CDM – Executive Board

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

CONTENTS

Annexes

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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.

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SECTION A. General description of small-scale project activity

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

Faxinal II Small Hydroelectric Power Plant – hereafter referred to as "FAXSHP II".

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

The FAXSHP II project consists in the implementation of Small Hydroelectric Power Plant in the Aripuanã river. The river is located in the Aripuanã Main Region at Mato Grosso State, Midwest Region of Brazil. The FAXSHP II is located in an isolated region, more than 1,000 Km away from the State's capital Cuiabá, and is not connected to any of the Brazilian Interconnected Systems. Nowadays the business as usual alternative for energy generation in that region is thermo power plants.

The main objective of the project is to help meet Brazil's rising demand for energy due to economic growth and to contribute to the environmental, social and economic sustainability by increasing renewable energy's share of the total Brazilian electricity consumption.

FAXSHP II uses the renewable hydro potential of the Aripuanã River to supply electricity to the Aripuanã Municipality and region. In 2002 (most recent data available) the energy joint enterprise that covers the project activity's area REDE - *Centrais Elétricas Matogrossesses S.A.* (REDE-CEMAT), consumed 866,890 litters of diesel in its thermoelectric plants to supply energy to the Aripuanã Municipality, and about 14,376,000 litters of diesel to supply energy to Aripuanã Main Region (www.seplan.mt.gov.br/anuario2004/13.10.htm), contributing to elevate the greenhouse gas (GHG) emission factor of Brazil's energy scenario. The project activity will reduce these emissions by displacing electricity generation through fossil fuel combustion (and CO_2 emissions).

FAXSHP II improves the supply of electricity with clean, renewable hydroelectric power while contributing to the regional/local sustainable economic development. The implementation of the project will result in an increase of energy supply in an opportune period, enabling the maintenance of the growing rate of Midwest Region of the order of 5.2% a year and reducing the risk of energy deficit. The demand for energy in Aripuanã and others Municipalities of the region was 86,000 MWh in 2003 (www.seplan.mt.gov.br/anuario2004/13.4.htm) and has been growing continually ever since due to the region's development. Without SHP projects such as FAXSHP II the only alternative to attend that increasing energy demand in the short term will be the continuous use of thermo power.

Besides, the project will be an example of a low environment impact alternative to large hydropower plants in a region that concentrates the lasts remnants of Amazonian Forest of the State, with a high rate of endemic species and that presents an amazing scenic beauty and great value for the tourism industry.

Small-scale hydropower run-of-river plants such as FAXSHP II provide local and clean distributed generation, in contrast with the business as usual large hydropower and natural gas or diesel fired plants built in the last 5 years, and these small-scale projects provide site-specific reliability and transmission and distribution benefits including:

• Increased reliability and 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 strong indication that FAXSHP II contributes to the country's sustainable development goals is that the project is in accordance with the April 2002 law # 10,438 of PROINFA(*Programa de Incentivo as Fontes Alternativas de Energia Elétrica*). PROINFA is a Brazilian federal program that gives incentive to alternative sources of electricity (wind energy, biomass cogeneration, and a small scale hydropower plant). Among other factors, this initiative's goal is to increase the renewable energy source share in the Brazilian electricity matrix in order to contribute to a greater environmental sustainability through giving these renewable energy sources better economic advantages. The Brazilian government has committed a large monetary found in order to develop this plan. Although FAXSHP II is eligible for PROINFA, it has not applied for financing under PROINFA and therefore does not have access the advantages of the program.

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	Centrais Elétricas Salto dos Dardanelos S/A	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 Region of Brazil).

A.4.1.3. City/Town/Community etc:

Aripuanã Municipality.

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

FAXSHP II is located in the Aripuanã river in the Municipality of Aripuanã, about 1,066 Km northwest of Cuiabá, the capital of Mato Grosso State (Figures 1 and 2) and 530 Km east of Porto Velho, capital of Rondonia State. The Aripuanã river is tributary of the Madeira River, located in the Amazon river's water-basin and the coordinates are 10°09'44" South, 59°27'28" West.

The Brazilian South/Southwest/Midwest Interconnected System, the closest to the project area, is more than 230 Km away from FAXSHP II (Figure 3). The remote location of the project area and the biogeography characteristics of the surroundings, with dense tropical forest and rough geography, difficult the connection of the area to the Interconnected Power Systems of Brazil.

