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

CONTENTS

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:

ARS Small Hydroelectric Power Plant (hereafter referred to as "ARSSHP")
Version 05
22 May 2009

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

The purpose of the project activity consists of the installation of a new small hydroelectric power plant with a capacity of 6.66 MW. The ARSSHP has the objective to provide renewable electricity to the Brazilian Interconnected Electricity System (hereafter as BIES).

The ARSSHP project involves the implementation of Small Hydroelectric Power Plant in the Von Den Steinen River. The River is located in the Nova Ubiratã municipality in Mato Grosso State, Midwest region of Brazil, where a representative portion of the electricity is provided by thermoelectric power plants (ANEEL – National Electricity Energy Agency)[1].

The main objectives of the project are to help meet the rising demand for energy due to economic growth and contribute to environmental, social, and economic sustainability by increasing the amount of renewable energy in Brazil`s total consumption. The energy generated will be dispatched into the grid, avoiding the use of non renewable sources of energy, such as fossil fuel sources which increase the greenhouse gas (GHG) emissions.

ARSSHP, with a power loading of 6.66 MW (2 Francis turbines and generators - 3.33MW each – section A.4.2), uses the renewable hydro potential of the Von Den Steinen River to supply electricity to the BIES.

Since 2003 ANEEL issued commercial exploration licenses to at least five thermoelectric plants connected to the grid (UTE (Thermoelectric Power Plant Unit) Rio Claro in Mato Grosso State, UTE Santa Terezinha Paranacity in Paraná State, UTE Viralcool in the State of São Paulo, UTE Giasa in Paraiba State and Giasa II in Paraiba State)[2], which will contribute to increase the GHG emission factor of Brazil's energy system. The project activity will reduce these emissions by generating electricity without the combustion of fossil fuels, which would generate (and release) CO_2 into the atmosphere.

ARSSHP boosts the supply of electricity with clean, renewable hydroelectric power while contributing to regional/local economic development. At the time of project design, it was understood that implementation of the project would increase the energy supply during an opportune time, allowing the growth rate of the mid-west region to be maintained at the order of 4% per year through the period of 1985 to 2002 (National Integration Ministry - *Ministerio de Integração Nacional, Plano Estratégico de Desenvolvimento do Centro-Oeste*) and reducing the risk of a deficit in electricity.[3]

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[1] *Source: ANEEL Generation Data Source (BIG – Banco de Informações de Geração) - www.aneel.gov.br/aplicacoes/ResumoEstadual/CapacidadeEstado.asp?cmbEstados=MT:MATO%20GROSSO*

[2] *Source: Boletim Energia, number 97, 2003 - http://www.aneel.gov.br/arquivos/PDF/BOLETIM_ENERGIA_097.htm*

[3] *http://www.integracao.gov.br/desenvolvimentodocentrooeste/plano/index.asp*

Small-scale run-of-river[4] hydropower plants, such as ARSSHP provide locally generated power, in contrast with the business as usual large hydropower and natural gas fired plants built in the last 5 years. These small-scale projects also provide site- benefits including:

- Increased reliability with shorter and less extensive outages;
- Lower reserve margin requirements;
- Improved power quality;
- Reduced lines losses;
- Reactive power control;
- Mitigation of transmission and distribution congestion; and
- Increased system capacity with reduced T&D investment.

A.3. Project participants:

Name of the 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)	Tecnovolt Centrais Elétricas S/A (private)	No
(*) In accordance with CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a party involved may not have provided its approval. At the time of requesting registration, the approval by the party(ies) involved is required		

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

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

A.4.1.1. Host Party(ies):

Brazil

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

Mato Grosso State (Midwest part of Brazil)

A.4.1.3. City/Town/Community etc:

Municipality of Nova Ubiratã

[4] *According to Eletrobrás (1999), run-of-river projects are defined as "the projects where the river's dry season flow rate is the same as or higher than the minimum required for the turbines".- http://www.eletrobras.gov.br/EM_Programas_PCH-COM/capitulos.asp - "Tipos de Pequenas Centrais Hidrelétricas".*

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

The ARSSHP is located on kilometer 91 of the Von Den Steinen River in the Fazenda Itapira municipality of Nova Ubiratã, Mato Grosso State, Brazil. The Coordinates are 13º05'57" South, 54º49'08"West. Figure 1 shows the project location in Mato Grosso State through an engineering plant map:

Figure 1: Project Activity location

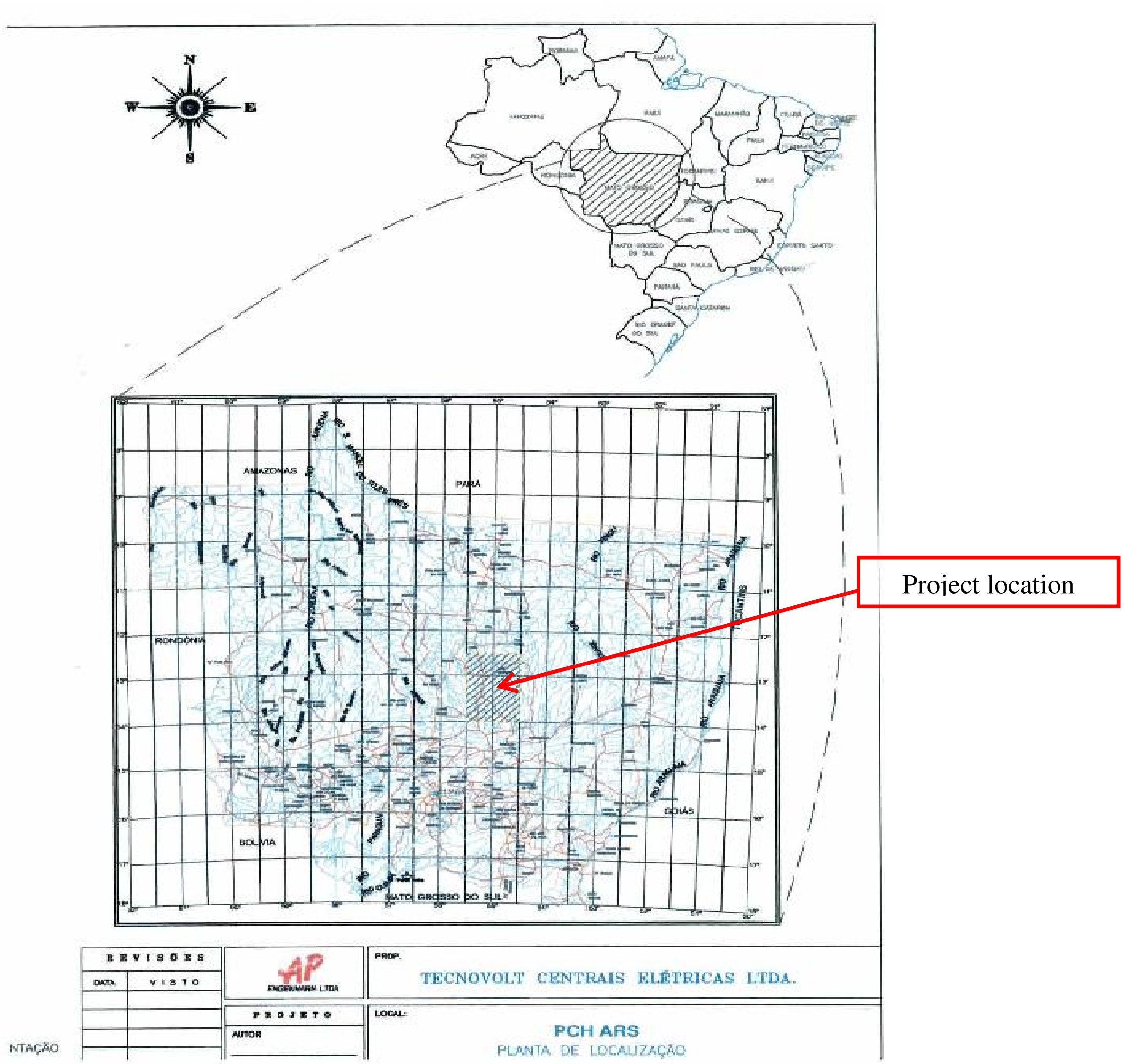

Figure 1: Project Activity location

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

According to the list of small-scale CDM project activity categories contained in Appendix B of the Simplified M&P for the Small-Scale CDM Project Activities, the ARSSHP project corresponds to:

Type I: Renewable Energy Projects

Category D: Energy Generation for a System.

The ARSSHP, with a power capacity of 6.66 MW, is introduced in the regional context as a low impact plant, whose dam is designed to function as run of river.

