impacts than large hydropower facilities (which is the business as usual scenario in Brazil), mainly because it has either no, or a very small, flooded area.

The participants of the project recognize that Incomex Hydroelectric Project is helping Brazil fulfil its goals of promoting sustainable development. Specifically, the project is in line with host-country specific CDM requirements because it:

- Contributes to local environmental sustainability since it will decrease use of fossil energy based on diesel sources, the predominant type of fuel used on isolated systems, and replace it with

[1] The capacities of the units are given according to the ANEEL records that can be seen at http://www.aneel.gov.br/aplicacoes/capacidadebrasil/UsinaListaSelecao.asp. Please check Annex 5 for more information regarding installed capacity.

[2] Note that before May 2008, this system was split into two separate systems (Rondonia-Acre and Cone-Sul) and that it may be connected to the national electricity grid in the future – see section B.6.1 for details.

alternative renewable hydro energy. Also, in the absence of this project, energy generation in Rondônia State would still not reach the entire population and diesel would be the first option in the region. Therefore, the project contributes to the better use of natural local resources. In addition, it uses clean and efficient technologies.

- Contributes towards better working conditions and increases employment opportunities in the area where the project is located – the new plant will require a whole team for operation, management and repair services;
- Contributes towards better revenue distribution since the use of a renewable fuel decreases dependence on fossil fuels; decreases the pollution and therefore the social costs related to this. In addition the project diversifies sources of electricity generation, and decentralizes energy generation;
- Contributes to technological and capacity development – all technology, hand labour and technical maintenance will be provided inside Brazil. The whole system including turbines and generators represents technology with high efficiency. This type of project can stimulate further innovative initiatives inside the Brazilian energy sector: it acts as a clean technology demonstration project, encouraging the development of modern and more efficient renewable energy units throughout Brazil;
- Contributes to regional integration and connection with other sectors – the project facilitates the increase in hydroelectricity as a generating source in the region and therefore may encourage other similar companies that want to replicate the experience of Incomex. Also, it creates an alternative market for this kind of energy generation, indirectly joining the Brazilian energy and environmental sectors.

A.3. Project participants:

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Country)	Incomex – Indústria, Comércio e Importação Ltda.	No
	Grupo Cassol Energia	No
Switzerland	EcoSecurities Group plc	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Ltd.	No

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

Further contact information of project participants is provided in Annex 1.

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

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

A.4.1.1. Host Party(ies):

Brazil

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

SHP Rio Branco and SHP Monte Belo – located in Rondônia State; connected to the isolated system Rondônia-Acre.
SHP Cabixi II – located in Mato Grosso State. Although this plant is in a different State, it belongs to Cone-Sul isolated system, in Rondônia.

A.4.1.3. City/Town/Community etc:

Rio Branco – in the municipality of Alta Floresta d'Oeste.
Monte Belo – the municipality of Alta Floresta d'Oeste.
Cabixi II – the municipality of Comodoro.

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

1. Small Hydro Rio Branco – located in the Branco river – 11°54'35"S and 62°10'49"N, in the State of Rondonia (RO), north region of Brazil.
2. Small Hydro Monte Belo – located in the Saldanha river - 11 °57'08.2"S and 62 °10'58.7"W, in the State of Rondonia (RO), north region of Brazil.
3. Small Hydro Cabixi II – located in the Lambari river – 13 °01'20.0" S and 60 °08'01.7"W, in the State of Mato Grosso (MT), mid-west region of Brazil.

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

The Project falls under UNFCCC sectoral scope 1: Energy industries (renewable - / non-renewable sources). According to Appendix B of the UNFCCC's published simplified procedures for small scale activities, the category of this project activity is:
Type I: Renewable Energy Project
Category I.D: Grid Connected Renewable Energy Generation

It is a Renewable electricity generation project for a grid (run-of-river hydro power plants). Total installed capacity for 3 energy units is 14.5 MW (please check annex 5 for more information regarding installed capacity). The Project conforms to the small projects Type 1.D since the nominal installed capacity of the Project is below the 15 MW threshold and the plants will sell their generated electricity to the grid.
Small Hydro run-of-river projects consist of the use of water, either from storage in small holding ponds or directly from the river, to generate electricity. The water's gravitational power is used to move the turbine and by doing so generates electric power. It is a clean and renewable source of energy that has minimum impact on the environment.

A run-of-river project is defined as "the project where the river's dry season flow rate is the same or higher than the minimum required for the turbine" (Eletrobrás). According to the Brazilian Power Regulatory Agency ANEEL, to be considered a Small Hydro, the area of the reservoir must be less than 3 Km^2 and generation capacity must be less than 30 MW. In case of Monte Belo and Rio Branco plants,

both units uses water directly from the river, without any dam or minimum flooded area. In case of Cabixi II, this unit presents a 0.2 km^2 of flooded area. None of those units generates more than 30 MW.

All 3 hydro units will use Brazilian turbines of the Francis model (Hydraulic reactor turbine in which the flow exits the turbine blades in a radial direction), produced by Hidráulicas S/A – HISA; that turbine is widely used among water turbines, and its performance can be calculated by comparing the output energy to the energy supplied (see tables below). The expected average load factor of the turbines is approximately 65%.

Table - Monte Belo Plant main characteristics.

Monte Belo	
Installed Capacity	4.8 MW
Turbine	2 Francis
Efficiency	92 %

Table - CABIXI II Plant main characteristics.

Cabixi II	
Power	2.8 MW
Turbine	1 Francis
Efficiency	92%

Table - Rio Branco Plant main characteristics.

Rio Branco	
Power	6.9 MW
Turbine	3 Francis
Efficiency	94 %

The Project uses well established hydro power generation technology for electricity generation and transmission. Please check annex 5 for more information regarding installed capacity.

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

A renewable crediting period is used, with 3 periods of 7 years for Rondônia-Acre isolated electricity system. This PDD refers to the second period of 7 years (first renewal of the crediting period). Total life cycle of the project is 21 years.

Table - Annual estimation of emission reductions over the chosen crediting period.

Years	Annual estimation of emission reductions in tonnes of CO2e
2008 (February - December)	75,754
2009	86,262
2010	86,262
2011	86,262
2012	86,262

2013	86,262
2014	86,262
2015(January - January)	7,189
Total estimated reductions (tonnes of CO2e)	600,515
Total number of Crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	85,788

Refer to section B.6.3 for further details on the quantification of GHG emission reductions associated with the Project.

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

The Project will not receive any public funding from Parties included in Annex I of the UNFCCC.

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

Based on the information provided in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities[3], the Project is not a part of any large scale project or program and is not a debundled component of a large project activity.

The project participants have not registered or are not applying to register any other small-scale CDM project activity.

[3] http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

SECTION B. Application of a baseline and monitoring methodology

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

The proposed project activity falls under Type/Category I.D. - Grid connected renewable electricity generation - I.D/Version 13, approved at EB36.

The grid emission factor was calculated following the steps described in the "Tool to calculate the emission factor for an electricity system", version 01.1, approved at EB35.

The baseline was updated according to the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period," as contained in Annex 1 of the "Procedures for renewal of the crediting period of a registered project activity" (version 5, approved at EB46).

For more information about the methodology, please refer to the following website:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

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

AMS I.D. version 13 is applicable since:

- The Project activity is a renewable electricity project (hydroelectric)
- The Project activity is not a combined heat and power (co-generation) system
- The Project activity has an output capacity lower than 15 MW (Decision -/CMP2 paragraph 28 (a): the project has an installed capacity of 14.5 MW. Please check Annex 5 for more information regarding installed capacity.
- The electricity generated by the Project activity is supplied to a grid that is or would have been supplied by at least one fossil fuel fired generating unit (the Rondônia-Acre isolated electricity system).

B.3. Description of the project boundary:

As referred to in Appendix B for small-scale project activities, methodology AMS-I.D, the project boundary for a small-scale hydropower project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source (see Table B.3. below). It also includes all power plants connected physically to the Rondônia-Acre isolated electricity system to which the Project is connected.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table B.3. below.

Table - Emission sources and gases included in the project boundary for the purpose of calculating project emissions and baseline emissions.

	Source	Gas	Status	Justification / Explanation
Basel ine	CO_2 emissions from electricity generation in fossil fuel fired power plants connected to the	CO_2	Included	According to AMS.I.D equations, only CO_2 emissions from electricity generation should be accounted for.

	Rondônia-Acre isolated electricity system	CH_4	Excluded	According to AMS.I.D.
		N_2O	Excluded	According to AMS.I.D.
Project Activity	Incomex Hydroelectric Project electricity production	CO_2	Excluded	According to AMS.I.D.
		CH_4	Excluded	According to AMS.I.D.
		N_2O	Excluded	According to AMS.I.D.

B.4. Description of baseline and its development:

This section is divided into two parts:

1. The first part is an updated version of section B.3 of the PDD initially registered[4]
2. The second part is the update of the baseline for the second crediting period according to the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period".

1. Updated baseline section

The baseline for the project was established with reference to the methodology applicable to the project activity. All assumptions and rationale of the baseline development as well as all data used to determine the baseline emissions are described in this section.

The project consists of a new electricity generation facility that will supply electricity to the grid. Electricity delivered to the grid by the project 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 in B.6.1.