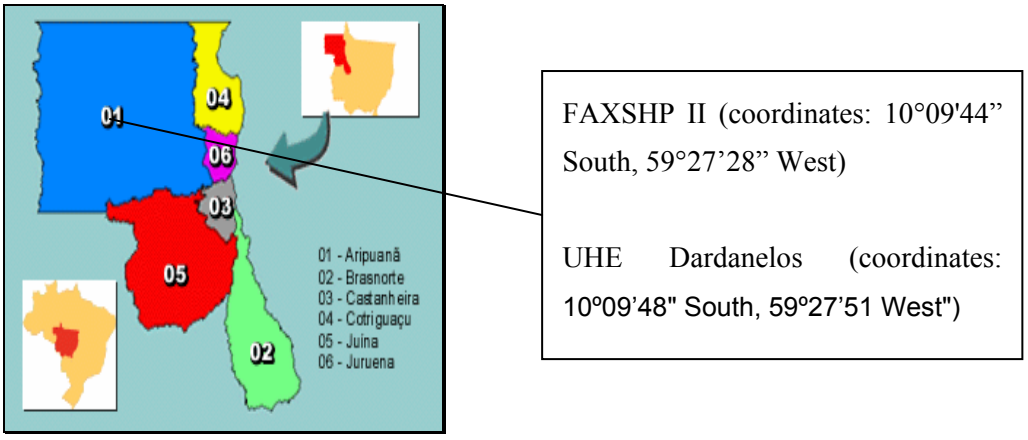

Figure 1. Location of Aripuanã Main Region and Aripuanã Municipality (number 01).

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Figure 3. Brazilian Interconnected Power Systems and location of the Aripuanã Main Region.

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

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 FAXSHP II project corresponds to:

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

The FAXSHP II, with a power loading of 10 MW (below the eligibility limit of 15MW for Small Scale Project), is introduced in the regional context as a low impact plant whose dam is designed to operate as run of river and utilizes the renewable hydro potential of the Aripuanã river to supply electricity to the Aripuanã Municipality and region that is supplied by fossil fuel fired generating units.

Run-of-River schemes do not include significant water storage, and must therefore make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually located on swift flowing streams. According to Eletrobrás (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 raises the water level in the river sufficiently to enable an 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 as low level as possible to gain the maximum head on the turbine.

The equipment and technology used in the FAXSHP II project has been successfully applied to similar projects in Brazil and around the world. The equipment used in the project was developed and manufactured locally.

The Generation System comprises 02 identical Generation Systems, as specified bellow:

Turbines: HISA
Generator: WEG
Active Power: 5,000 KW

Automation System: SEME / FLESSAK

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

Table 2. Estimated emission reductions through the first crediting period.

Years	Estimation of annual emission reductions in tonnes of CO_2e
2008 (June to December)	30,660
2009	52,560
2010	52,560
2011	52,560
2012	52,560
2013	52,560
2014	52,560
2015 (January to May)	21,900

Total estimated reductions (t CO_2e)	**367,920**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (t CO_2e)	**52,560**

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

No public funding has been involved 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 FAXSHP II project is not a debundled component of a larger CDM project activity.

The project activity is an independent hydro power plant generating electricity, unrelated to any other CDM project activity in the region, existing or planned. The project proponent has not another registered small-scale CDM project activity, or an application to register another small-scale CDM project activity:

- in the same project category;
- registered within the previous 2 years; or
- whose project 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 FAXSHP II 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

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Generation (Version 13).

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

The FAXSHP II qualifies under this project category since:

- The project activity is a hydroelectric power plant.
- The project activity supplies electricity to the Aripuanã Municipality and surroundings.

This project replaces existing fossil fuel fired generation plants in the Aripuanã Municipality by constructing a small hydropower station (categorized under renewable energy), with a power loading of 10 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 project activity types during every year of the crediting period.

B.3. Description of the project boundary:

The AMS ID, states:
The project boundary encompasses the physical, geographical site of the hydropower generation source.

According to this definition, the project boundary is set to 'the generating unit' such as the main building of the FAXSHP II station, which is represented by the Aripuanã River basin close to the power plant facility and the connected grid of the Aripuanã and Colniza Municipalities .

B.4. Description of baseline and its development:

According to the selected methodology "the baseline is the annual kWh generated by the renewable unit times an emission coefficient for a modern diesel generating unit of the relevant capacity operating at optimal load".
The baseline scenario that reasonably represents the anthropogenic GHG emissions that would occur in the absence of this project activity is the continuum of diesel power generation thru the CEMAT's thermoelectric plants. Electrification by the diesel power generation is a method generally used by remote electrification systems and is cited as an appropriate method in the "Appendix B of the simplified modalities and procedures for small-scale CDM project activities".
The amount of GHGs emissions from the diesel power generation are calculated using a default value of 0.8 $KgCO_2e/kWh$, coefficients from diesel power generation units (according to Table I.D.1. of the methodology AMS-I.D).