Run-of-river designs do not include significant water storage and must therefore make complete use of the water flow. A typical run-of-river design involves a low-level diversion dam and is usually located on a swift-flowing stream. According to Eletrobrás[5] (1999), run-of-river projects are defined as “the projects where the river’s dry season flow rate is the same or higher than the minimum required for the turbines”. A low-level diversion dam sufficiently raises the water level in the river to enable the intake structure to be located on the side of the river. The intake consists of a trash screen and a submerged opening with an intake gate. Water from the intake is normally taken through a pipe (called a penstock) downhill to a power station constructed downstream of the intake and at the lowest possible level to gain the maximum head on the turbine.

The equipment and technology to be used in the ARSSHP project has been successfully applied to similar projects in Brazil and around the world. The equipment to be used in the project is developed and manufactured locally.

Estimated equipment to be installed:

- Turbines: manufactured by Hidráulica Industrial – Hisa
- Generators: manufactured by Seme/Flessak
- Command Panels: manufactured by Seme/Flessak
- Two Francis turbines and generators system of 3.33MW each.

According with the ANEEL, Dispatch 911[6]:

- Installed Capacity: 6.66 MW
- Assured Energy: 5.23 MW
- Reservoir Area: 1.64 km^2

The main components of the small hydro plant include the following:

Dam characteristics

Table 1: Dam characteristics

[5] *Eletrobrás – Brazilian Electrical Company*

[6] *http://www.aneel.gov.br/cedoc/dsp2004911.pdf*

General Characteristics	
Lifetime	400 years
Perimeter	13.57 km
Medium Profundity	4 m
Maximum Profundity	7.5 m
Time of Formation	2 days
Edge Length	485.50 m
Height of the Dam	10.50 m
Levels of Water (upstream)	
Normal Level	328.50 m
Minimum Level	328.00 m
Maximum Capacity Level	330.50 m
Levels of Water (downstream)	
Normal Level	314.00 m
Normal at the escape duct	312.75 m
Flow	
Long Time (MLT) Average Flow	55.80 m^3/s
Maximum River Flow	128.00 m^3/s
Flood Spillway (500 years)	233.00 m^3/s
Specific MLT Flow	26.60 $l/s/km^2$
Specific Flow at 95% of time	11.00 $l/s/km^2$
Flooded Area	
Maximum Normal	1.64 km^2
Minimum Normal	1.64 km^2
Maximum Capacity	2.10 km^2

Turbines

Table 2: Turbines characteristics

General Characteristics	
Type	Francis
Number of Turbines	2
Height Net Fall	15.15 m
Unit Nominal Flow	25 m^3/s
Unit Power	3,265 kW
Nominal Rotation	180 rpm

Generators

Table 3: Generators characteristics

General Characteristics	
Type	Static Three Phase Generator
Number of Generators	2
Generator Type	Three-phase synchronous
Power per Unit	4000 kVA
Rotation	180 rpm
Nominal Tension	6,900 V
Power Tactor	0.80
Number of Poles	40
Axle Position	Horizontal

Transformers

Table 4: Transformers characteristics

General Characteristics	
Type	Three-phase oil transformer
Nominal Power	4.16 MVA
Primary Tension	3.8 kV
Secondary Tension	34.5 kV
Frequency	60 Hz
High-tension connection	Grounded star/triangule
Number of transformers	1

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

The emission reductions are the total amount of CO_2e which would occur in the absence of the proposed project by fossil fuel power plants, considering the operating margin and build margin of the BIES.

The total *ex-ante* emission reductions are estimated to be 59,074 tCO_2e for the chosen crediting period of 7 years. Note that actual emission reductions will be based on monitored data and may differ from the estimate shown below.

Table 5: Estimated amount of emission reductions

Years	Estimation of annual emission reductions in tonnes of CO_2e
Year 2010	8,439
Year 2011	8,439
Year 2012	8,439
Year 2013	8,439
Year 2014	8,439
Year 2015	8,439

Year 2016	8,439
Total estimated reductions (tonnes of CO_2e)	**59,074**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (tCO_2e)	8,439

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

No public funding has been used in financing this project activity.

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

In accordance with Appendix C of the Simplified M&P for the Small-Scale CDM Project Activities, the ARSSHP project is not a separate component of a larger CDM project activity.

The project activity is an independent hydro power plant generating electricity and supplying the grid, unrelated to any other CDM project activity in the region, existing or planned. The project proponent does not have other registered small-scale CDM project activity, or applications to register other small-scale CDM project activity:

- in the same project category;
- registered within the previous 2 years; or
- project, whose boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

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:

As mentioned above, according to the list of the small-scale CDM project activity categories contained in Appendix B of the Simplified M&P for the Small-Scale CDM Project Activities, the ARSSHP project corresponds to:

Type I: Renewable Energy Projects
Category D: Electricity Generation for a System

Thus, the methodology used in this project activity is AMS-I.D: Grid Connected Renewable Electricity Generation (Version 13).

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

According to the AMS ID, version 13:

Technology/measure

1. This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

The project consists of renewable energy generation that supplies electricity to a fossil fuel fired distribution system; therefore the proposed project activity meets this applicability criterion.

2. If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel1, the capacity of the entire unit shall not exceed the limit of 15MW.

The project consists of renewable energy generation with a total installed capacity of 6.66 MW; therefore the proposed project activity meets this applicability criterion.

3. Combined heat and power (co-generation) systems are not eligible under this category.

Not applicable, considering there is no co-generation systems under the proposed project activity.

4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct2 from the existing units.

Not applicable, since the project is not adding energy generation units to an existing renewable power generation facility.

5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.

Not applicable, since the project does not modify or retrofit an existing facility for renewable energy generation.

Summarizing, as a renewable energy generation project, according with the statement of the methodology AMS-ID – version 13, the ARSSHP qualifies under this project category because:

- The project activity is a hydroelectric power plant.
- The project activity supplies electricity to the BIES.

The ARSSHP has a plate power capacity of 6.66 MW, which is lower than 15 MW, and thus, the project activity qualifies as a small-scale project activity and will remain under the limits of small-scale type project activity every year of the crediting period. The capacity of the proposed project activity will not exceed 15 MW.

B.3. Description of the project boundary:

According to the methodology AMS ID version 13, the project boundary encompasses the physical, geographical site of the hydropower generation source.

Brazil has a unique emission factor of the grid, determined by MCT (Science and Technology Ministry). The MCT[7] has published a resolution (number 08 on 26/05/2008) which establishes a unique emission factor for entire BIES.

The project boundary encompasses the physical, geographical site of the hydropower generation source, represented by the Von Den Steinen river basin near the power plant facility and the BIES.

B.4. Description of baseline and its development:

The baseline can be defined as the continuation of the current practices, which is the current situation of the electric system in Brazil without the electric generation of the ARSSHP and its contribution to the BIES.

According to the project category, and the corresponding methodology, the baseline is the energy produced by the renewable generating unit (MWh) multiplied by an emission coefficient (tCO_2e/MWh) calculated in a transparent and conservative manner such as:

a) A combined margin (CM) emission factor, consisting of the combination of operating margin (OM) and build margin (BM) emission factors according to the procedures prescribed in the "Tool to calculate the emission factor for an electric system". Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered, or
b) The weighted average emissions (in tCO_2e/MWh) of the current generation mix. The data from the year which the project generation occurs must be used.

For this project activity, the first option (option a) is selected.

Historically, most generation in Brazil has been based on large and medium size hydroelectric plants. However, the less expensive hydroelectric resources have been exhausted. Gas-fired power plants require much lower capital cost, thus representing low financial risk for investment. Brazil also has thermal power plants using coal, fuel oil, and diesel. Since fossil fired power plants have higher operating cost compared to hydro, these are likely to be displaced by generation from any hydro added to the system. Thus, it is reasonable to choose the first option for calculating the grid emission factor.

The "Tool to calculate the emission factor for an electric system" indicates that the emission factor of the grid is determined by the following six steps:

1. Identify the relevant electric power system
2. Select an operating margin (OM) method
3. Calculate the operating margin emission factor
4. Identify the cohort of power units to be included in the build margin
5. Calculate the build margin emission factor

[7] *http://www.mct.gov.br*

6. Calculate the combined margin emission factor by working out the weighted average of the operating margin emission factor and the build margin emission factor

The Brazilian emission factor is calculated based on the "Tool to calculate the emission factor for an electric system" by the MCT. The emission factor of the BIES is a combination of the operating margin emission factor, reflecting the intensity of the CO_2 emissions of the dispatch data margin and the build emission factor, reflecting the intensity of the CO_2 emissions of the last power plants built.

Baseline data sources

MCT has published a resolution (number 08 on 26/05/2008) which establishes a unique emission factor for the entire BIES. Such an Emission Factor must be adopted for CDM project activities, as stated in the "Tool to calculate the emission factor for an electric system".