The following table provides the key information and data used to determine the baseline scenario:

Table - key information and data used to determine the baseline scenario

Variable	Unit	Data Source
Operating Margin Emissions Factor (EF_OM_y, in tCO_2/MWh)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON
Build Margin Emissions Factor (EF_BM_y, in tCO_2/MWh)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON
Baseline Emissions factor (EF_y)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON

The technology employed in the baseline is the technology already used in the grid. Electricity generation in the grid is predominantly based in diesel fueled thermoelectric plants with internal combustion technology or fuel oil fueled thermoelectric plant with one combined cycle. Also, a small share of the electricity is generated by hydroelectric plants.

[4] Although such update is not necessary according to the procedures to renew the crediting period, project participants have updated some of the information contained in sections B.4 and B.5 compared to the PDD initially registered.

The baseline is defined as the Rondônia-Acre isolated electricity system, it consists in 9 thermoelectric plants, totalling 681.55 MW of installed capacity and 13 hydroelectric plants totalling 259.50 MW of installed capacity. The components of the grid, and thus of the baseline, are provided in the table below. For more details please see Annex 3.

Table - Baseline grid

Units	Type	Installed Capacity (MW)
Rio Branco	Hydro	6.90
Cabixi II	Hydro	2.80
Termonorte II	Thermal	349.95
Monte Belo	Hydro	4.80
PCH Altoe	Hydro	1.10
Alta F. D'Oeste	Hydro	5.00
PCH ST. Luzia	Hydro	3.00
Termonorte I	Thermal	68.00
PCH Cachoeira	Hydro	11.12
PCHs Castaman 2	Hydro	0.50
PCH Cabixi 1	Hydro	2.70
Rio Acre	Thermal	45.80
PCHs Castaman 3	Hydro	1.48
Rio Branco II	Thermal	32.40
PCHs Castaman 1	Hydro	1.50
Samuel	Hydro	216.00
PCH Rio Vermelho	Hydro	2.60
UTE Colorado	Thermal	10.95
UTE Vilhena	Thermal	23.75
Rio Madeira	Thermal	83.00
Rio Branco I	Thermal	18.10
Barro Vermelho	Thermal	49.60

For this analysis, the following scenarios were considered to be the most realistic and credible:

- Scenario 1 - The continuation of current activities – This scenario represents the continuation of current practices. Electricity demand is supplied by the current generation mix of the Rondônia-Acre isolated electricity system, which comprise a significant proportion of fossil fuelled units.

- Scenario 2 - The project activity (construction of a small hydro generation plant) undertaken without being registered as a CDM project activity.

2. Update of the baseline for the second crediting period

This update is done according to the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period".

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

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

There are no new rules or legislations in Brazil that go against the previously established baseline for the first crediting period, i.e. electricity could continue to be generated by the plants feeding the grid. There are several new SHPs requesting validation in Brazil (i.e. Faxinal dos Guedes Small Hydroelectric Power Plant, ARS Small Hydroelectric Power Plant, Electra Power CDM Project). It shows that the revenues from the CDM is still being considered an important point in the project decision to move forward and also that there is no new relevant mandatory national and/or sectoral policies that should be considered to define a new baseline scenario for this project activity.

Step 1.2: Assess the impact of circumstances

The only new circumstance to the baseline is the interconnection of the two isolated electricity grids (Rondônia-Acre isolated electricity system and Cone Sul Isolated electricity system) that were applicable during the first crediting period and the first 3 months of the second period (February to May 2008). In May 2008, both grids got interconnected; the new grid is still called the Rondônia-Acre isolated electricity system but it now includes the former Cone-Sul isolated electricity system). However, this change is addressed in the Grid Emission Factor calculations only, not having any real impact on the baseline scenario choice.

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

Not applicable since the project activity is not a retrofit of existing equipment.

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

Some parameters determined at the start of the crediting period and not monitored were updated to reflect the newest data possible. This update includes Grid Emission Factor and all values used in its calculation (including OM, BM and emission factors from fuels).

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

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period was updated, without reassessing the baseline scenario, based on the latest approved version of the methodology AMS-I.D. This update was applied in the context of the sectoral policies and circumstances that were applicable at the time of request for renewal of the crediting period. The updated baseline emissions for the second crediting period can be seen in section B.6.1 (updated calculations) and B.6.4 (updated summary of emissions).

Step 2.2: Update the data and parameters

As mentioned in step 1.4 above, all parameters regarding the grid emission factor calculation were updated to this second crediting period. All new values can be seen in section B.6.2 (updated ex-ante parameters), B.6.3 (updated results of calculations) and B.7.1 (updated monitoring parameters).

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

Introduction

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, project participants should provide an explanation to show that the project activity is additional (i.e. would not have occurred anyway) due to at least one of the following categories of barriers: (a) investment, (b) technological, (c) prevailing practice and (d) other barriers. This section will describe the
barriers faced by each scenario; the most plausible scenario will be the one with the fewest barriers.

The barriers are as follows:

- Investment barrier – This barrier evaluates the viability, attractiveness and financial and economic risks associated with each scenario, considering the overall economics of the project and/or economic conditions in the country.

- Technological barrier – This barrier evaluates whether the technology is currently available, if there are skills to operate it, if the application of the technology is of regional, national or global standard, and generally if there are technological risks associated with the particular project outcome being evaluated.

- Barrier due to prevailing practice – This evaluates whether the project activity represents prevailing business practice in the industry. In other words, it assesses whether in the absence of regulations it is a standard practice in the industry, if there is experience to apply the technology and if there tends to be high-level management priorities for such activities.

- Other barriers - This barrier evaluates whether without the project activity emissions would have been higher, for any other reason identified, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies.

General Context

The majority of the Brazilian electricity system is connected to the Brazilian Interconnected System (SIN – *Sistema Interligado Nacional*); about 97% of the electricity generation capacity is included in the SIN. The remaining 3% of electricity generation capacity corresponds to small isolated grids, predominantly thermal, fuelled with fossil fuels.

According to the audit report elaborated from the Brazilian Court of Audit (2004)[5], the Brazilian Electricity System mainly consists of an interconnected system that includes the South, Southeast, Middle-West, Northeast and part of the North Regions. The North Region is predominantly supplied by isolated systems, which are mostly fuelled by diesel. In 1993 in order to promote the development of the North Region, the Brazilian Government adopted a law - 8631/93 - that obliged all energy concessionaires to share proportionally the fuel consumption costs incurred by the isolated systems. Therefore, the electricity would be available in the North Region at a reasonable price. This obligation is

[5] All references are listed at the end of the PDD

called CCC (from Portuguese "*Conta Consumo de Combustíveis*", which means Fuel Consumption Account), and creates an effective subsidy for electricity generation in isolated grids.

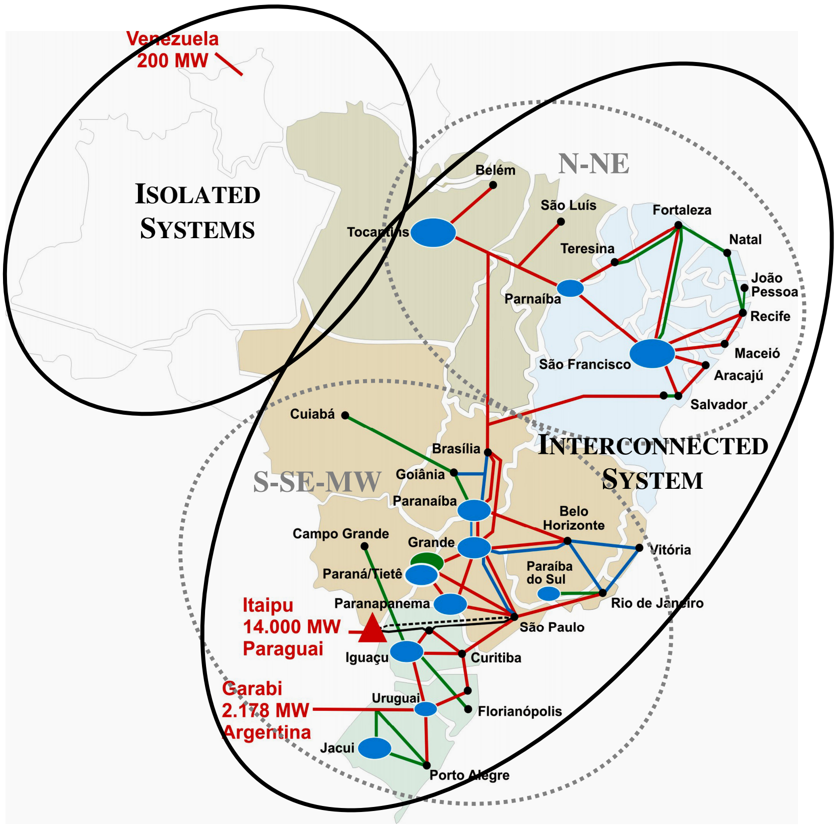

Figure - Brazilian electric system

The isolated systems are located in the Amazonian region; examples of isolated systems are Rondônia-Acre isolated electricity system, located in the north-western part of Brazil. This is the system applicable to the Project. The figure above illustrates the Brazilian electricity system. Laws and regulations are different for isolated systems in Brazil than for the larger interconnected systems. In the isolated system, thermoelectric generation is highly subsidised by the government (CCC subsidy) to provide electricity prices at a reasonable price for the consumers. As result, the generation mix in this region is very different from the interconnected one.