Since this new built run-of-river small hydropower generation does not emit GHGs in operating and will displace the generation of the same quantity of energy by diesel combustion, it can be assumed that without this project the GHGs emissions will be higher.

Key data

Data	Source
Electricity generation of FAXSHP II	Centrais Elétricas Salto dos Dardanelos S/A
Amount of GHGs emissions from the diesel power generation	Table I.D.1. of the methodology AMS-I.D

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:

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 (30 September 2005 edition):

> "*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."*

The project activity has been initiated in November 25th, 2002, as stated in the Resolution nº 637 of November 22th, 2002, issued by ANEEL, which authorizes to Centrais Elétricas Salto dos Dardanelos Ltda. to be established as an Independent Power Producer[1]. However, the FAXSHP II started supplying electricity (partial load), on November 2005.

To justify the additionality for this project, some previous internal analysis of the above alternatives were done and it was decided that this analysis will be focused on the alternatives mentioned bellow*:*

[1] See the resolution in the following link: http://www.aneel.gov.br/cedoc/res2002637.pdf

Institutional Barrier

Since 1995, when the privatization and the deregulation of the Brazilian Electricity market began, the government policies have been continuously changing in Brazil. Too many laws and regulations were created with the aim of providing incentives for new investments in the energy sector.
At that time, three entities were created, the Brazilian Electricity Regulatory Agency (Agência Nacional de Energia Elétrica, ANEEL) set up to develop the legislation and to regulate the market; the National Power System Operator (Operador Nacional do Sistema Elétrico, ONS) to supervise and control the generation, transmission, and operation; and the Wholesale Energy Market (Mercado Atacadista de Energia Elétrica, MAE) to define rules and commercial procedures of the short-term market.

The Brazilian government signalized that it was strategically important for the country to increase thermoelectric generation and consequently be less dependent of hydropower. With that in mind, the federal government launched in the beginning of the year 2000 the Thermoelectric Priority Plan (Plano Prioritário de Termelétricas, PPT) [2] originally planning the construction of thermo plants using mainly natural gas.

In 2004, the new government decided to review completely the institutional rules of the electricity market. The Congress approved a new model to the electric sector, in March/2004, and new rules to the electric sector have had decided (OCDE, 2005):

The risk of regulatory failure that might occur due to the significant play of the government on long term Planning, contributes to difficult the analysis of the market by the developers, mainly for small projects, such small hydro plants, which are not considered as a project finance basis and the lender demands for direct guarantees from the developer.

Prevailing Business Practice

The prevailing business practice in Brazil as far as obtaining financing and financial guarantees to project is a barrier to investment in renewable energy projects in the country. Given the various programs and incentives, which were considered along the last years, but never successfully implemented, it is possible to notice the difficulty and barriers to implement small hydro projects in the country. An indication of this barrier is exemplified by the Program called PCH-COM, structured by the end of 2000 and beginning of 2001. In 2001, Eletrobrás, in partnership with BNDES, launched the PCH-COM program, which had as its main goal to support and encourage the construction of small hydropower plants. This program consisted in the financing of the project by BNDES and the commercialization of the power by Eletrobrás. The operation of the program consisted on the analysis of the project by both BNDES and Eletrobrás. In case the project was approved, there would have been two contracts to be signed: the financing one with BNDES and the Power Purchase Agreement (PPA) with Eletrobrás. The program was

[2] Federal Decree 3,371 of February 24th, 2000, and Ministry of Mines and Energy Directive 43 of February 25th, 2000

not successful because of the guarantees needed and the clauses of the contracts (i.e., the project was not considered as a project finance basis and the lender demanded for direct guarantees from the developer, other than the project itself). After that, the government created, in 2002, the PROINFA program, which foresees raising the share of renewable energy power generation by adding 3,300 MW installed capacity of small-hydro power plants, wind-power, and biomass, offering long-term contracts with special conditions, lower transmission costs, and smaller interest rates from the local development banks. In 2005, the BNDES presented the last final version of its financing incentive line to PROINFA, which is different from the one first considered for the program and that was not considered sufficiently attractive by potential entrepreneurs.

Aware of the difficulties mentioned above, FAXSHPII decided not apply to PROINFA, and therefore, does not have access to the benefits of the program.

Another important aspect of prevailing business practice is related to the small participation of small hydro power plants in the Brazilian electric portfolio, which is commented in sequence:

Due to all what was exposed above, and in spite of all government incentives, an analysis based on data available at August 6th, 2007, shows that [3]:

a) there are 184 approved small hydropower plant projects in Brazil between 1998 and 2005, which have not started construction yet.

b) Small hydropower plants in operation, correspond to less than 2% of the total electric power generated in the country.