EF_{OM} and EF_{BM}, respectively Operating Margin emission factor and Build Margin emission factor, were given by MCT and were calculated under the method: ***Dispatch data analysis operating margin.*** It was considered the default w_{OM} and w_{BM} (50% and 50% respectively) according to the referred tool, for the first crediting period.

All of the emission factor calculation and explanation documents can be found on MCT website (http://www.mct.gov.br).

The following table summarizes the key data necessary for the *ex-ante* determination of baseline emissions:

Table 6: Key data

Data	Source	Value
Ex-ante estimation of Electricity generation of ARSSHP	Tecnovolt Centrais Elétricas S/A	45,815[8] MWh/year
Emission factor for the BIES	The emission factor is calculated by MCT with the ONS (National Dispatch Center) data. The $EF_{grid,CM,y}$, the emission factor for the BIES, formula items, EF_{OM} and EF_{BM}, are also monitored and calculated by MCT and ONS, with the Dispatch Data of the Grid System. For each year this value is recalculated, thus, this value has been calculated for the year 2007, according with the MCT.	0.1842 tCO_2/MWh

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:

CDM prior consideration

[8] *More details regarding ex-ante baseline estimation and ex- ante electricity generation estimation at Section B.6.3*

As per Glossary of CDM terms: "*The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins.*"

The project activity was initiated on January 04th, 2006 (Generator Purchase Contract was signed). However, the ARSSHP is set to begin supplying electricity to the grid by June 2009. Nevertheless, achieving this target required effort to remove several barriers.

CDM was seriously considered in the decision to proceed with the project activity. This evidence is based on the action of partners meeting at Tecnovolt Centrais Elétricas S/A, on 10 September 2001. It was stated that the project participants will undertake the CDM for obtaining carbon credits and improve feasibility of the project. Although Project Sponsor has seriously considered the CDM benefits in the early years, they found difficulties to have a successful agreement with a CDM project developer and they also had to confront important project delays (detailed in the additionality assessment). Nevertheless, Project Sponsor did not give up and continued searching for a company to develop the CDM project. After some time, Project Sponsor finally succeeded to make an agreement with a company, unfortunately the delay in the process do not enable using benefits of the early operation years, but still on time to contribute with several payments related to operation or loan payments. These actions, confirm that CDM was seriously considered for this project activity in accordance with the criteria expressed in Annex 46 of the EB meeting 41[9].

The timeline prepared for the DOE to assess the serious consideration given to the CDM in the project's decision making process and implementation is stated in Annex 6.

Additionality

In accordance with Attachment A of Appendix B of the Simplified M&P for the Small-Scale CDM Project Activities, a barrier analysis could be carried out in order to demonstrate project additionally, as described bellow

> "*Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:*
>
> *(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;*
>
> *(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;*
>
> *(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;*
>
> *(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.*"

[9] *http://cdm.unfccc.int/EB/041/eb41_repan46.pdf*

The following explanation provides the reasons why the project activity would not have occurred anyway due to the following barriers.

Prevailing Business Practice

The prevailing business practice in Brazil has been to construct large-scale hydroelectric plants and, more recently, natural gas based thermal plants. This common practice has become a barrier to invest in small renewable energy projects which fund important barriers, among other, in obtaining financing and financial guarantees for project development.

The creation of several programs is strong evidence that renewable energy projects are not feasible in the Brazilian context. Although the various programs and incentives were launched along the last years, the fact that they were never successfully implemented indicates the difficulty and barriers found to implement small hydro projects in the country.

This barrier can be exemplified by a Program called PCH-COM[10] that was structured by the end of 2000 and began in 2001. In 2001, Eletrobrás, in partnership with BNDES (National Bank for Social and Economic Development), launched the PCH-COM program, whose main goal was to support and encourage construction of small hydropower plants. This program consisted on financing of the project by BNDES and the commercialization of the power by Eletrobrás (Brazilian Electric Company). In case the project was approved, two contracts were to be signed: the financing with BNDES and the Power Purchase Agreement (PPA) with Eletrobrás. The program was not successful because of the types of guarantees required and the clauses in the contracts (i.e., the project was not considered on a project finance basis and, therefore the lender demanded guarantees directly from the project owner and not the project itself), low fixed price value, etc; this many times, constituted a barrier for the project sponsors.

After PCH - COM, the government created in 2002 the PROINFA[11] program, which foresaw to raising the share of renewable energy generation by adding 3,299.40 MW of installed capacity while offering long-term contracts with special conditions, lower transmission costs, and smaller interest rates from the local development banks. The Program attracted the attention of several potential investors but others, like Tecnovolt, had not demonstrate interest due to, among others, the price offered for the electricity sell to the grid.

In 2005, BNDES presented the final version of its financing incentive line to PROINFA[12], different from the first one and on top of that, Government established that the CDM benefits eventually obtained from projects under PROINFA, would pertain to Eletrobrás. The final perception of many entrepreneurs was to consider these programs not sufficiently attractive.

Aware of the difficulties mentioned above, Tecnovolt Centrais Elétricas S/A decided not apply to PROINFA for considering it not attractive (not important benefits were provided, requirements and guarantees needed; and other benefits that the project could obtain, like CERs, must be transferred. That

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[10] *PCH-COM - http://www.eletrobras.gov.br/EM_Programas_PCH-COM/conceituacao.asp*

[11] *http://www.eletrobras.com/elb/main.asp?ViewID={ABB61D26-1076-42AC-8C5F-64EB5476030E}&params=itemID={4CD80A9D-8141-489C-AE9A-9A81D0E177E0};&UIPartUID={D90F22DB-05D4-4644-A8F2-FAD4803C8898}*

[12] *http://www.bndes.gov.br/noticias/2005/not059_05.asp*

is to say, the rights to develop and obtain the benefit of the CDM shall be for Eletrobrás), therefore, the proposed project activity does not have access to the benefits of the program.

At the end, these incentives constituted a lost of money and time trying to submit projects to these programs and realizing that, after some time, they would not serve to overcome the barriers and therefore other financing alternatives should be found.

The fundamental aspect for the prevailing business practice analysis is related to the marginal participation of small hydro power plants in the Brazilian electric portfolio, an analysis based on data available on April 27th, 2009, shows that[13]:

a) There were 163 small hydropower plant projects approved in Brazil between 1998 and 2009, which have not started construction yet.

b) Small hydropower plants in operation correspond to less than 2.52 % of the total electric power generated in the country.

c) 72.33% and 22.66% of the total power generated in Brazil is being generated respectively by large hydro and thermal plants.

Due to all that was exposed above, and despite all the government incentives, it is possible to conclude that:

1) Common practice in Brazil has been to construct large-scale hydroelectric plants and, more recently, natural gas based thermal plants.

2) The construction of thermal power plants has been more attractive than the construction of small hydropower plants.

The graphic below illustrates the total electric power generation in Brazil:

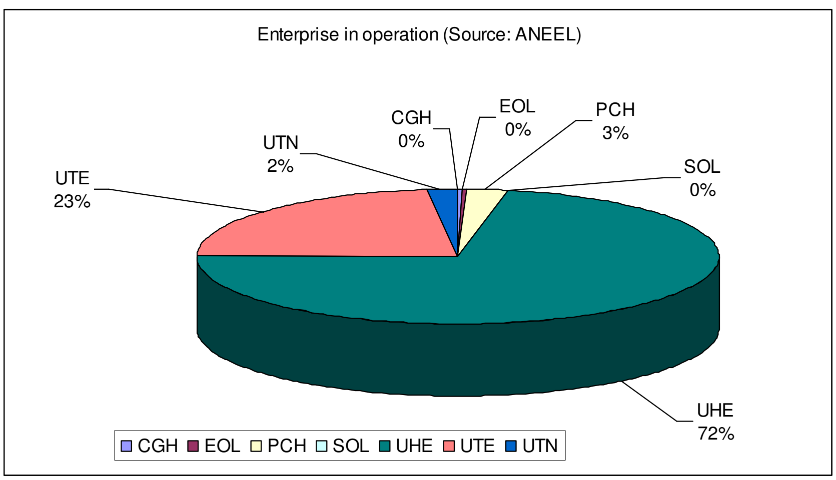

Figure 3: total power generation in Brazil (source: ANEEL)

[13] *Source: http://www.aneel.gov.br/area.cfm?idArea=15 (Capacidade Geração Brasil, April 2009)*

The following table shows the references for the graphic above.

Table 5: Legend for the figure 3

Legend	
CGH	Hydroelectric Power Plant owned by self-producers
EOL	Wind Power Plant
PCH	Small Hydroelectric Plant
SOL	Solar Power Plant
UHE	Conventional Hydroelectric Power Plant
UTE	Thermoelectric Power Plant
UTN	Nuclear Power Plant

As seen in the graphic, independent of the political and economic efforts made by government, the installed power capacity of SHP has not shown significant increase. This is the reason why the small hydroelectric power plants cannot be considered common practice in Brazil, because it represents only 2.52% of the total electric generation in the country.