Besides CCC, the government also created the CCC Subrogation (law no. 9648/98). This policy was implemented because CCC only applies to electricity generation from thermal units fired by fossil fuels. The CCC subrogation now says that renewable energy can also apply for the subsidy. Therefore, the subrogation of CCC resources facilitates the replacement of fossil fuel consumption by other alternative and renewable sources, as for example, hydro energy (Tolmasquim, 2004).

The CCC Subrogation could represent an attractive incentive: according to ANEEL (National Electricity Agency), for the implementation of a new generation unit, the construction can be subsidised by between 50% and 75%, and therefore the internal rate of return for those investments can increase considerably. However, there are still two main obstacles involved in the CCC Subrogation that will be better described in the financial barriers items below, specifically considered in this project.

According to "ANEEL CCC + CCC subrogation utilization guide" other legal frameworks should be created in order to assist the switch of energy sources from fossil fuels to renewable fuels, in which the Kyoto Protocol is suggested as an alternative.

As quoted by the Brazilian National Court of Audit in 2004, the economical situation of CERON (Centrais Elétricas de Rondônia S.A), the Electricity Distribution Company in the North region (also called concessionaires) to which the Project supplies electricity, is not very good. CERON has a very high indebtedness index, which may lead to their not making electricity payments, short and long term. This results in a lack of security about the payback for investments in the electricity sector.

A programme created by the Brazilian Government, the "*Luz para Todos*" (LPT), has encouraged the installation of fossil fuelled thermal units. The goal of the LPT is to provide electricity to households in rural areas. These areas are, in general, located in the North region of the country, where the Project is located. The LPT goal has been achieved mainly by installing diesel generators in isolated areas. This supports the argument that the trend in isolated systems is the installation of fossil fuelled thermal units, not renewable energy units. This is especially true in regards to small scale generation (less than 5 MW). Furthermore, the recently published government report *Annual Operational Plan 2008 for Isolated Systems* shows that the thermal capacity of CERON increased while the hydroelectric capacity proportionally decreased.

Barrier analysis

The project faces significant economical and prevailing practice barriers as described in the barrier analysis below.

With respect to the **investment barrier**:

- The continuation of current practices (Scenario 1) does not pose any investment barrier to the project developer, and requires no further financing. The greater part of the energy supplied to the isolated system being considered by this project comes from diesel fuelled thermal units. From a total of 941.05 MW of installed capacity in the Rondônia-Acre system, 681.55 MW comes from thermal units, whilst from a total of 47 MW of installed capacity in the Cone-Sul isolated system, 26 MW comes from thermal units. Moreover, this scenario is not likely to change since all fossil fuel fired thermal generation units in the isolated system are subsidized by the CCC - a tariff shared by all Brazilian electricity consumers directly charged on the electricity bill. This subsidy is easy to collect, lacks monitoring from contributors and provides no incentive to improve efficiency related to the fossil fuel consumption[6].

- The construction of a renewable energy plant (Scenario 2) faces specific investment barriers despite the fact that the project is receiving subsidies from the CCC Subrogation – a subsidy created to promote the substitution of thermal electricity generation capacity using fossil fuels by renewable electricity generation capacity. The Brazilian Court of Audit assessed in 2004 that projects under CCC Subrogation face substantial obstacles, specifically the three investment barriers listed below are most relevant:

  Lack of long-term financing available for medium sized investors. According to the report provided by the Brazilian Court of Audit (2004), page 17, there are two main barriers to the long-

[6] Brazilian Court of Audit, 2004.

term financing for medium sized renewable power project investors: obtaining a Power Purchase Agreement in advance, which is more difficult to obtain for renewable energy projects, and the behaviour of the Concessionaries of Electricity Distribution Services (hereafter referred to as "utilities") that have no obligation or interest to substitute the use of fossil fuels for renewable resources, even if investors present feasible and economically attractive projects. Therefore, the utilities' option to continue using fossil fuel to generate electricity weakens the CCC-subrogation mechanism and disadvantages renewable power projects.
Furthermore, sponsors require very high guarantees in order to invest in electricity projects in isolated grids in Brazil. Even the Brazilian Development Bank (BNDES) requires 130% of the financed value in guarantees for any operation using its resources[7]. The project developer of the plants in the project activity is a very small developer, making it difficult for the company to provide that guarantee. Moreover, the poor financial performance of the North-Brazilian utilities discourages investors from financing renewable energy projects in the region. Hence getting financing for the implementation of the plants is a real barrier to the Project.

Lack of interest from energy utilities. As mentioned in the "general context" above, the financial situation of CERON was not good in the time of the registration of this project activity and is still not good. An analysis of the data from the past few years shows that the company's debts have increased (both in absolute and relative levels – see first two graphs below) and its ability to repay this debt, reflected in the "acid test ratio", is still low despite a slight increase in the past years (third graph below).

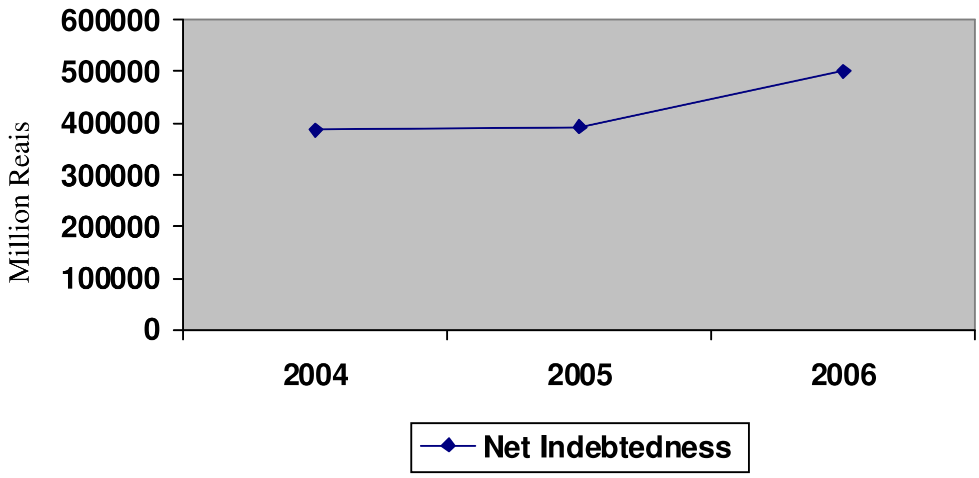

Figure – Increase in indebtedness degree of CERON. Source: Accountant elaboration, made with data provided by CERON.

[7] http://www.bndes.gov.br/linhas/garantias.asp

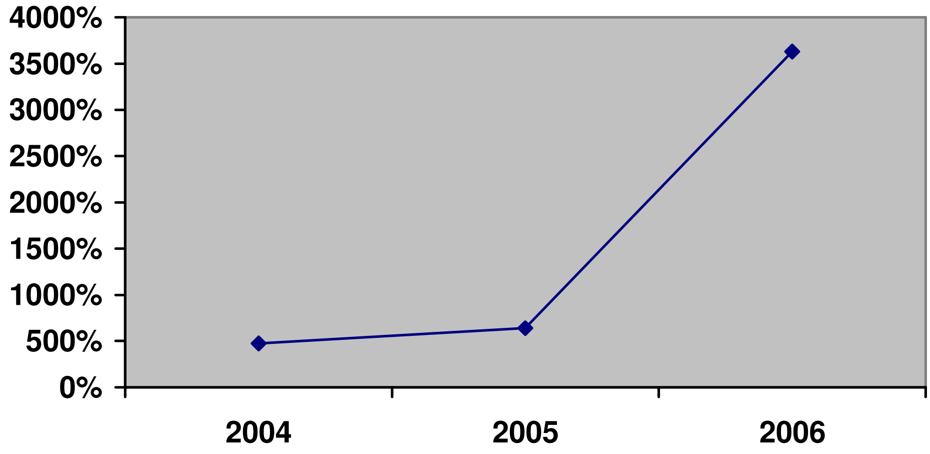

Figure – Capital Structure of CERON (Indebtedness – total debts with third parties related to own capital). Source: Accountant elaboration, made with data provided by CERON.

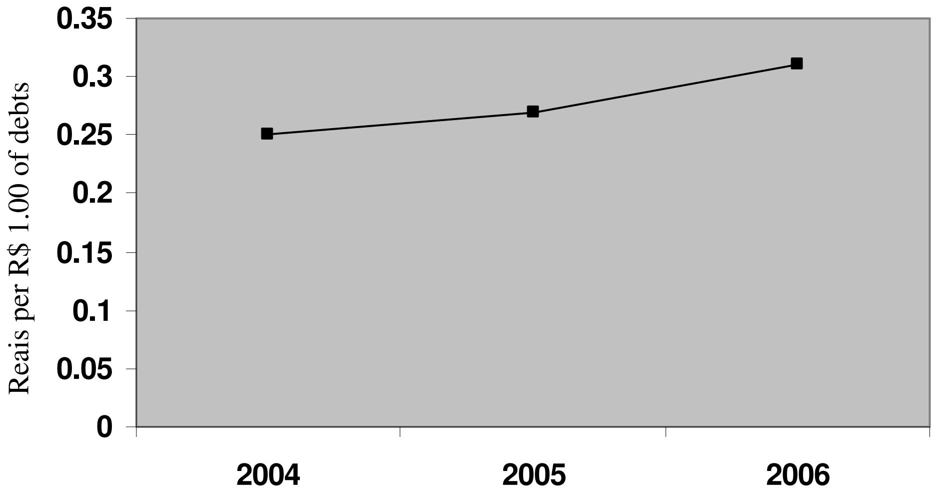

Figure – Acid Test Ratio (stringent test that indicates whether a firm has enough short-term assets to cover its immediate liabilities without selling inventory). Source: Accountant elaboration, made with data provided by CERON.