These numbers show that:

1) Common practice in Brazil has been the construction of large-scale hydroelectric plants and, more recently, of natural gas based thermal plants

2) Incentives for the construction of thermal power plants have been more effective than those for small hydropower plants.

The recent trend does not anticipate changes from what has been observed in the last decade. In an energy auction, which took place on December 16th, 2005, in Rio de Janeiro, 20 concessions for new power plants were granted, of which only two are for small hydropower plants (28 MW). From the total of 3,286 MW sold, 2,247 MW (68%) will come from thermal power plants, from which 1,391 MW come from natural gas fired thermal power plants, i.e., 42% of the total sold [4].

The recent nationalization of the natural gas industry by the Bolivian government which occurred at the

[3] Source: http://www.aneel.gov.br/area.cfm?idArea=15 (Capacidade Geração Brasil)

[4] Source: Rosa, Luis Pinguelli. Brazilian. Newspaper “Folha de São Paulo”, December 28, 2005.

begin of 2007 might change this situation, but perspectives are not clear so far.

The FAXSHP II is located in an isolated region, more than 1,000 Km away from the State's capital Cuiabá, and more than 230 Km away from the South/Southwest/Midwest Interconnected System (the closest to the project area). This region is covered by the enterprise REDE-CEMAT *Centrais Elétricas Matogrossensses),* where the business as usual for energy generation is thermo power plants.
Furthemore, the project owner company: Dardanelos Centrais Elétricas, was established in order to manage FAXSHP II, and it is composed by Madeireira Barra Grande Ltda and Mabagra Agropastoril Ltda, which are enterprises that act on the agricultural core business.
For developing the activity of energy generation, the shareholders had to contract consultants from Cuiabá capital.

In summary, FAXSHPII cannot be considered common practice and therefore does not fit in the business as usual type scenario.

Other Barriers:

As the region where the project is located in is an isolated, underdeveloped area, there is a deficit of infrastructure such as roads, reliable electricity supply, communication and transport.
The project sponsor had to develop some of these facilities before beginning the project's implementation. In addition there are no qualified workers available in the region due the lack of schools and universities. The raw materials to be used for the project implementation need come from other sites, distant hundreds of kilometers away from the project.

Other barrier inherent to the technology applied, is the hydrological risk.
Since this is a run of river project with no flooded area, it is subject to 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.

Other reason for the reduced number of similar project activities is the financial burden, mainly for financing small hydro plants, when the lender demands for direct guarantees from the developer.
In order to follow with the project implementation, FASXSHP II had to ask for partial financing from Banco do Brasil (Bank). Both processes of negotiating a PPA with utility and obtaining funding from BNDES have proved to be very cumbersome. The developer realizes BNDES requiring excessive guarantees in order to provide financing, besides the excessive of bureaucracy . Although this might be the Bank role as a financing institution to mitigate risk, it is understood as a market barrier

Conclusions

As defined by ANEEL[5], small hydro power plants are power plants with installed capacity greater than 1 MW and up to 30 MW, and with reservoir area lower than 3 km². Generally, it consists of a run-of-the-river hydro plant, which has a minimum environmental impact. This is not the business-as-usual scenario

[5] Resolution n. 394, December 4th, 1998.

in a country where large hydro and thermal fossil fuel projects are preferable. CDM has made it possible for some investors to set up small hydro plants and sell electricity to the grid and this fact has motivated the implementation of FAXSHPII. With the financial benefit derived from the CERs, it is anticipated that other project developers would benefit from this new source of revenues and would then decide to develop such projects.
The registration of the proposed project activity will help FAXSHPII to improve its economic performance and may have a strong impact in paving the way for similar projects to be implemented in Brazil.

It is clear that the identified barriers do not prevent the continuation of the business as usual alternative for electric energy generation.