In addition, if we consider the generation in the Mato Grosso state it is possible to verify that there are 42 small hydros (below to 30 MW according to ANEEL definition) in operation at May 2009; however, most of these SHPs are different from the proposed project activity and, the most important aspect; they have been installed considering additional incentives as PROINFA program or CDM revenues.

Taking into account that ARSSHP is a small scale project (installed power below 15 MW), that it is classified as IPP -Independent Power Producer- (PIE in Portuguese) and that this plant did not apply to PROINFA, only three plants are found with similar characteristics in Mato Grosso state (more details in Annex 8 of this PDD):

- The Rio Prata Plant with 2.135 MW in the West region of Mato Grosso;
- The Camargo Correa (Arrossensal) Plant with 4.230 MW in the Center-South region of Mato Grosso;
- The Santa Lúcia Plant with 5.000 MW in the West region of Mato Grosso;

As there are 120 Power Plants operating in the state of Mato Grosso, these three plants represent only 2.5% of the total quantity of plants in the state.

In conclusion, ARSSHP can not be considered common practice since the total generation by small hydroelectric power plants, with similar conditions as the proposed project activity, represents only 2.5% of the total generation operating in the Mato Grosso state. The common practice in Brazil is the installation and the operation of large hydroelectric plants, such as thermoelectric plants and huge thermoelectric plants, and therefore ARSSHP does not fit in the business as usual type scenario.

Prevailing practice, existing regulatory or policy requirements would have led to implementation of a technology with higher emissions.

Other Barriers:

- *Significant implementation delays*: Other reason for the reduced number of similar project activities in Brazil is the financial burden, mainly for small hydro plants financing, when the lender demands for direct guarantees from project developer.

  The high guarantees required to finance an energy project is a barrier for new projects development in this sector. Insurance, financial guarantees, financial advisors, are requirements that raise the costs of these projects and a feasibility barrier for its financing. Another barrier is the contract for buying and selling electrical energy. These contracts are required to obtain long-term financing from banks. The lack of adequate commercial agreements for energy buyers influences directly in the negotiation process between banks and the project developer. Since the majority of Brazilian concessionaries does not have a satisfactory credit history, it becomes a barrier for long-term financing processes.

  In the case of ARSSHP, the project owner has spent a lot of time trying to obtain financing from different entities. One of the first attempts to request finance for the ARSSHP project was with *BNDES Bank* in the year 2004. The second attempt was with the *Banco do Brasil* (Brazil State Owned Bank Fund). The processes lasted near two years where several meetings took place, guarantees were required, project information was provided and so on. Finally, after some time, although the efforts made and the time expended, the financing with these banks were not obtained. The developer has realized the excessive guarantees required in order to provide financing, besides the excessive of bureaucracy, which have been producing important project delays. Although Bank's role as a financing institution might be mitigating risks, it is understood as a market barrier.

  Another project financial attempt took place with Caixa Economica Federal (Federal Bank Fund) in the year 2005. Although the project fortunately has obtained the financing, more than two year had been consumed to achieve the approval of it. Despite the confirmation of the financial approval in May 2007, several problems arose to finally proceed with the contract signature, which allowed the availability of founds for August 2007 (only a part of the total amount).

  These barriers have lead to important project delays, in the process to achieve the financial approval and later because of the rain season when it was obtained; that bring more difficulties as changes in the economical situations, several contract amendment in the Power Purchase Agreement, several changes in the project chronogram which had to be submitted to ANEEL for approval, the necessity for asking guarantee period extension, several environmental installation license renewals and so on.

  The time expended in receiving founds not only has produced the loss of the best period for civil works but also has prevented the necessary payment to the equipment provider, which need the resources to acquire the raw material to start with the equipment manufacture.

  As a consequence of these delays, that led the project owner suffer the changes in the economical situation; the project was affected by the increase in the material costs for project development and in some cases the availability of them. An example of this is the cement that has to be provided from Chapecó (Santa Catarina State), a city almost 2,000 km away from the project location. This situation produced an important increase in the cost foresaw for the civil work and consequently in the inversion needed for project development.

This barrier clearly demonstrates the high risk perception of the small hydro power energy market and discourages possible investors because the incentives are not enough to guarantee the project profit.

- *Disadvantageous location of the project*: Other barrier was related to the region where the project is located is an isolated and underdeveloped area 500 km from Cuiabá (capital of Mato Grosso state). There is a deficit of infrastructure such as roads, reliable supply of electricity, communication and transport. The project sponsor had to develop some of these facilities before beginning the implementation. In addition, there are no qualified workers available in the region due to the lack of schools and universities. The raw materials needed for implementing the project come from other sites, distant hundreds of kilometers away from the project.

- *Risk associated to project type*: Other barrier inherent to the technology applied is the hydrological risk, which is more critical for run of river projects. Since this is a run of river project with no flooded area, it is more heavily affected by hydrological fluctuations and cannot produce energy on demand, nor produce enough energy at certain times of the year, unlike a fossil fuel fired plant. Also the project is a risk from hydrological factors such as flooding or erosion throughout its operating life.

- *Regulatory and macroeconomic aspects*: Another important barrier is the regulatory aspect related to the procedure for obtaining licenses. Before taking the license to use the water resources and implement the SHP, there is an initial investment to develop the inventory studies of the river without knowing for sure whether the license will be provided or not.

  Furthermore, the value of the assured energy, defined in the basic project, changes throughout the process and its final value will be determined only when the entrepreneur is committed to the project and has already made a large initial investment. The major barrier is that the financial return is directly related to the assured energy, leaving the investor vulnerable to these variations. Potential investors cite the high degree of regulatory barriers and uncertainties as a factor that leads them to demand high rates of return for projects with high risks or to invest their money in safer and more profitable options.

  Despite of several government attempts to change and create regulations and incentives, a stable and long term regulatory framework that effectively promotes renewable energy in Brazil has not yet been created.

  On the other hand, Brazil's macroeconomic environment is currently characterized by high degrees of instability and uncertainty, therefore, in order to achieve the profitability that is appropriate to project risks, the analyst must foresee or establish the probabilities of all (or the most important) characteristics of the economy that will affect the prices (e.g. inflation rates, energy demand), debt (e.g. interest rate adjusted to inflation) and others. In addition to those, other difficulties that stem from the uncertainties regarding regulatory variables (previously described), engineering variables (projects, civil construction) and environmental issues (environmental licensing and damages), may lead to scheduling changes, affect the beginning of operations, cause fines and other possible outcomes that might affect the project's cash flow.

Conclusions

As defined by ANEEL[14], small hydro power plants are power plants with installed capacity from to 1 to 30 MW, and with a reservoir area smaller than 3 km². It generally consists of a run-of-the-river hydro plant which has minimum environmental impact. This is not the business-as-usual scenario in a country where large hydro and thermal fossil fuel projects are preferred. CDM has made it possible for some investors to set up small hydro plants and sell electricity to the grid and this motivated the implementation of ARSSHP.

The registration of the proposed project activity will help ARSSHP to improve its economic performance; contributing with several expenses related to the operation or loan payments and will be an important incentive to overcome barriers. Also, the project registration may have a strong impact in paving the way for similar projects to be implemented in Brazil.

Considering all above assessment, it is clear that the project activity would not have occurred anyway due to the barriers presented and therefore the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel-fired power plants by renewable electricity. The emission reduction ER_y, by the project activity during a given year *y* is the difference between baseline emission reductions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows

$$ER_y = BE_y - PE_y - LE_y \quad (1)$$

Considering that AMS-ID version 13 not considers emissions from the project and that ARSSHP is a small scale project with no reservoir area; no project emissions are considered.

$$PE_y = 0 \quad (2)$$

Leakage is to be considered only when the generating equipment is transferred from another activity. This is not the case with ARSSHP. The energy conversion equipment for the project was newly manufactured for the specific site conditions. Therefore, there is no leakage associated with the project activity.

$$LE_y = 0 \quad (3)$$

Thus,

$$ER_y = BE_y \quad (4)$$

Emission reductions obtained during year *y* (ER_y, in tCO_2e/year) are equal to baseline emissions calculated by multiplying the combined margin emission factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) by the electricity generated by the proposed project activity during year *y* (EG_y, in MWh), as follows:

[14] *Resolution n. 394, December 4th, 1998.*

$$BE_y = EG_y \times EF_{grid,CM\ y} \quad (5)$$

Thus,

$$ER_y = EG_y \times EF_{grid,CM\ y} \quad (6)$$

The combined margin (CM) emission factor is a combination of operating margin (OM) and build margin (BM) emission factors according to the procedures described in the “Tool to calculate the emission factor for an electric system”.