The information in the charts above means that although the Acid Test Ratio shows a slight increase in the capacity of the company to pay its debts, CERON still has only about R$ 0.30 to pay R$ 1.00 of debts. Moreover, the indebtedness of the company increased among these three years, with a dramatic increase in the relative indebtedness of debts with third parties related to own capital. It shows that the increase in the Acid Test Ratio is possibly due to an increase of indebtedness instead being due to revenues.

This situation is exacerbated by the fact that investors must have a pre-set energy selling contract (PPA) signed between producer and buyer as a compulsory document in order to access the subsidy. It is easier to secure a PPA for fossil fuel power plants, since the electricity generation can be easily predicted and controlled. On the other hand, hydroelectric plants are highly affected by seasonality and by rain periods and consequently its output can vary within a year and across several years.

To conclude, the difficult financial situation of CERON combined with the uncertainty associated with buying electricity from renewable projects encourages the utility to continue with fossil fuel generation units and weakens the CCC Subrogation as a subsidy. The Brazilian Court of Audit (2004, page 23) also confirms that North-Brazilian utilities prefer to guarantee the CCC subsidies to fossil fuel plants rather than supporting investments in renewable energy generation. This is corroborated by the fact that no power unit involved in this project have CCC subsidy.

Cost escalation in isolated systems. Finally, the implementation costs for units in the North Region are considerably higher than in other regions. Camargo, quoted in Tolmasquim (2004), verified that the implementation costs for hydroelectric plants with an installed capacity up to 10 MW located in isolated systems are considerably higher than in other regions (see Table 6 below). This can be explained by difficulties related to logistics and transportation better detailed in the prevailing practice barrier. Based on the same author, even with the CCC Subrogation benefits, the average energy cost for this region is still high.

Table - Small hydro units costs in different Brazilian regions

Regions / Systems	Construction costs (R$/kW)		Electricity Cost (R$/MWh) - SHP above 1 MW	
	Small plants (1-10 MW)	Other plants (10-30 MW)	Minimum	Maximum
North/Isolated	**4000**	**4000**	**69.62**	**157.75**
Northeast	3500	3500	58.05	122.03
Mid-West	3500	3500	58.99	112.75
Southeast	2800	3000	50.70	106.03
South	2800	2800	46.22	110.23

Source: Tolmasquim, M. T., 2004.

Although part of the above construction costs are covered by the subsidy, it is important to note that this subsidy is not fully paid when the subrogation is conceded, but instead amortized every month for the maximum of 5 years. Furthermore, the amount paid is related with the energy produced and thus if the energy producer produces less energy than he assured in the contract, the subsidy would be paid proportionally to that value and the rest would be postponed to the following months. This delay in getting the subsidy is a real problem for a small company, for which alignment of costs with revenues is very important.

In conclusion, although renewable and non-renewable plants may both receive a subsidy, it is easier, faster and cheaper for thermal plants to be put into operation and to receive the subsidy. It is also more difficult for small renewable plants to secure long-term financing and to sign Power Purchase Agreements with utilities. Moreover, there are fewer complications involved in the operation of conventional thermal plants (better detailed under ‘prevailing practice’) than in the operation of hydro power stations.

To evidence this, a financial analysis was developed comparing the two possible scenarios in this case: the construction of a thermal plant unit and the construction of a hydro plant unit. The analysis presented below is from the time of the registration of this project activity. It is the same analysis presented in the PDD for the first crediting period and validated by the DOE. However, as shown in the entire additionality discussion, the general picture did not changed significantly. Therefore, this analysis is still applicable to the project in its current form

This analysis was elaborated based on data from ANEEL (National Energy Agency), Eletrobrás (responsible for Isolated Systems recorded data), IEA (International Energy Agency), Guascor Ltd (private company) and the project proponents. All those references are clearly demonstrated on the spreadsheet for CERs and financial analysis calculation previously validated and registered, from the first crediting period PDD[8]. The results of the calculation clearly showed the NPV and IRR for both scenarios: for a thermal plant the NPV corresponds to R$ 5.3 million dollars in 21 years, while for a hydro plant, the same NPV is R$ 4.3 million. Also, the IRR for the thermal is 34% against an IRR of 32% for the hydro. It clearly demonstrates what was mentioned above: comparing the advantages of a thermal and a hydro plant, the thermal is still more attractive. Moreover, the thermal plant does not present risks related to rain variations. Finally, the prevailing practices confirmed this result: in the North region, specifically in Rondônia, most plants uses fossil sources as fuels, while hydro have always been aminority (comparing the Operational Plans for 2001 until 2005 – Please see **prevailing business practice** below).

	Discount rate	THERMAL PLANT 21 years	SMALL HYDRO 21 years
Present Value at	15%	R$ 5,256,615.78	R$ 4,289,098.62
IRR		34%	32%

With respect to **technological barriers**:

- In the case of Scenario 1 (continuation of current practices), there are no technical/technological barriers as it simply represents the maintenance of current electricity generation practices which have been proven to work, and neither involves implementation of any new technology nor innovation.
- In the case of Scenario 2, there are no significant technical/technological barriers either. All the technologies involved in this scenario are available in the market, and have been used effectively elsewhere in the Host Country.

With respect to barriers due to **prevailing business practice**:

- The continuation of current practices (Scenario 1) presents no particular obstacles. By definition, it is prevailing practice in the region.
- In the case of Scenario 2, there are barriers that would have to be overcome. According to the Brazilian Court of Audit (2004), even though the CCC subrogation is considered an attractive alternative to reduce the use of fossil fuel in the isolated system, until the end of 2004 only 12 plants were approved for CCC Subrogation and only 6 are operating, with the operational units producing only 2.78% of the electricity consumed during the year of 2003 in isolated systems. None of the plants included in the project receive the CCC subsidy. The lack of interest from the local concessionaires in subscribing for this program is not only related to financial reasons but also to the greater attractiveness of the subsidy for fossil fuel thermal plants.

An assessment of the prevailing practice is done considering the number of similar projects that have been built previously in the region. Projects are considered similar if they are the same technology and “they occur in the same country/region”. For this Project an analysis of similar activities in the isolated systems from North Region of Brazil is considered to be the most appropriate, as investment conditions, and some regulatory requirements, tend to be different in those systems than in other regions.

[8] See http://cdm.unfccc.int/Projects/DB/DNV-CUK1172478016.18/view.

This analysis shows that in the North region, specifically in Rondônia, most plants use fossil sources as fuels, while hydro plants have always been a minority (comparing the Operational Plans for 2001 until 2005). The table below includes all information about the isolated systems, including an analysis for all electricity generation plants in Rondônia State, where the project is located, and an analysis for all Isolated Systems in Brazil. The next table shows the same data in percentage form. All information was taken from the Operational Plan for 2006, a public report issued by ELETROBRÁS. To analyse similar activities, all Hydro and Thermal Power Stations that are operating in the Isolated Systems were selected.

Table - Isolated Systems Configuration in 2006 (sources: Eletrobras)

	Number of units		Installed Capacity (MW)	
	Hydro	Thermal	Hydro	Thermal
Rondônia (all plants)	26	153	262.574	701.464
All Isolated Systems in Brazil	61	1,443	628.549	3,391.543

Table – Thermal and Hydro participation in Rondonia, and in all Isolated Systems in Brazil, 2006 (source: Eletrobras)

	Number of units		Installed Capacity (MW)	
	Rondônia	All	Rondônia	All
Total	179	1,504	964.038	4,020.092
Hydro	14.53%	4.06%	27.24%	15.64%
Thermal	85.47%	95.94%	72.76%	84.36%

Installed capacity and generation from thermal power plants inside isolated systems has historically increased between 2001 and 2006. According to the Operational Plan for 2003 (ELETROBRAS), thermal generation was projected to increase by 9% and hydro generation to decrease by 5%. The Operational Plans for 2004 and 2005 show a similar trend. Analysing the Operational Plan for 2006, thermal installed capacity remains higher than hydro installed capacity, and comparing with the report from 2005 thermal installed capacity increased by 7.76%, while hydro installed capacity decreased by 3.83%. The figure below illustrates the installed capacity trends in Rondônia. It clearly shows that thermal installed capacity has tended to increase, while hydro installed capacity has tended to be almost constant, between 2004 and 2006.