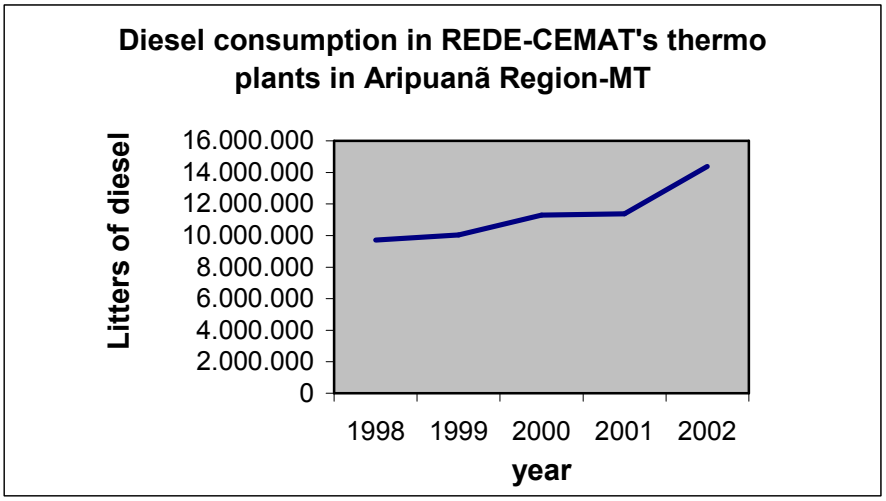
B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the project category and the corresponding methodology, project emissions are zero and leakage is to be considered only when the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.
This is not the case of FAXSHP II. The energy conversion equipment for the project was manufactured new for specific site conditions, and the existing equipment will not transferred to another activity.
The existing equipment will be deactivated by CEMAT (the local electric utility) and will remain under its ownership.
Therefore, there is no leakage associated to the project activity

The baseline scenario that reasonably represents the anthropogenic GHG emissions that would occur in the absence of the project activity is the continuum of the diesel power generation scenario, which is cited as reasonable in the "Appendix B of the simplified modalities and procedures for small-scale CDM project activities." In this project, the emission reductions are achieved by replacing an existing technology (diesel fired thermoelectric power plant).

The graphic below is based on data provided by Mato Grosso State's Planning and General Control Secretariat – SEPLAN. It shows the increase in diesel consumption by REDE-CEMAT's thermoelectric plants, located in Aripuanã Main Region, between 1998 and 2002. REDE is the main energy producer in Mato Grosso State and CEMAT is REDE's local energy concessionary.



The graphic's curve illustrates an average annual increase of 10.75% in fuel consumption in Aripuanã Main Region. Considering that the project activities area is experimenting a high development rate in the lasts years, it is reasonable to assume an increase trend in fuel consumption rates for the next years.

Nevertheless the table below also provided by SEPLAN and with data from REDE-CEMAT plants, shows a small reduction in thermo power production from 2002 to 2003 in Aripuanã Main Region. However, in 2003 the thermo generation still represented 57.8% of all energy produced in the area and, even if that reduction continues, is reasonable to project a continuum high portion of thermoelectric generation in the region.

Table 3. Effective thermic energy installed capacity (kW) in Mato Grosso State from REDE-CEMAT System /1998-2003.

Code	Municipality	1998	1999	2000	2001	2002	2003
Mato Grosso State		55500	64000	72115	82000	87770	87375
1. North State		39530	44830	50485	58325	66405	65780
1.1 Aripuanã Region		9870	12065	14410	22050	27705	26155
1.1.1	Aripuanã				2000	3500	3500
1.1.2	Brasnorte	1490	2000	2500	3500	3500	
1.1.3	Castanheira	980	750	1250			
1.1.4	Colniza		330	830	1500	2700	4425
1.1.5	Cotriguaçu	1140	805	1150	1375	1375	1625
1.1.6	Juína	5050	7000	7000	11500	12400	12375
1.1.7	Juruena	1210	1180	1680	1725	3725	3725
1.1.8	Rondolância				450	505	505

Source: www.seplan.mt.gov.br/anuario2004/13.2.htm

Since the run-of-river small hydropower generation emits no GHGs, all GHGs emitted from the diesel power generation replaced by this project can be considered to be reduced. As suggested in the methodology, a default value from diesel generation units, or 0.8 $KgCO_2e/kWh$ (Table I.D.1), is used for the calculation of baseline emission.

According to what is presented above (and also presented in the annex 3, bellow), the formula used to calculate the emission reductions achieved by the FAXSHP II project is:

$$ER_y = EG_y * EF$$

Where:

$\mathbf{ER_y}$ = Emission reductions achieved in year *y* (tCO_2e);
$\mathbf{EG_y}$ = Electricity generated by the proposed project activity during the year *y* (MWh);
EF = Emission factor from diesel generation units (0.8 tCO_2e/MWh).

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

Table 4. Data available at validation.

Data / Parameter:	***EF***
Data unit:	tCO_2e/MWh
Description:	Carbon dioxide emission factor from diesel generation units.
Source of data used:	2006, UNFCCC. Methodology: AMS I.D.: Grid Connected Renewable Electricity Generation.
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology, an emission coefficient for a modern diesel generating unit of the relevant capacity operating at optimal load must be used as given in Table I.D.1.
Any comment:	This is used to determine the emission reductions.