The tool indicates that the emission factor of the grid is determined by the following six steps:

1. Identify the relevant electric power system
2. Select an operating margin (OM) method
3. Calculate the operating margin emission factor
4. Identify the cohort of power units to be included in the build margin
5. Calculate the build margin emission factor
6. Calculate the combined margin emission factor by calculating the weighted average of the operating margin and the build margin emission factor

The Brazilian emission factor is calculated based on the “Tool to calculate the emission factor for an electric system” by the MCT. The emission factor from the interconnected system is a combination of the operating margin emission factor, reflecting the intensity of the CO_2 emissions from the dispatch data margin and the build emission factor, reflecting the intensity of the CO_2 emissions of the last power plants built.

The combine margin emission factor is calculated as the weighted average of the operating margin emission factor and the build margin emission factor and is expressed in tCO_2/MWh.

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

Where

$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting for operating margin emission factor (%)
w_{BM}	=	Weighting for build margin emission factor (%)

In this case, as per “Tool to calculate the emission factor for an electricity system” the default value of 50% will be considered for both weighting for the operating margin and the build margin emission factors (i.e., $w_{OM} = w_{BM} = 0.5$), during the first crediting period.

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

Data / Parameter:	$EF_{OM,Dispatch\ Data,y}$
Data unit:	tCO_2/MWh
Description:	Dispatch Data Operating Margin emission factor of the grid in a year y

Source of data used:	$EF_{OM,DD,,y}$ calculation is provided by MCT/ONS . Calculated according to the "Tool to calculate the emission factor for an electric system"
Value applied:	0.2909
Justification of the choice of data or description of measurement methods and procedures actually applied:	Operating Margin emission factor is calculated by MCT with the ONS data. The $EF_{OM,\ DD,,}\ y$ formula items, will be also monitored and calculated by MCT and ONS, with the Dispatch Data of the BIES.
Any comment:	This data is available on the web-site: http://www.mct.gov.br

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Margin CO_2 emission factor of the grid in a year *y*.
Source of data used:	$EF_{BM,y}$ calculation is provided by MCT/ONS (National Dispatch Center).
Value applied:	0.0775
Justification of the choice of data or description of measurement methods and procedures actually applied:	Build Margin emission factor is calculated by MCT with the ONS data. The EF_{BM},y formula items, will be also monitored and calculated by MCT and ONS, with the Dispatch Data of the BIES.
Any comment:	This data is available on the web-site: http://www.mct.gov.br

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor for the Brazilian interconnected grid
Source of data used:	Data for $EF_{grid,CM,y}$ calculation is provided by MCT/ONS (the national dispatch center)
Value applied:	0.1842
Justification of the choice of data or description of measurement methods and procedures actually applied :	The $EF_{grid,CM,y}$ formula items, EF_{OM} and $EF_{BM,}$ will also be monitored and calculated by MCT and ONS, with the Dispatch Data of the Grid System. This value is yearly updated according to MCT calculations for the BIES.

Any comment:	http://www.mct.gov.br/

B.6.3 Ex-ante calculation of emission reductions:

As mentioned above, leakage emissions and project emissions are zero, therefore emission reductions are the same as baseline emissions:

$$ER_y = BE_y \quad (4)$$

$$ER_y = EG_y \times EF_{grid,CM,y} \quad (6)$$

ARSSHP is expected to generate around 45,815 MWh per year, as shown in the following table:

Table 9: Expected annual electricity generation

Plant capacity **(A)**	6.66 MW
Annual hours **(B)**	8,760 hr/year
Capacity factor **(C)**	0.785 [15]
Electricity generation **(A)** x **(B)** x **(C)**	**45,815 MWh/year**

As mentioned above, the emission factor of the grid is determined using the "Tool to calculate the emission factor for an electric system" as a combined margin emission factor consisting of both the operating margin and the build margin.

As shown in Annex 3, the operating margin emission factor is 0.2909 tCO_2/MWh and the build margin emission factor is 0.0775 tCO_2/MWh.As per the "Tool to calculate the emission factor for an electricity system" – version 1.1, the resulting grid emission factor is:

$$EF_{grid,CM,y} = w_{OM}.EF_{grid,OM,y} + w_{BM}.EF_{grid,BM,y} = 0.1842\, tCO_2 / MWh$$

$$ER_y = 8{,}439\ tCO_2\ /\ year$$

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

Table 10: Ex-ante estimation of emission reductions during the first 7-year crediting period

[15] *The capacity factor is calculated through the Installed Capacity divided by the Energy Assured, mentioned in the Dispatch 911 from ANEEL (details in section A.4.2)*

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of Leakage (tCO2e)	Estimation of Overall reductions (tCO2e)
2010	0	8,439	0	8,439
2011	0	8,439	0	8,439
2012	0	8,439	0	8,439
2013	0	8,439	0	8,439
2014	0	8,439	0	8,439
2015	0	8,439	0	8,439
2016	0	8,439	0	8,439
Total (tonnes of tCO_2e)	**0**	**59,074**	**0**	**59,074**

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

B.7.1 Data and parameters monitored:

Parameter:	EG_y
Unit:	MWh
Description:	Electricity generated by the renewable technology in year *y*
Source of data:	Tecnovolt Centrais Elétricas S/A.
Value of data:	45,815
Description of measurement methods and procedures to be applied:	Electricity delivered to the grid will be monitored by the project (seller) and by the buyer through electricity meter connected to the grid and through sales receipt. This data will be measured every 15 minutes and recorded monthly.
QA/QC procedures to be applied (if any):	The equipment will be calibrated every two years, according with the ONS regulations.
Any comment:	This data will be used to calculate the emission reductions resulting from obtained through the project activity. Data will be archived electronically up to two years after completion of the crediting period.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor for the BIES grid.
Source of data to be used:	Data for $EF_{grid,CM,y}$ calculation is provided by MCT/ONS (the national dispatch center)

Value of data	To be calculated
Description of measurement methods and procedures to be applied:	Ex-post emission factor will be calculated by MCT with the ONS data. The $EF_{grid,CM,y}$ formula items, EF_{OM} and EF_{BM}, will also be monitored and calculated by MCT and ONS, with the Dispatch Data of the Grid System. This value is yearly updated according to MCT calculations for the BIES.
QA/QC procedures to be applied:	This data is from an official source and is publicy available. Margin of error for the data is Low.
Any comment:	http://www.mct.gov.br/

B.7.2 Description of the monitoring plan:

According to Type I, Category D of small-scale project activity categories contained in appendix B of the Simplified M&P for CDM Small-Scale Project Activity, monitoring shall consist of metering the electricity generated by the renewable technology.

The energy generated will be transmitted to a substation belonging to the power utility. ARSSHP will monitor the energy generation trough a supervision system (hereafter SMF) where the electrical and others parameters measured are registered. The SMF has the ability to generate reports and keep record of the historical data.

The energy generated will be measured through two equipments of measure, *Schneider Electric*, model ION 8600C and a backup meter (reserve model), connected to a panel. If the principal meter brake down or fails, the reserve meter, will continue measuring and registering the generation trough the system.

The meters are installed in metallic panels and it can be visualized even if the panel door is closed. In ARSSHP project, the meters are located at the electric transformers cabin. The system is locked (including internal panel equipments), verified and sealed by CEMAT, in order to not permit the project owner have access to the equipments, ensuring the system inviolability. These meters use, for calibration, maintenance, configuration and downloading stored values, external remote devices which allow the execution of these tasks without the need of disconnecting them.

CEMAT (Mato Grosso Electric Company - Energy Buyer) shall monitor the installation of the SMF, inspect equipments, coordinate supervision and commissioning, lock SMF and approve equipments to operation.

Project owner is the responsible for the installation of the SMF (equipments purchase, installation and commissioning), for the submission of the data to the CCEE (Electrical Energy Commercialization Chamber) and for the communication with the Energy Data Collect System (EDCS). The project owner will also provide physical and remote access to the SMF.

The SMF is according to the ONS norm 12[16] that regulates its procedures for the SMF. The system will be connected to internet, allowing the remote access (to CCEE and involved parts) in order to permit the visualization of the generation registered.

[16] *http://www.ons.org.br/procedimentos/modulo_12.aspx*

The equipment will be calibrated every two years, according with the ONS regulations. This equipment will be online with the CCEE, who is responsible for the accounting of the energy supplied.

ARSSHP will assign a qualified person to compile all the necessary data to accurately calculate emission reductions according to the approved methodology. The data will be compiled in a manner amenable to third party audit and deliverable to the DOE for validation and certification purposes.

The monitoring methodology is applied through a spreadsheet model. The person responsible for monitoring the project must complete the electronic worksheets on a monthly basis. The spreadsheet automatically provides annual totals of GHG reductions achieved by the project.