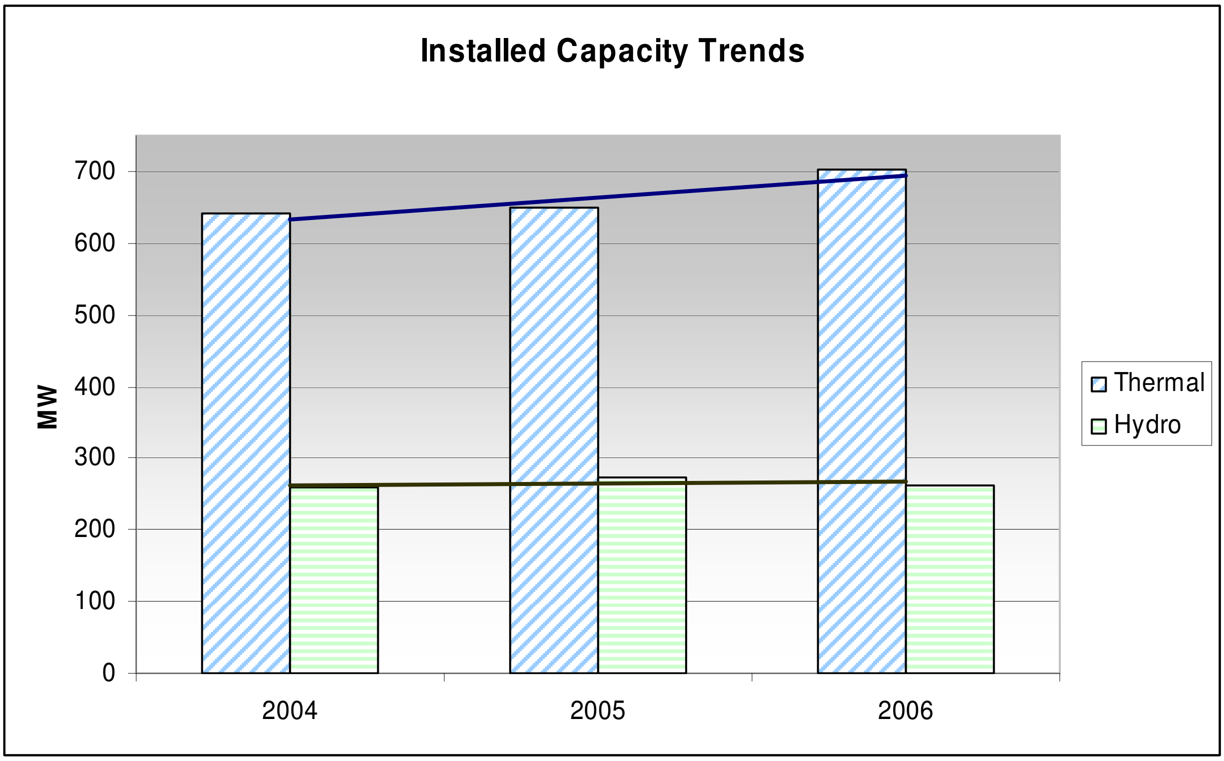

Figure - Installed capacity trends in Rondônia (Souces: Eletrobrás – own elaboration)

Therefore, based on these data, it is clearly demonstrated that the prevailing practice in terms of energy generation and installed capacity in Rondônia is predominantly thermal and, consequently, the trend in the region is the construction of thermal units using fossil fuels rather than the construction of hydro units.

With respect to the analysis of **other barriers**:

- No other barriers for either scenarios are identified.

The table below summarises the results of the analysis regarding the barriers faced by each of the plausible scenarios. Scenario 1 faces no barriers, whereas Scenario 2 faces investment barriers and is not prevailing practice.

Table - Summary of barriers Analysis

Barrier Evaluated		Scenario 1	Scenario 2
		Continuation of current activities	Construction of a new plant
1.	Financial / Economical	No	**Yes**
2.	Technical / Technological	No	No
3.	Prevailing Business Practice	No	**Yes**
4.	Other Barriers	No	No

Conclusion

To conclude, the barrier analysis above has clearly shown that the most plausible baseline scenario is the continuation of current practices, which means to continue generating electricity from a very carbon intensive mix. Therefore, the project scenario is not the same as the baseline scenario, and these are defined as follows:

- The **Baseline Scenario** is the continued use of electricity from the Rondônia-Acre isolated electricity system, based mainly on diesel consumption.
- **The Project Scenario** is the construction of the new hydroelectric plants of 14.5 MW total installed capacity. The new plants will displace grid electricity from a more carbon-intensive source, resulting in significant GHG emission reductions. The Project Scenario is additional in comparison to the baseline scenario, and therefore eligible to receive Certified Emissions Reductions (CERs) under the CDM.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

In accordance with AMS I.D, emission reductions are calculated with the following equation:

$$ER_{electricity,y} = EG_y \cdot EF_{grid,CM,y} \qquad (1)$$

Where:

$ER_{electricity,y}$ Emission reductions due to displacement of electricity during the year y (tCO2/yr)

EG_y Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)

$EF_{grid,CM,y}$ CO2 emission factor for the electricity displaced due to the project activity during the year y (tCO2/MWh)

Note that at the beginning of the crediting period, two different grids are supplied by the plants of the project (see details in step 1 below). In this case, the emission factor of each grid will be multiplied by the electricity generation of each plant feeding that grid in order to calculate emission reductions.

The grid emission factor is calculated according to the “Tool to calculate the emission factor for an electricity system”.

Step 1: Identify the electric system:

For the first three months of the crediting period (February to April 2008):

i. Monte Belo and Rio Branco plants are connected to the “Rondônia-Acre isolated electricity system” (grid G1)

ii. CABIXI II plant is connected to the “Cone-Sul isolated electricity system” (grid G2)

In May 2008, those two grids (G1 and G2) were interconnected into a third grid (G3), also called “Rondônia-Acre isolated electricity system” (but which now includes Cone-Sul).

In the future, this grid G3 might be connected to the “Brazilian Interconnected System (SIN)”, which would be a fourth grid (G4). Therefore, the emission factor will be determined ex post depending on the grid supplied by the project. However, for CER estimates, it is assumed that this will not happen during the crediting period and hence only the emission factors of grids G1, G2 and G3 are estimated.

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Step 2: Select an operating margin (OM) method:

The grid emission factor is calculated using the method (a) of the Tool, Simple OM. This is possible because low-cost/must-run resources, in the grid, constitute less than 50% of total grid generation in average of the five most recent years.

The following date vintage will be considered: the OM will be calculated *ex-post*, using the full generation-weighted average for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring with the most recent data available.

The Brazilian government long term objective is to interconnect all electric systems in the country; therefore the ex-post option was chosen. At the time when the project starts to supply the Brazilian Interconnected System (SIN), or any other grid, the emission factor used will be the one that best reflects the baseline.

For more information please see Annex 3.

Step 3: Calculate the operating margin emission factor according to the selected method:

The Simple OM emission factor ($EF_{OM,simple}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants and all electricity generated from low-cost/must-run resources. Option A was selected (i.e. based on data on fuel consumption and net electricity generation of each power plant / unit).

$$EF_{grid,OMsimple,y}(tCO_2/MWh) = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_m EG_{m.y}} \qquad (2)$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO2 emission factor in year y (tCO2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power plant / 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)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
$EG_{m,y}$	Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m	All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i	All fossil fuel types combusted in power plant / unit m in year y
y	The most recent year for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex post* option)

Step 4: Identify the cohort of power units to be included in the build margin

In terms of vintage of data, option 1 of the “Tool to calculate the emission factor for an electricity system” was chosen, i.e. ex ante calculation. The build margin emission factor has been updated based on the most recent information available on units already built at the time of submission of the request for

renewal of the crediting period to the DOE.

The sample group of plants that was chosen for build margin calculation is the one that comprises the larger annual generation between:

a) The most recent 5 units
b) The most recent 20% units in terms of power generation

For grid G1, G2 and G3, option a) comprised the larger annual generation and therefore is used for build margin calculation.

Step 5: Calculate the Build Margin emission factor:

The calculation was done as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (3)$$

Where:

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO2/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 each power plant was calculated according to the option B1 (i.e. with available data on electricity generation and fuel consumption):

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NVC_{i,y} \cdot EF_{CO2,i,y}}{EG_{m.y}} \qquad (4)$$

Where:

$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO2/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)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type i in year y (tCO2/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	The most recent year for which data is available at the time of submission of the CDM-PDD to the DOE for validation

The build margin emission factor is calculated and defined ex-ante, as described in this PDD, using data from the most recent historical year for which power generation data is available at the time of crediting period renewal.

Step 6: Calculate the combined margin emissions factor:

The calculation was done as the weighted average of the Operating Margin emission factor and the Build Margin emission factor:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \qquad (5)$$

Where the weights w_{OM} and w_{BM}, by default, are w_{OM} = 25% and w_{BM} = 75%, and $EF_{grid,OM,y}$ and $EF_{gird,BM,y}$ are calculated as described in previous Steps above and are expressed in tCO_2/MWh.

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

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin Emission Factor
Source of data used:	CERON, Termonorte, Eletronorte, Eletrobrás
Value applied:	Applied for February to April 2008 G1 Rondônia Acre system (2005) = 1.0704 tCO_2/MWh G2 Cone Sul system (2005)= 0,0266 tCO_2/MWh Applied for May 2008 onward G3 Linked Rondônia acre-Cone Sul system (2005) = 1.0479 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Build Margin Emission Factor calculation was calculated according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system” and AMS-I.D.
Any comment:	In the first crediting period, the *ex-ante* calculation was used. For this second crediting period, the calculations will be also *ex-ante*. Therefore, even if the grid that is supplied by the project activity changes during the crediting period (e.g. if the project gets connected to G4 Brazilian Interconnected System (SIN)), $EF_{grid,BM,y}$ will remain equal to 1.0479.