Data / Parameter:	***Plant capacity***
Data unit:	MW
Description:	Energy generation capacity of the SHP in year *y*
Source of data used:	Project proponent
Value applied:	10
Justification of the	N/A

choice of data or description of measurement methods and procedures actually applied :	
Any comment:	This is used to determine the energy generation in year *y*.

Data / Parameter:	***Capacity factor***
Data unit:	fraction
Description:	Capacity factor of the SHP in year *y*
Source of data used:	This value is the mean capacity factor for Small Hydro Power Projects.
Value applied:	0.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default
Any comment:	This is used to estimate the energy generation in year *y*.

B.6.3 Ex-ante calculation of emission reductions:

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

$$ER_y = EG_y * EF$$

Where:
$\mathbf{EG_y}$ = Electricity generated by FAXSHP II during the year *y* (MWh);
EF = Emission factor from diesel generation units (0.8 tCO_2e/MWh).

The expected annual renewable energy produced by FAXSHP II and the emission reductions are shown in the following table:

Table 5. Expected annual electricity generation and emission reductions.

Plant capacity **(A)**	10 MW
Annual hours **(B)**	8,760 h/year

Capacity factor **(C)**	0.75
Electricity generation (A) x (B) x (C)	65,700 MWh/year
Emission Reduction	52,560 tCO_2e/year

Thus, the amount of the renewable energy generation of FAXSHP II is estimated in **65,700 MWh/year** and the mean annual emission reduction results to be **52,560 tCO_2e/year**.

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

Table 6. *Ex-ante* estimation of emission reductions during the first crediting period (tCO_2e).

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of Leakage (tCO_2e)	Estimation of Overall reductions (tCO_2e)
2008 (June to December)	0	30,660	0	30,660
2009	0	52,560	0	52,560
2010	0	52,560	0	52,560
2011	0	52,560	0	52,560
2012	0	52,560	0	52,560
2013	0	52,560	0	52,560
2014	0	52,560	0	52,560
2015 (January to May)	0	21,900	0	21,900
Total (tonnes of tCO_2e)	**0**	**367,920**	**0**	**367,920**

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

B.7.1 Data and parameters monitored:

Table 7. Data to be monitored.

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Electricity generated by the renewable technology in the year *y*
Source of data to be used:	Centrais Elétricas Salto dos Dardanelos S/A
Value of data	65,700
Description of measurement methods and procedures to be applied:	In collecting data of the electricity produced for the monitoring at the power station, using watt-hour-meters is the most appropriate method to meet the requirement of accuracy, comparability, completeness, and validity. This data will be measured each 15 minutes and recorded monthly.
QA/QC procedures to be applied:	The uncertainty level of the data is low, and the equipment will be regularly calibrated.
Any comment:	This data will be used to calculate the emission reductions obtained through the project activity. Data will be archived electronically until two years after finishing the crediting period.

Data / Parameter:	EFy
Data unit:	tCO_2/MWh
Description:	Emission factor for the Brazilian Southeast/Midwest interconnected grid
Source of data to be used:	Data for EFy calculation is provided by ONS (the national dispatch center)
Value of data	To be calculated
Description of measurement methods and procedures to be applied:	The calculation for this combined margin is based on the approved methodology ACM0002
QA/QC procedures to be applied:	These data are from an official source, and are made public available.
Any comment:	This data will be adopted in case of the Isolated System of the FAXSHP II project being connected to the national grid (SIN) before the end of the proposed crediting period.

B.7.2 Description of the monitoring plan:

According to the methodology AMS I.D, monitoring shall consist of metering the electricity generated by the renewable technology. This Monitoring Plan applies to electricity capacity additions from small-scale run-of-river hydro power plants.

Since this project is a run-of-river small hydropower generation, there occur no emissions of greenhouse gases through its operation. Also there are no leakage sources identified in the project, therefore, no control over leakage is necessary.

For the monitoring, the data of total amount of power produced by the plant, such as gross power output is monitored by 02 equipments Saga 1000 model 1317-AK which are located into the project site.
- One equipment (number 1053519) is connected at the bus-way of 13.8 kV
- The other one (number 1053518) is connected at the bus-way of 34.5 kV

The measurements are carried out under the responsibility of the local electricity utility (REDE – CEMAT), and the equipments will be calibrated each three years.

FAXSHP II assigned a qualified person (Engineer) to compile the necessary data according to the approved methodology to accurately calculate emission reductions. The data will be compiled in a manner amenable to third party audit and deliverable to the DOE for validation and certification purposes.