All the data monitored will be archived during the crediting period and two more years afterwards.

Prior to the first crediting period, an internal written procedure will be prepared which covers the quality and reliability of the monitoring process, including the following essential items:

- Procedures for training, periodical update and eventual substitution of operators and other personnel involved in the monitoring process;
- Procedures for quality assurance and calibration of measuring equipment;
- Procedures for archiving and back-up of monitored data;
- Procedures for recording activities related to above mentioned subjects.

The operational and management structure to be implemented is the following:

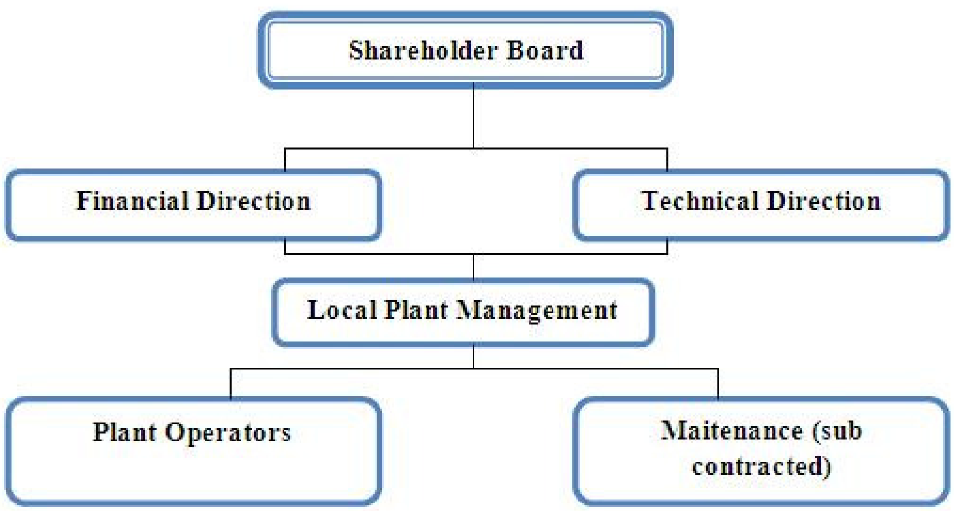

Figure 4: Operational and management structure

The Technical Direction coordinates Local Plant Management, responsible to the verification and registration of the energy generated in the supervisory system. Plant Operators may have access to information of energy and parameters, but not always, shall have permission to modify generation or control of supervisory system.

B.8	**Date of completion of the application of the baseline and monitoring methodology and the**

name of the responsible person(s)/entity(ies)

Date of completion: 01/12/2005 (revised on 22/05/2009)

Name of the responsible person/entity:

- Fernando Alarcon Nogueira and Rocio Rodriguez , MGM International SRL
  Av. Luis Carlos Berrini, 1297 cj.121
  CEP 04571-010, São Paulo - Brazil
  Tel. (55 11) 5102 3844

Fernando Alarcon Nogueira and Rocio Rodriguez are not project participants.

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:

4 January 2006 (Generators Purchase Contract).

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

25 years 0 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:

01/01/2010 (or on the registration date of the CDM project activity).

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:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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

The proponent of any project that involves the construction, installation, expansion, and operation of any polluting, potentially polluting, or any other activity capable of causing environmental degradation is required to secure a series of permits from the respective state environmental agency. In addition, any such activity requires the preparation of an environmental assessment report, prior to obtaining construction and operation permits. Three types of permits are required. The first is the preliminary permit (*Licença Ambiental Prévia*, LP) issued during the planning phase of the project which contains basic requirements to be met during the construction and operation stages. The second is the construction permit (*Licença Ambiental de Instalação*, LI) and, finally, the operating permit (*Licença Ambiental de Operação*, LO).

The process starts with prior analysis (preliminary studies) by the local environmental department. After that, if the project was considered environmentally feasible, the sponsors have to prepare the Preliminary Environmental Assessment composed of the following information:

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

Successful submission of these assessments results in a preliminary license reflecting the local environmental agency`s understanding of the environmental project concepts.

To get the construction license, it will be necessary to present either: (a) additional information to the previous assessment; (b) a new more detailed and simplified assessment; or (c) the PBA, according to the environmental local agency`s decision when the preliminary license was issued. The operation license will be obtained as a result of the pre-operational tests performed during the construction phase, to verify if all demands made by environmental local agency have been satisfied.

All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency (FEMA/MT).

Given that the project is below the environmental legislation criteria for small-scale (up to 15 MW) plants and its reduced impact, environmental assessment process is fast-tracked.

The power plant has all the necessary licenses issued by the environmental agency of the State of Mato Grosso (FEMA):

- Installation license number 397/2003, issued on December 29, 2003
- Installation license number 154/2005, issued on March 02nd, 2005
- Installation license number 1096/2007, issued on May 16th, 2008
- Operation license number 297328/2009, issued on April 30th, 2009

The implementation of the environmental requests stated in the installation licenses was carried out as requested. These requests remain valid after the operation license issuance, as part of the operation licensing process.

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

The proposed project is a run-of-river hydropower plant involving the construction of a small reservoir. Therefore, the environmental impact is very small compared to other types of power generation alternatives.

SECTION E. Stakeholders' comments

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

ARSSHP project had its local stakeholders consultation process carried out twice due the new rules established by CIMGC (Comissão Interministerial de Mudança Global do Clima), the Brazilian DNA. As a consequence, the local stakeholder consultation process had to be revaluated and repeated according to new rules.

The first consultation process was held in January 2007 following the rules established in the Resolution #1 issued by CIMGC.

In March 2008, Resolution #7 was published by CIMGC, modifying some rules previously established in the Resolution #1. One of the modifications was the inclusion of another entity to be invited to make comments: the Federal Public Ministry. Therefore, according to Resolution #7, the consultation should be performed by the project sponsor inviting for comments at least the following entities:

- Municipality
- Alderman Chamber
- State Environmental Agency
- Municipal Environmental Agency
- Brazilian Forum of NGOs
- Community Associations
- Public Ministry
- Federal Public Ministry

The second local stakeholder consultation, as per Resolution #7, was performed in January 2009.

The invitation letters were sent informing that the full content of the Project Design Document, as well as the Annex 3 regarding the contribution of the Project Activity to sustainable development, would be made available on the internet at http://www.flessak.com.br/.

Contact information was also specified in the invitation letter in order to receive comments, doubts and opinion about the project.

The local stakeholders invited for the local consultation process are shown as follows:

- Municipality (NovaUbiratã)
- Alderman Chamber (NovaUbiratã)
- Municipal Environmental Agency (NovaUbiratã)
  Secretaria Municipal da Agricultura e Meio Ambiente
- State Environmental Agency:
  SEMA – *Secretaria de Estado do Meio Ambiente*
  FEMA – *Fundação Estadual do Meio Ambiente*
- Brazilian Forum of NGOs – *Forum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e Desenvolvimento*.
- Community Association (NovaUbiratã)

ACENU – *Associação Comercial Empresarial de Nova Ubiratã*

- Public Ministry (NovaUbiratã)
- Federal Public Ministry
- Aneel (electrical regulatory agency)

The invitation letters,,sent to the local stakeholders listed above, its copies and the acknowledgement of receipt (called AR in Brazil) were shown to the DOE during the validation process.

To facilitate comments by the local stakeholders invited, the following questionnaire was sent:

1. Do you believe that the socio-economic situation of the region will improve due to the implementation of the project?
2. Is the implementation of project able to improve the environmental situation in the region?
3. How does the development of the project affect you (positively or negatively) or your environment?
4. Would you recommend private companies or authorities to develop projects of this nature?
5. Do you think the project will contribute to the Brazilian Sustainable Development?
6. Any additional comments you would like to make.

The following documents are publicly available to all potential stakeholders on a website[17]:

- Presentation on the ARS Project
- Executive Summary of ARS Project
- Project Design Document (PDD) – in Portuguese
- Annex III - contribution of the Project Activity to sustainable development
- General Concepts on Greenhouse Effect and the Kyoto Protocol

E.2. Summary of the comments received:

During the first local stakeholders consultation, comments were received from:

- Brazilian Forum of NGOs – *Forum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e Desenvolvimento*

In the second local stakeholders consultation made, comments were received from:

- Municipality and Municipal Environmental Agency (jointly comment)
- Alderman Chamber

All the presented comments were positives, emphasizing the project activity will bring one more source of employment and consequently the municipality development, besides supplying electric energy for the region.

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

[17] *http://www.flessak.com.br*

As the comments received in the first and in the second consultation did not affect the project, no further action was necessary.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Tecnovolt Centrais Elétricas S/A
Street/P.O.Box:	Rodovia MT 242, km 140, Fazenda Irapira, Distrito de Santo Antonio do Rio Bonito
Building:	--
City:	Nova Ubiratã
State/Region:	Mato Grosso
Postfix/ZIP:	78888-000
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Represented by:	Edson Flessak
Title:	Director
Salutation:	Mr,
Last Name:	Flessak
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was involved in financing this project activity.