Data / Parameter:	**w_{OM}**
Data unit:	%
Description:	Weighting of operating margin emissions factor
Source of data used:	“Tool to calculate the emission factor for an electricity system”
Value applied:	0.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value from the methodological tool.

Any comment:	

Data / Parameter:	w_{BM}
Data unit:	%
Description:	Weighting of build margin emissions factor
Source of data used:	"Tool to calculate the emission factor for an electricity system"
Value applied:	0.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value from the methodological tool.
Any comment:	

Data / Parameter:	Installed Capacity
Data unit:	MW
Description:	The installed capacity
Source of data used:	ANEEL (Brazilian National Electrical Energy Agency, from Portuguese *Agência Nacional de Energia Elétrica*)
Value applied:	14.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data refers to the total installed capacity of the three SHP units installed as a result of this project activity: Rio Branco, Monte Belo and Cabixi II.
Any comment:	ANEEL database can be seen at http://www.aneel.gov.br/aplicacoes/capacidadebrasil/UsinaListaSelecao.asp. Please see annex 5 for more information regarding installed capacity.

Data / Parameter:	$FC_{i,m,y}$
Data unit:	Tonnes
Description:	Amount of fossil fuel type i consumed by power plant / unit m in year y
Source of data used:	See Annex 3.
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All values were provided by governmental agencies. Those agencies are responsible for the control of the electric system.
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/tonnes
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	See Annex 3.

Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 3.
Any comment:	

Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data used:	See Annex 3.
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All values were provided by governmental agencies. Those agencies are responsible for the control of the electric system.
Any comment:	

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i in year y
Source of data used:	See Annex 3.
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 3.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

All equations used to estimate the emission reductions were provided in section B.6.1. Detailed information of how the equations were used, and values applied are provided in the tables below.

Note: the grid emission factor indicated below is for the Linked Rondônia-Acre isolated electricity system (G3), which applies from May08 onwards. For the first three months of the crediting period, the emission factor of each grid (G1 and G2) is used and applied to the plants feeding each grid.

Table - The ex-ante emission reduction values and calculations

Data from electricity grid:

Combined margin	tCO_2/MWh	1,0213

Project Generation:

Installed capacity	MW	14,50
Guaranteed Power	MW	9,64
Reference Electricity generation	MWh/year	84.463

Baseline Emissions

Baseline Emissions (first year)	tCO_2e	75.754
Baseline Emissions	tCO_2e	86.262

Project Emissions

Default emission factor for emissions from reservoirs	$KgCO_2$/MWh	0
Project Emissions (first year)	tCO_2e	0
Project Emissions	tCO_2e	0

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

Table - Ex-ante estimation of emission reductions

Years	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2008 (February - December)	0	75,754	0	75,754
2009	0	86,262	0	86,262
2010	0	86,262	0	86,262
2011	0	86,262	0	86,262
2012	0	86,262	0	86,262
2013	0	86,262	0	86,262
2014	0	86,262	0	86,262
2015(January - January)	0	7,189	0	7,189
Total (tonnes of CO_2e)	**0**	**600,515**	**0**	**600,515**
Average	**0**	**85,788**	**0**	**85,788**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh/year
Description:	Annual net electricity supplied to the grid, per plant

Source of data to be used:	Measured jointly by CERON and project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual net electricity supplied to the grid, per plant: SHP Monte Belo: 24936 SHP Rio Branco: 43770 SHP Cabixi II: 15757 Between February and April 2008, the first two plants supplied grid G1 and the last plant supplied grid G2. Since May 2008, all project plants have been supplying grid G3 and the same has been assumed for the rest of the second crediting period. See step 1 of section B.6.2 for a definition of each grid.
Description of measurement methods and procedures to be applied:	The electricity generation will be measured by a cumulative meter (located on each site) and recorded monthly. These meters are owned by CERON (grid operator). The readings are used as the amount that is invoiced.
QA/QC procedures to be applied:	The accuracy of the meters will be assured by the grid operator (i.e. CERON), as the meters were installed by them and remain their property.
Any comment:	Data will be archived at least for two years after crediting period or the last issuance of CERs, whichever occurs later.

Data / Parameter:	$\mathbf{EF_{grid,CM,y}}$
Data unit:	tCO_2/MWh
Description:	Baseline Emission Factor
Source of data to be used:	Calculated ex post as the average of $EF_{grid,OM,y}$ (determined ex post) and $EF_{grid,BM,y}$ (determined ex ante)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Applied for February to April 2008 G1 Rondônia Acre system (2005) = 1.0388 tCO_2/MWh G2 Cone Sul system (2005)= 0.1667 tCO_2/MWh Applied for May 2008 onward G3 Linked Rondônia acre-Cone Sul system (2005) = 1.0213 tCO_2/MWh
Description of measurement methods and procedures to be applied:	The Baseline Emission Factor calculation consists of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" and AMS-I.D.
QA/QC procedures to be applied:	Not applicable, as this data is calculated based on OM and BM.
Any comment:	

Data / Parameter:	$\mathbf{EF_{grid,OMsimple,y}}$
Data unit:	tCO_2/MWh
Description:	Operating Margin Emission Factor
Source of data to be used:	Calculated ex post from $EG_{m,y}$, $FC_{i,m,y}$, $EF_{CO2,i,y}$ and $NCV_{i,y}$
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Applied for February to April 2008 G1 Rondônia Acre system (2005) = 0.9441 tCO_2/MWh G2 Cone Sul system (2005)= 0.5870 tCO_2/MWh Aplied for May 2008 onward G3 Linked Rondônia acre-Cone Sul system (2005) = 0.9415 tCO_2/MWh
Description of	The Operating Margin Factor calculation was performed according to option

measurement methods and procedures to be applied:	(a) of the “Tool to calculate the emission factor for an electricity system”. Data are acquired by governmental companies that control the electricity grid.
QA/QC procedures to be applied:	The governmental companies responsible for the collection of data are also responsible for guaranteeing the quality of data. The calculation will be verified by the DOE, or another competent party, in order to assure and guarantee quality.
Any comment:	This data will be calculated ex-post using the most recent year of data available. For Brazilian isolated electricity grids, the governmental companies responsible for the data are difficult to reach and data is not regularly published. If at any time of the crediting period, the grid configuration changes, the OM will be calculated for the electric system that best represents the Project baseline.

B.7.2 Description of the monitoring plan:

The monitoring of this type of project consists of metering the electricity generated by the renewable technology that is supplied to the grid. Below is a description of monitoring procedures for data measurement, quality assurance and quality control.

In each of the three power plants (Rio Branco, Cabixi II and Monte Belo) there is a main cumulative meter that records the electricity exported to the grid. These meters are installed, owned and maintained by CERON (Centrais Elétricas de Rondônia S/A – the grid operator).

Readings are taken monthly by both CERON and Cassol (Project participant and operator of the plants). CERON and the plant staff check the main meter on the first day of each month. Both CERON and Cassol have to agree to the readings (reached by subtracting the first data of the month from the last data of the last month) by signing of a report document. The monthly electricity supplied to the grid values are processed by CERON, who sends Grupo Cassol the official amount of electricity generated in the given month. This confirms the total MWh for the period and the payment associated with the supplied power. Cassol generates the invoice and sends it to CERON for payment.

The grid operator (CERON) is responsible for the main meter on each site. CERON makes site visits from time to time in order to check the integrity of the monitoring equipment and also to check if the generation of the plant is higher than authorized. If no problems are identified during these site visits, it is assumed that the plant is compliant with the authorization (checked by the competent authority).

A summary of the data flow process can be found in the figure below.

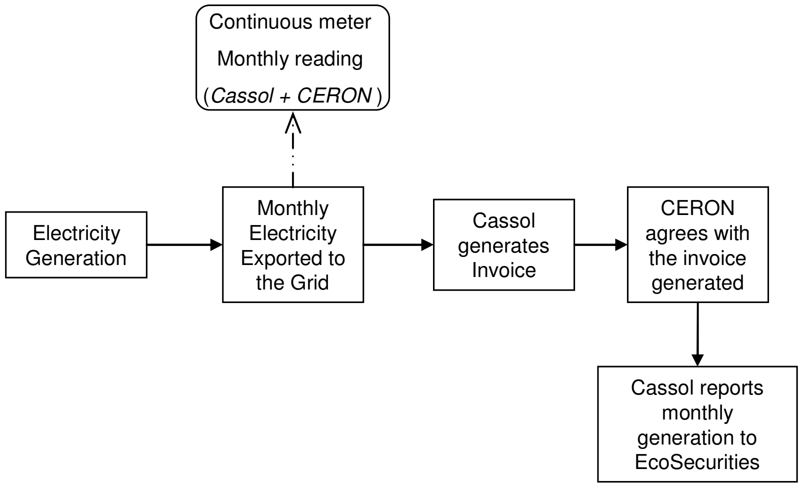

Figure: Summary of the data flow process

The monthly electricity supplied to grid data will be recorded on site log sheets. At the end of each month the monitoring data from each site will be transferred to electronic files and reported to EcoSecurities (working also as back-up). The project developer will store copies of the invoices. Data will be archived electronically and on paper and will be kept for at least two years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

Quality control and quality assurance procedures will ensure the quality of data collected. As the meters were installed by CERON (the grid operator and responsible for establishing the requirements for electricity generation in the isolated system) and are their property, they will be responsible for maintaining the meters and assuring their accuracy.