During the period that precedes the first crediting period, an internal written procedure will be prepared, covering the aspects to warrant the quality and the reliability of the monitoring process, including essentially the following 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;

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 25/03/2008)

Name of the responsible person/entity:

- Osvaldo Stella Martins PhD

- João M. Franco, MGM International SRL
  Av. Luis Carlos Berrini , 1297 cj 121
  CEP 04571-010, São Paulo - Brazil
  Tel. (55 11) 5102 3844

Osvaldo Stella Martins and João M. Franco are not project participants.

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The project activity had been initiated in December 23th, 2002, as stated in the decision nº 838 issued by ANEEL, which approves the FAXSHP II basic project.

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

25 years – 0 months.

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

Renewable crediting period.

C.2.1. Renewable crediting period

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

The crediting period will start on 01/06/2008, or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

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 or potentially polluting activity or any activity capable of causing environmental degradation is required to secure a series of permits from the respective state environmental agency.

Three types of licenses are required:

1- Preliminary Permit (Licença Prévia or L.P.) issued during the planning phase of the project and which contains basic requirements to be complied with during the construction, and operating stages;

2- Construction Permit (Licença de Instalação or L.I.);

3- Operating Permit (Licenca de Operação or L.O.).

Depending of the preliminary studies required for the issue of the L.P., the preparation of an additional Environmental Assessment Report is required prior to obtaining construction and operation permits.

According to the preliminary studies carried out in the project implementation area, the possible negative environmental impacts regarding the construction and operation of the FAXSHP II, are low and therefore the Environmental Assessment Report was not required by the competent environment agency State (Environmental Secretariat - SEMA).

SEMA issued all the required licenses to Centrais Elétricas Salto dos Dardanelos S/A,
allowing the construction and operation of FAXSHP II :

L.I. Nº 498/2004 isuued on 25/11/2004
LO Nº 2417/2007 issued on 12/04/2007

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, which involves no dam construction. Therefore, the environmental impact is very small compared to other types of power generations alternatives.

SECTION E. Stakeholders' comments

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

Researches made with the local community demonstrated no opposition to the construction of the plant. This information was considerate in the decision to continue with the project, mainly by the fact that the displacement of households generates expectation of unquietness as well as voluptuous investment demands, making plants with low installation capacity not feasible.

The Resolution number 1, issued by Brazilian DNA, established that the consultation must be performed by the project sponsor at least with the following entities:

- Municipality Alderman Chamber
- State and Municipal Environmental Agencies
- Brazilian Forum of NGOs
- Community Associations
- Public Ministry

The stakeholders who were invited to participate in this process are the following:

- Municipality of Aripuanã
- Alderman Chamber of Aripuanã
- State Environmental Agency - SEMA (Secretaria de Estado do Meio Ambiente)
- Municipal Environmental Agency of Aripuanã
- Brazilian Forum of NGOs – Forum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e Desenvolvimento
- Community Association of Aripuanã (02 Residents Associations)
- Public Ministry of Aripuanã

The invitation letters were sent to the stakeholders listed above, during May 2007. The copies of the letters and the acknowledgement of receipt (called AR in Brazil) will be shown to the DOE during the validation process.

With the purpose to facilitate the comments of the invited persons, the following questionnaire was sent to the stakeholders:

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 were made available at a website available to all potential stakeholders: http:// www.mgminter.com.ar/Projeto_PCH_Faxinal_II as indicated in the letter inviting stakeholder comments:

CDM – Executive Board

Presentation on the FAXSHP II Project.

- Executive Summary of FAXSHP II Project.
- Project Design Document (PDD)
- Anexo III (regarding Resolution Nº 1 of the CIMGC)
- General Concepts on Greenhouse Effect and the Kyoto Protocol

E.2. Summary of the comments received:

Only the Alderman Chamber of Aripuanã Municipality commented the project (Mrs. Antonieta Varaschin)

The comments were positive, emphasizing that the project is important for supplying electric energy to the Aripuanã Municipality.

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

Since all stakeholders consulted so far, support the project, no modifications to project design were necessary.

However, despite the acceptance of the project, we emphasize that the environmental aspects will be carefully observed with the objective to manage any eventual environmental impact.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Centrais Elétricas Salto dos Dardanelos S/A.
Street/P.O.Box:	Ilha do Salto Dardanelos, s/no,
Building:	
City:	Aripuanã
State/Region:	Mato Grosso (MT)
Postfix/ZIP:	
Country:	Brazil
Telephone:	55 49 3436 0103
FAX:	
E-Mail:	mabagra@mabagra.com.br
URL:	
Represented by:	Paulo Vitorino Favero
Title:	Director
Salutation:	
Last Name:	Favero
Middle Name:	Vitorino
First Name:	Paulo
Department:	
Mobile:	
Direct FAX:	
Direct tel:	55 49 3436 0103
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Background information used in the application of the baseline methodology.