Annex 3

BASELINE INFORMATION

The baseline can be defined as continuing the current practice, meaning, the current situation of the electric system in Brazil without the ARSSHP electric generation and its contribution to the BIES.

Grid emission factor calculation

The “Tool to calculate the emission factor for an electric system” indicates that the emission factor of the grid is determined by the following six steps:

1. Identify the relevant electric power system
2. Select an operating margin (OM) method
3. Calculate the operating margin emission factor
4. Identify the cohort of power units to be included in the build margin
5. Calculate the build margin emission factor
6. Calculate the combined margin emission factor by calculating the weighted average of the operating margin and the build margin emission factors.

The Brazilian emission factor is calculated based on the “Tool to calculate the emission factor for an electric system” by the MCT. The emission factor of the BIES is a combination of the operating margin emission factor, reflecting the intensity of the CO_2 emissions of the dispatch data margin and the build emission factor, reflecting the intensity of the CO_2 emissions of the last power plants built.

What`s behind the main criteria for calculating the emission factor for the BIES:

Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$) based on one of the following four methods:

(a) Simple OM
(b) Simple adjusted OM
(c) Dispatch Data Analysis OM
(d) Average OM.

The MCT has published a resolution (number 08 on 26/05/2008) which establishes a unique emission factor for the entire BIES.

The EF_{OM} is given by the MCT and calculated under the method: ***Dispatch data analysis operating margin.***

All the emission factor calculation and explanation documents can be found on MCT website (www.mct.gov.br).

Calculate the Build Margin emission factor ($EF_{BM,y}$)

EF_{BM} is given by the MCT and explanation documents can be found on its website (www.mct.gov.br).

Calculate the combined margin emission factor ($EF_{grid,CM,y}$)

The baseline emission factor is calculated as the weighted average of the operating margin and builds margin emission factors. To weight these two factors apply the 50% default value to both, the operating margin and build margin emission factors; the combined margin emission factor is obtained as follows:

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

EF_{OM} and EF_{BM}, calculated by MCT and ONS, with the Dispatch Data of the Grid System (year 2007):

Table 11: MCT Build Margin and Operating Margin

Build Margin

Average Emission Factor (tCO_2/MWh)	
Year	**2007**
0.0775	

Operating Margin

Average Emission Factor (tCO_2/MWh)												
Year	**Month**											
2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.2292	0.1954	0.1948	0.1965	0.1606	0.2559	0.3096	0.3240	0.3550	0.3774	0.4059	0.4865

Thus, the resulting grid emission factor for the year 2007 is:

$$EF_{grid,CM} = 0.5 \times 0.2909 + 0.5 \times 0.0775 = 0.1842 \text{ tCO}_2\text{e/MWh}$$

Annex 4

MONITORING INFORMATION

The methodology describes the procedure and equations for calculating emission reduction from monitored data. For this specific project, the methodology is applied through a spreadsheet model. The staff responsible for project monitoring must complete the electronic worksheets. The spreadsheet automatically provides annual totals of GHG reductions achieved by the project. The model contains a series of worksheets with different functions:

- Data entry sheet (*Electricity Generation*)
- Result sheet (*Emission Reduction*)

There are cells where the user is allowed to enter data. All other cells contain computed values that cannot be modified by the staff.

A color-coded key is used to facilitate data input. The key for the code is as follows***:***

- ***Input Fields:*** Pale yellow fields indicate cells where project operators are required to supply data required to run the model;
- ***Result Fields:*** Green fields display result lines as calculated by the model.

All electronic data will be backed up on a daily basis, and two electronic copies of each document will be kept at different locations (the project site and the Head Office). This data will be archived for two years following the end of the crediting period.

Annex 5

BIBLIOGRAPHY

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Annex 6

Timeline

ARS Small Hydroelectric Project - Sequence of Events

Document	Date (DD/MM/YYYY)	Event	Comment
Reference 01 *Minutes of the Partners Meeting*	10 September 2001	Internal Meeting	The meeting occurred in September 2001 with all partners present, it was decided that the company (Tecnovolt Centrais Elétricas) shall participate in the Carbon Credit Project under the Clean Development Mechanism.
Reference 02 *ANEEL Resolution*	28 May 2002	Resolution #284 from ANEEL	Resolution #284 from ANEEL authorizes Tecnovolt Centrais Elétricas to explore ARSSHP.
Reference 03 *Request to ANEEL*	27 May 2003	Chronogram Approval Request	ARSSHP requests approval to ANEEL for the chronogram of implementation of the project activity.
Reference 04 *Installation License*	29 December 2003	Installation License	FEMA (local environmental agency) approves Installation License (397/2003) valid until 29 October 2004.
Reference 05 *Financing Request*	25 August 2004	BNDES Financing Request	A finance request was sent to BNDES (Bank) for ARSSHP project. Notwithstanding the efforts made (meetings, guarantees, etc), the time spent, etc., after some time the financing with this bank was not approved.
Reference 06 *Financing Request*	30 October 2004	*Banco do Brasil* Financing Request	In attempt to get financing another request was sent, this time, to *Banco do Brasil* (Bank). Again, notwithstanding, the efforts made, the time spent, faced changes in the economical situation, the results for the request were not satisfactory. In response the bank stated that the program no longer include funding for PCHs.
Reference 07 *ANEEL Dispatch*	16 November 2004	ANEEL Dispatch #911	ANEEL Dispatch #911 approves basic engineering project.

Reference 08 *Financing Request*	09 February 2005	*Caixa Economica Federal* Financing Request	This time, the financing request was sent to *Caixa Economica Federal* (Bank). More than two years passed until receive the approval of this request (see Reference 19).
Reference 09 *Installation License*	02 March 2005	Installation License	FEMA issued a new Installation License number 154/2005 valid until 02 March 2007. It was necessary to extend the license period because of the delays in obtaining financing and consequently in the project construction.
Reference 10 *Financing request*	11 October 2005	Response to financing request	The BNDES sent a response to the project participant (Tecnovolt Centrais Elétricas) stating that the project was qualified into the financing program to receive a loan; however the financing was not carried out with BNDES.
Reference 11 *Equipment purchase contract*	04 January 2006	Starting date of the project activity	Generators Purchase Contract signed: equipment for project implementation.
Reference 12 *Contact with MGM International*	11 March 2006	Contact with MGM	Mr. Edson Flessak (project sponsor) sent Mr. Stefan J. David (MGM) information concerned to project activity including the installation license. Thus to start a evaluation of the project activity under the CDM. Before contact MGM, Mr. Flessak was in contact with other CDM consulting firm, but the CDM project development was agreed with MGM.
Reference 13 *PDD development information*	29 June 2006	PDD development	MGM sent information to the external consultant (Mr. Osvaldo Stella) in order to evaluate and start the PDD development.
Reference 14 *Equipment purchase contract*	27 July 2006	Turbines purchase	Turbines Purchase Contract signed: equipment for project implementation.
Reference 15 *CDM Project*	26 September 2006	CDM Project Development agreement	CDM project development agreement was signed between MGM International and Tecnovolt Centrais Elétricas.

Development Agreement (first & last pages)			
Reference 16 *Invitation Letter - Municipality acknowledgment receipt*	January 2007	First Local Stakeholders Consultation Process	The first consultation process was held in accordance to the rules established in the Resolution #1 issued by CIMGC (the Brazilian DNA).
Reference 17 *PDD sent to SGS*	12 April 2007	PDD sent for validation	The PDD was sent to the DOE (SGS) in order to start the validation process.
Reference 18 *PDD on UNFCCC web site*	18 April 2007	PDD published on UNFCCC web site	PDD applying the methodology AMS ID, version 10, was made available on UNFCCC web site http://cdm.unfccc.int/Projects/Validation/DB/VBSEM1SUFCWJTS5SB5ACJQFO9Q56QH/view.html
Reference 19 *Approval of financing*	08 May 2007	Approval of financing	*Caixa Econômica Federal* has approved the financing for the project development. This process took a while waiting for extra documentation and contract loan signature.
Reference 20 *Bank Loan contract*	18 June 2007	Bank loan contract	*Caixa Economica Federal* and Tecnovolt Centrais Elétricas, signed the contract to obtain the loan used for the project activity implementation. After this, and some time later with the availability of part of the fund, the main project construction works started.
Reference 21 *First validation visit*	22 and 23 July 2007	First Validation Visit	First validation visit on site was carried out by SGS team.
Reference 22 *Validation Report*	12 September 2007	Validation Report	Validation report issued by SGS. This was sent to the Brazilian DNA to start the National Approval Process to obtain the host country Letter of Approval (LoA).
Reference 23 *National Approval Process*	02 August 2007	Project submitted to DNA for approval	Presentation of project activity to start the National Approval Process, requesting the host country Letter of Approval.