The energy generating equipment will not be transferred from another activity; therefore, leakage effects do not need to be accounted for.

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

The baseline study and the monitoring methodology were concluded on 21/08/2008 for the renewal of the crediting period. The entity determining the baseline study and the monitoring methodology is EcoSecurites Brasil Ltda. The entity participating in the project as the Carbon Advisor is EcoSecurities Group Plc, listed in Annex 1 of this document.

Personnel responsible for the baseline and monitoring of this project:

Mr. Thiago Viana	EcoSecurities Brasil Ltda.	Project Manager	thiago.viana@ecosecurities.com
Mr. Arnaud Viel	EcoSecurities Ltd.	Technical Reviewer	arnaud.viel@ecosecurities.com

Contact: EcoSecurities Brasil Ltda., Rua Lauro Müller 116, 4304, Botafogo, Rio de Janeiro, Brazil. CEP: 22290-160. Phone: +55 (21) 2546-4150

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:

01/01/2001 (DD/MM/YYYY)

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

21 years 00 months

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:

The first crediting period comprised the period between 01/02/2001 to 31/01/2008. Therefore, as this PDD refers to a renewal of crediting period, the starting date of the second crediting period is:

01/02/2008 (DD/MM/YYYY)

C.2.1.2. Length of the first crediting period:

7 years 0 months

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

All 3 hydro plants have received official permits from local official authorities to start activities. All received operational licenses from the official authority in the State of Rondônia (Monte Belo and Rio Branco) and Mato Grosso (Cabixi II). For each hydroelectric unit, project proponents developed an Environmental Control Plan, which evaluates the environmental aspects of the projects. The Plan was developed by AgroFlorestal Donanoni, and assessed potential impacts relating to land degradation; influence on hydrological quality; dips instability, and erosion risks.

All units have valid Environmental Operational Licenses and are in compliance with the applicable legislation.

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:

According to the Environmental Control Plan, all the impacts cited above were mitigated. The company carried out specific analysis to test water quality after using the turbines; they also started recovering the degraded land area. In the case of Monte Belo and Cabixi, engineer Antonio Carlos Vieira was responsible for developing the “Recovering degraded land plan”. Concerning erosion risks, all areas that present this risk will be frequently checked and monitored.

With mitigation controls planned as part of the Project construction and EIA process, and the contribution made by the Project to sustainable development for the local and national area, the Project is expected to have an overall positive impact on the local and global environment. Mitigation measures ensure that there are no residual significant adverse impacts associated with the Project.

SECTION E. Stakeholders' comments

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

The local stakeholders consultation was performed for the first crediting period. For the second crediting period, it was not performed as there was no significant changes in the project design.

According to Resolution #1 dated December 2nd, 2003 from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), any CDM projects must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Alta Floresta D'Oeste and Comodoro;
- Chamber of Deputy of all municipalities above;
- Environment agencies from the State and local authority;
- Brazilian Forum of NGOs;
- District Attorney (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests) and;
- Local community associations.

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation. All project developers addressed questions raised by stakeholders during this period.

Due to an official request from the Brazilian DNA, all the invitation letters were sent again to the public above on the 11th May 2006. During 30 days, the PDD was available for comments at www.ecosecurities.com, so the comments period will be closed on the 11th June 2006.

E.2. Summary of the comments received:

The comments received were incorporated in the PDD for the first crediting period.

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

The comments received were incorporated in the PDD for the first crediting period.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This Project will not receive any public funding.

Annex 3

Grid Emission Factor Calculation

The grid emission factor calculation was performed *ex-post* in accordance with the latest version of "Tool to calculate the emission factor for an electricity system". Rondônia-Acre system is isolated from Brazilian interconnected systems S-SE-CO and N-NE. The grid is predominantly thermal thus the Simple OM method was selected.

All data used to calculate the Emission Factor are from the following sources:

1. Data obtained from CERON from report "RELATÓRIO MENSAL - ENERGIA SUPRIDA", years 2001 to 2005
2. Data from TERMONORTE report to CERON
3. Data obtained from CERON from report "RESUMO DE GERAÇÃO TÉRMICA", years 2001 to 2005
4. Data from Programa Mensais de operação para o ano de 2004, http://www.eletrobras.com.br/EM_Atuacao_SistIsolados/default.asp
5. personal communication with CERON for 2004 data
6. Aneel BIG
7. Data from Programa Mensais de operação para o ano de 2005, http://www.eletrobras.com.br/EM_Atuacao_SistIsolados/default.asp
8. Data from Plano Anual de Operação 2005, pág. 9, item 3.3
9. Data obtained from ELETRONORTE from report "Mapa Oleo Diesel", years 2003 to 2005
10. Data obtained from ELETRONORTE from report "Relatório Integrado do Desempenho Empresarial" (RIDE), years 1994 to 2005
11. Data from GTON[9] Brazilian Annual Operational Plan- 2002-2005 - ELETROBRAS
12. Data from GTON Brazilian Monthly Operational reports-2002-2005 - ELETROBRAS

Fuel data to grid emission factor calculation

Sources	density [1] (kg/m³)	lower heating value [1] (kcal/kg)	NCV [1] (TJ/kton)	Carbon Emission Factor [2] (tCO2e/TJ)	Carbon Emission Factor (tCO2e/unit)	Fuel unit
diesel	840	10100	42.29	74.10	3.13	ton
fuel oil	1000	9590	40.15	77.40	3.11	ton

Sources:
[1] Brazilian Energetic Balance, 2006 - Annex E, table E.9
[2] IPCC 2006 - Volume 2, Chapter2, Table 2.2 p2.16. Average value.

[9] Grupo Técnico Operacional da Região Norte (Technical Group from Brazilian North Region).

A summary of the calculation is provided below.

Table - Data used to calculate EF

	2005	
	Total Generation (MWh)	Fuel Consumption (m³)
PIE Rovema	3.053	852
Termonorte II	989.079	352.776
PCH Altoe	8.709	0
Alta F. D'Oeste	26.467	0
PCH ST. Luzia	21.030	0
Termonorte I	439.150	104.242
PCH Cachoeira	60.087	0
PCHs Castaman 2	3.044	0
PCH Cabixi 1	18.281	0
Rio Acre	0	0
PCHs Castaman 3	9.012	0
Rio Branco II	41.207	12.613
PCHs Castaman 1	9.133	0
Samuel	650.627	0
PCH Rio Vermelho	15.369	0
Rio Madeira	76.784	24.514
Rio Branco I	152.514	51.424
Barro Vermelho	0	0
UTE Colorado	6.419	2.191
UTE Vilhena	20.996	6.145

Table - EF calculation summary (Rondônia Acre + Cone sul systems, interconnected, ex-post) The main emission factor used for this project activity.

Rondonia-Acre System				
	EF_{OM} (tCO_2/MWh)	Load (MWh)		
2005	0.9415	2,550,962		
	$EF_{OM,SIMPLE}$	0.9415	w_{OM}	0.25
	$EF_{BM,\ 2005}$	1.0479	w_{BM}	0.75
	$EF_y(tCO2/MWh)$	1.0213		

	2001	2002	2003	2004	2005	Average
Thermal Generation	578,565	875,330	1,267,971	1,516,522	1,729,201	**1,193,518**
Hydro Generation	1,002,510	833,259	987,406	894,683	821,761	**907,924**
Predominance	Hydro	Thermal	Thermal	Thermal	Thermal	**Thermal**

Table - EF calculation summary (Rondônia-Acre system only, used only for the first 3 months of the crediting period, for Rio Branco and Monte Belo units)

Rondonia-Acre System					
	EF_{OM} (tCO_2/MWh)	Load (MWh)	Lambda		
2005	0.9441	2,405,566			
	$EF_{OM,SIMPLE}$	0.9441	w_{OM}	0.25	
	$EF_{BM,2005}$	1.0704	w_{BM}	0.75	
	EF_y(tCO2/MWh)	1.0388			

	2001	2002	2003	2004	2005	Average
Thermal Generation	548,030	849,711	1,242,095	1,488,118	1,698,733	**1,165,337**
Hydro Generation	919,061	739,128	887,345	785,628	706,833	**807,599**
Predominance	Hydro	Thermal	Thermal	Thermal	Thermal	**Thermal**

Table - EF calculation summary (Cone sul system only, used only for the first 3 months of the crediting period, for the Cabixi II unit)

Cone-Sul System					
	EF_{OM} (tCO_2/MWh)	Load (MWh)	Lambda		
2005	0.7938	145,396	0.2605		
	$EF_{OM,SIMPLE\ AJUSTED}$	0.5870	w_{OM}	0.25	
	$EF_{BM,2005}$	0.0266	w_{BM}	0.75	
	EF_y(tCO2/MWh)	0.1667			

	2001*	2002*	2003	2004	2005	Average
Thermal Generation	30,535	25,619	25,875	28,404	30,468	**28,180**
Hydro Generation	83,449	94,131	100,061	109,054	114,928	**100,324**
Predominance	Hydro	Hydro	Hydro	Hydro	Hydro	**Hydro**

Grid selection

According to Bosi (2000), the Brazilian Electricity System is divided in three separate subsystems:

(i) The South/South-east/Midwest System + The North/North-East System, resulting in the Brazilian Interconnected System; and

(ii) The Isolated Systems (which represents 300 locations that are electrically isolated from the interconnected systems.