The municipalities of Aripuanã and Colniza have an interconnected electric system isolated of the other municipalities in the Aripuanã region.
The energy system in the municipality of Cotriguaçú is isolated of the other municipalities in the Aripuanã region.
FAXSHP II currently supplies energy to the municipalities of Aripuanã and Colniza, as the transmission line for energy supply to the municipality of Cotriguaçú has not been built yet.
The thermal generation unit of the municipality of Aripuanã (from generator CEMAT) is currently deactivated, as well as the thermal unit in the municipality of Colniza.

The data bellow was obtained from Seplan (Planning and Coordinating State Secretary of Mato Grosso State) Yearbook 2006 (most recent available information):
http://www.zsee.seplan.mt.gov.br/anuario2006/Capitulo_13.pdf

Hydric Generation by municiality (MWh)							Installed. kW	Installed. kW
Year	2000	2001	2002	2003	2004	2005	2000	2005
1 Aripuanã	6339	6677	6465	6719	6743	6869	2788	2788
							800	800
2 Colniza	0	0	0	0	0	0	0	0
3 Cotriguaçú	0	0	0	0	0	0	0	0
Total 1, 2:	6339	6677	6465	6719	6743	6869	3588	3588
Total 1,2,3:	6339	6677	6465	6719	6743	6869	3588	3588

Thermal Generation by municipality (MWh)							Installed. kW	Installed. kW	Thermal Energy(%)	Thermal Energy(%)
Year	2000	2001	2002	2003	2004	2005	2000	2005	**2001/2005**	**2005**
1 Aripuanã	0	942	2952	5198	6142	3655	0	3000		
2 Colniza	1729	2560	4444	7185	12819	14747	830	4950		
3 Cotriguaçú	3304	3127	3868	4803	4813	5284	1150	1850		
Total 1, 2:	1729	3502	7396	12383	18961	18402	830	7950	**64**	**73**
Total 1,2,3:	5033	6629	11264	17186	23774	23686	1980	9800	**71**	**78**

The table above does not include the FAXSHP II project

As demonstrated in the table above, thermal generation in the municipalities of Aripuanã and Colniza correspond to more than 50% of the total energy generated in the period 2001 to 2005. If the municipality of Cotriguaçú is included, the same also occurs.
In the year 2005, thermal energy share in these municipalities increases to more than 70%, clearly

indicating diesel generation increasing.

According to the Methodologies AMS ID and ACM0002 and according the "tool to calculate the emission factor for an electricity system", which is applied for this project:

For project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

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 described below:

STEP 3. Calculate the Operating Margin emission factor(s) (EFOM,y) based on one of the four following methods:

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

For the present connected electricity system, it is adopted the Simple OM method:

The Simple OM method (a) can only be used where low-cost/must run resources5 constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production.
The Simple OM, simple-adjusted OM, and average OM emission factors can be calculated using either,ex-ante or ex-post option,of data vintages for years(s) y.

- (For this project the ex-post option was selected): The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring..,

(a) Simple OM. The Simple OM emission factor (EFOM,simple,y) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

STEP 5. Calculate the Build Margin emission factor (EFBM,y) as the generation-weighted average emission factor (tCO2/MWh) of a sample of power plants m, as follows:

- Calculate the Build Margin emission factor EFBM,y
- (Ex-post option selected): For the first crediting period, the build margin emission factor shall be updated annually, ex-post..
The sample group m consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

STEP 6. Calculate the baseline emission factor EFy as the weighted average of the Operating Margin emission factor (EFOM,y) and the Build Margin emission factor (EFBM,y):

where the weights wOM and wBM, by default, are 50% (i.e., wOM = wBM = 0.5), and EFOM,y and EFBM,y are calculated as described in Steps 3 and 5 above and are expressed in tCO2/MWh.

Calculation of the Baseline Emission Factor:

Step 3: As low cost/must run (hydric generation) correspond to less than 50% of the total grid generation, we can select the option a (simple OM, ex-post calculation).
Therefore, the EFOMy is composed exclusivelly by diesel generation.

Step 5: As the the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently, are diesel generation, The EFBM,y (ex-post) is composed exclusivelly by diesel generation.

Step 6: The baseline emission factor is calculated as the weighted average of the operation margin and the built margin.

Therefore, for the present connected electricity system, the EFy is the EF for diesel generation (0.8 tC02/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 on a monthly basis. The spreadsheet automatically provides annual totals in terms 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 input, as is needed to run the model;
- ***Result Fields:*** Green fields display result lines as calculated by the model.

All the monitored data will be archived for two years following the end of the crediting period.

Annex 5

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