(http://www.mct.gov.br/index.php/content/view/68007.html).			
Reference 24 *PDD on UNFCCC web site*	13 December 2007	PDD published on UNFCCC web site	PDD updated according to methodology AMS ID, version 12, was made available again on UNFCCC web site http://cdm.unfccc.int/Projects/Validation/DB/B4ZHHVDNVPLXYZ5M2PIBXL57V6FDTH/view.html
Reference 25 *Request sent to ANEEL*	06 March 2008	Chronogram Approval Request	ARSSHP requested to ANEEL approval of the updated project implementation chronogram..
Reference 26 *Installation License*	16 May 2008	Installation License	FEMA approved the issuance of a new Installation License number 1096/2007 with validity until 28 February 2010.
Reference 27 *Letter of Approval*	04 July 2008	Letter of Approval issuance	The Brazilian DNA issued the host country Letter of Approval for the project activity.
Reference 28 *CDM Executive Board Meeting 41 Annex 46*	02 August 2008	41st CDM Executive Board Meeting	The CDM Executive Board published a guidance (EB 41th Annex 46) on the demonstration and assessment of prior CDM consideration. As the project was not yet requesting for registration, it had to be reviewed by the DOE according to the new guidance and this brought up additional requests from the DOE.
Reference 29 *ANEEL resolution*	05 August 2008	Resolution #1490 from ANEEL	Resolution #1490 from ANEEL authorizes Tecnovolt Centrais Elétricas to use the necessary land to implement the transmissions lines.
Reference 30 *Validation Process Review*	November 2008	Internal discussion – Start of new Validation Process	As a consequence of the new guidance (EB 41th Annex 46) and of the new VVM (Validation and Verification Manual, EB44 Annex 3), both published by the CDM EB, after several discussions between MGM and SGS, it was decided that a new validation process should be performed.

Reference 31 *New Validation Process*	Dec.2008 – Feb.2009	DOE hiring	In December, 2008, the process to hire a DOE for the new validation was started. The final agreement was signed on February 26, 2009.
Reference 32 *Invitation Letter - Municipality acknowledgment receipt*	January 2009	Second Local Stakeholders Consultation Process	In Brazil, the DNA establishes that the Validation Process should start fifteen days after the start of the Local Stakeholders Consultation Process. Thus, a new consultation process was done following the new rules established in the Resolution #7 issued by CIMGC (the Brazilian DNA).
Reference 33 *PDD sent to SGS*	17 February 2009	PDD sent to SGS to start the new validation process	MGM sent PDD to SGS in order to start the new validation process. A second consultation process was done following the new rules established in the Resolution #7.
Reference 34 *PDD on UNFCCC web site*	28 February 2009	PDD published on UNFCCC web site	PDD updated to the methodolgy AMS ID version 13, was made available on UNFCCC web site http://cdm.unfccc.int/Projects/Validation/DB/PSBA39LNEKK8EGB6HKGOAU105W5LBU/view.html
Reference 35 *Validation Visit*	17 March 2009	Validation Visit (Part 1)	Validation visit on site was carried out by SGS team.
Reference 36 *Validation Visit*	05 May 2009	Validation Visit (Part 2)	SGS team confirms data and information provided in the Project Design Document.

Annex 7

Acronyms

Acronyms	
ANEEL - Agência Nacional de Energia Elétrica	Brazilian Electricity Energy Agency
Eletrobrás – Centrais Elétricas Brasileiras S.A.	Brazilian Electric Company
MCT - Ministerio da Ciencia e Tecnologia	Science and Technology Ministry
ONS – Operador Nacional do Sistema	National Dispatch Center
CEMAT	Mato Grosso Electric Company
SCDE	Energy Data Collect System
FEMA and SEMA	Mato Grosso State Environmental Agency
CIMGC	Brazilian DNA
BNDES	National Bank for Social and Economic Development
CCEE	Electrical Energy Commercialization Chamber
BIES	Brazilian Interconnected Electricity System

Annex 8

SMALL HYDROS IN OPERATION IN MATO GROSSO STATE ON MAY 7th. 2009

Following is presented the list of small hydro plants in operation in Mato Grosso state up to May 2009. Small hydro plants in Brazil have an installed power capacity below 30 MW. This list was prepared based on data obtained from ANEEL and PROINFA web site.

According to the information there are 42 small hydropower plants in operation in the Mato Grosso state. In order to assess the prevailing practice analysis, a research was performed on the characteristics of these plants and the differences from ARSSHP.

Eliminating from the list those plants which have installed power capacity higher than 15 MW, the ones that are not Independent Power Producer and the ones that did apply for PROINFA, the quantity of 42 is reduced to 9 plants. If we consider only those which are not CDM projects, only three plants remain as small hydros with installed power below 15 MW, classified as IPP and not applying for PROINFA.

- The Rio Prata Plant with 2.135 MW in the West region of Mato Grosso;
- The Camargo Correa (Arrossensal) Plant with 4.230 MW in the center-South region of Mato Grosso;
- The Santa Lúcia Plant with 5.000 MW in the West region of Mato Grosso;

As there are 120 Power Plants operating in the state of Mato Grosso, these three plants represent a quantity of only 2.5% of the total quantity of Plants in the state.

In summary, ARSSHP cannot be considered common practice since the total generation by small hydroelectric power plants, with similar conditions as the proposed project activity, represents only 2.5% of the total generation in the state. The common practice in Brazil is the installation and the operation of large hydroelectric plants and huge thermoelectric plants, and therefore ARSSHP does not fit in the business as usual type scenario.

Small hidros in operation in Mato Grosso state				
Nº	**Plant Name**	**Installed Power (MW)**	**Category**	**Incentive**
1	Água Suja	1.20	APE-COM	
2	Alto Araguaia	0.80	SP	
3	Antônio Brennand (Ex-Alto Jauru)	20.02	PIE	CDM
4	Alto Paraguai (Pedro Pedrossian)	1.34	SP	
5	Aprovale	1.52	APE	
6	Baruíto	18.30	SP	CDM
7	Camargo Corrêa (Arrossensal)	4.23	PIE	
8	Canoa Quebrada	28.00	PIE	PROINFA
9	Aquarius	4.20	PIE	CDM
10	Faxinal I	2.79	APE	
11	Primavera	8.12	SP	
12	Ronuro	0.87	APE	
13	Salto Belo	3.60	SP	
14	Braço Norte II	10.75	SP	
15	São Domingos (Torixoréo)	2.40	SP	
16	Casca II	3.52	SP	
17	Culuene	1.79	SP	
18	Braço Norte	5.18	SP	
19	Braço Norte III	14.16	PIE	CDM
20	Ombreiras	26.00	PIE	
21	Rio Prata	2.14	PIE	
22	Salto Corgão	27.00	PIE	
23	Indiavaí	28.00	PIE	CDM
24	Poxoréo (José Fragelli)	1.20	SP	
25	Cachoeira da Fumaça	2.56	APE-COM	
26	Santa Lúcia	5.00	PIE	
27	Juína	2.65	SP	
28	Salto	19.00	PIE	CDM
29	Senador Jonas Pinheiro (Caeté)	6.30	PIE	PROINFA
30	Santa Lúcia II	7.60	PIE	CDM
31	Cabixi II	2.80	APE	
32	Braço Norte IV	14.00	PIE	CDM
33	Faxinal II	10.00	PIE	CDM
34	Sacre 2	30.00	PIE	CDM
35	São Lourenço (Ex.Zé Fernando)	29.10	PIE	PROINFA
36	Paranatinga II	29.02	PIE	
37	Sucupira	4.50	PIE	CDM
38	Pequi	6.00	PIE	CDM

39	Engº José Gelásio da Rocha	24.44	PIE	PROINFA
40	Rondonópolis	26.60	PIE	PROINFA
41	Garganta da Jararaca	29.30	PIE	CDM
42	Graça Brennand (Ex.Terra Santa)	18.27	PIE	CDM

Remarks
In total there are 42 Plants operating under the following categories:
APE - Self producer
PIE - Independent Power Producer (IPP)
SP - Public Service

Sources:

PROINFA: http://www.eletrobras.gov.br/ELB/services/DocumentManagement/FileDownload.EZTSvc.asp?DocumentID={26924AEC-4ECD-4B19-9FED-CC9F45D6BE82}&ServiceInstUID={9C2100BF-1555-4A9D-B454-2265750C76E1}
ANEEL: http://www.aneel.gov.br/area.cfm?idArea=15 (Capacidade Geração Brasil, May 2009)
CDM: http://www.cd4cdm.org