The proposed project activity will be connected to the Rondônia-Acre isolated system (Figure 2), and according to the "Tool to calculate the emission factor for an electricity system", it is necessary to account all generating sources serving the system. As a result, the project proponent should research all power plants serving this system. Any changes in the grid configuration will be monitored. As the Operation Margin will be calculated *ex-post*, it will be possible to account for changes. According to Eletrobrás (Operational plan for the year 2008[10]), the plan was to interconnect these two systems in May 2008, actually transforming it in one system. Therefore, for the first three months of the crediting period (February to April 2008) it was used the Grid emission factor from both electricity systems independently, as the interconnection was on May 2008. For the rest of the crediting period, it was used the grid emission factor as described in this PDD.

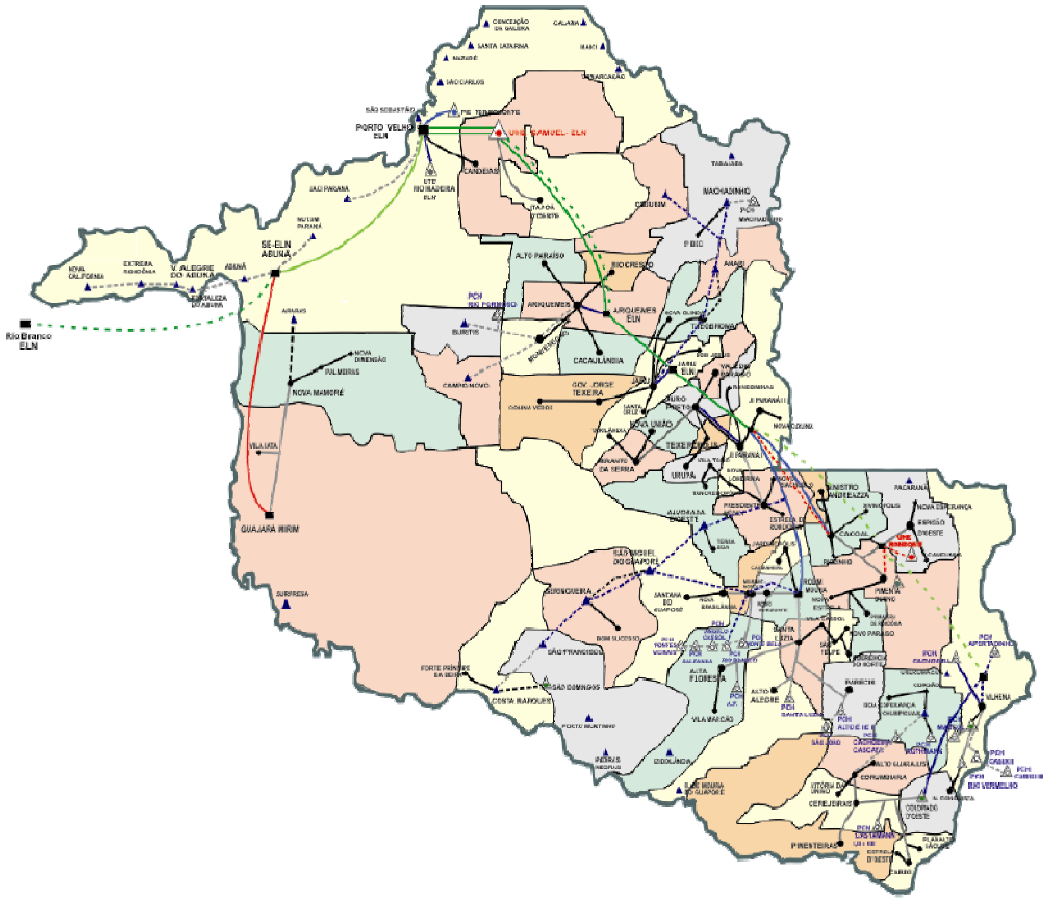

Figure – Rondonia isolated systems (Source: Eletrobras, Annual Operational Plan 2003)

[10] http://www.eletrobras.gov.br/elb/portal/data/Pages/LUMISB4C86407PTBRNN.htm

Annex 4

MONITORING INFORMATION

The monitoring plan will be executed based on the simplified baseline and monitoring procedures established in the AMS-I.D, "Grid-connected renewable electricity generation" - Version 12, EB33.

The responsible for the project activity will proceed with the established procedures and will record the data related to the electricity generated by the renewable technology.

Table - Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the project activity

Task	On-site technician	Operations manager	Project developer's head office	Head of Maintenance / External company	EcoSecurities
Collect Data	E	R	N/A	N/A	N/A
Enter data into Spreadsheet	N/A	E	R	N/A	N/A
Make monitoring reports	N/A	E	R	N/A	I
Archive data & reports	N/A	E	R	N/A	N/A
Calibration/ Maintenance	I	I	I	E	I

Legend: *E = responsible for executing data collection, R = responsible for overseeing and assuring quality, I = to be informed*

For more information, please check section B.7.

Annex 5

INSTALLED CAPACITY

ANEEL is the national Brazilian electricity agency which oversees the following procedures with regards to new electricity projects. Firstly ANEEL grants permission to install capacity, typically based on a feasibility study. After the installation and test period, ANEEL audits the projects to confirm the installed capacity. ANEEL resolutions are commonly used in Brazil as the definitive reference for capacities of electricity projects. In 2007, EcoSecurities requested some clarifications from ANEEL. A reply, dated 28 June 2007 confirms the installed capacities for the three sites. Aneel says that "*We emphasize that these plants are supervised by ANEEL and no unconformity has been so far detected regarding the installed potencies, being the licensed potency equal to the supervised potency.*"

The installed capacity of the units for CDM purposes was assessed as the installed capacity as per the permits issued by ANEEL to produce electricity.

Table – Installed capacity of the plants involved in this project activity.

Plant	Unit	Capacity ANEEL MW
CABIXI II	1	2.8
MONTE BELO	1	2.4
MONTE BELO	2	2.4
RIO BRANCO	1	2.3
RIO BRANCO	2	2.3
RIO BRANCO	3	2.3
TOTAL		14.50

REFERENCES

AgroFlorestal Donadoni, 2005. Monitoramento Ambiental.

Aneel BIG - Information Generation Base (acessed on http://www.aneel.gov.br/15.htm)

ANEEL, 1999. Guia para utilização de recursos da Conta Consumo de Combustíveis – CCC por empreendimentos de geração de energia elétrica a partir de fontes renováveis nos sistemas isolados.

BOSI, M., An Initial View on Methodologies for emissiond Baselines: Electricity Generation Case Study. Paris: International Energy Agency, 2000.

Brazilian Court of Audit 2004 - *Tribunal de Contas da União - TCU; Agência Nacional de Energia Elétrica - ANEEL e Centrais Elétricas Brasileiras S.A – Eletrobrás, 2004. Auditoria Operacional. Conta de Consumo de Combustíveis Fósseis dos sistemas isolados – CCC-isol.*

CERON, Monthly reports – from 2001 to 2005 (reports named as: *totais sistema CERON; totais sistema CERON + PIE; Dados Suprimento; Suprimento_ConsInterno_PartGeração*)

Conselho Regional de Engenharia, Arquitetura e Agronomia, 2002. Plano de Recuperação de Áreas Degradadas – PRAD. Pequena Central Hidrelétrica Cabixi.

Conselho Regional de Engenharia, Arquitetura e Agronomia, 2002. Plano de Recuperação de Áreas Degradadas – PRAD. Pequena Central Hidrelétrica Monte Belo.

Data from GTON Brazilian Monthly Operational reports-2004 (acessed on http://www.eletrobras.gov.br/EM_Atuacao_SistIsolados/default.asp) - ELETROBRAS

ELETROBRAS, Annual Operational Plan and Monthly Operational Plan (*Plano Anual de Operação* and *Plano Mensal de Operação*) - from 2002 to 2006.

ELETRONORTE, 2001 to 2005 data. Reports named as: *RIDES – Relatório Integrado de Desempenho; RDO; Mapa de Óleo Diesel*

GTON Brazilian Annual Operational Plan-2004 (acessed on http://www.eletrobras.gov.br/EM_Atuacao_SistIsolados/default.asp) - ELETROBRAS

IPCC, 2006 Guidelines for national greenhouse gas inventories.

National Petroleum Agency – *Agência Nacional de Petróleo*, Weighted weekly average prices 2002(*report known as: Preços Médios Ponderados Semanais – 2002*) available at www.anp.gov.br

Tolmasquim, M. T., 2004. Alternativas energéticas sustentáveis no Brasil. Rio de Janeiro: Relume Dumará: COPPE: CENERGIA.

Tribunal de Contas da União - TCU; Agência Nacional de Energia Elétrica - ANEEL e Centrais Elétricas Brasileiras S.A – Eletrobrás, 2004. Auditoria Operacional. Conta de Consumo de Combustíveis Fósseis dos sistemas isolados – CCC-isol.

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