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:

Saldanha Small Hydroelectric Project
Version 05
21/02/2008

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

The Saldanha Small Hydroelectric Project (hereafter, the Project) developed by Hidroluz Centrais Elétricas Ltda., as project developer and operator of the project, consists of a small run-of-river hydroelectric project, located at the Saldanha River in the municipality of Alta Floresta d'Oeste, Rondônia state and has an installed capacity of 5.0 MW, consisting of 2 turbines of 2.5MW capacity each. Although the installed capacity of the plant is 5.0 MW, the authorization provided by the Electricity Agency (ANEEL) is for the operation of 4.8MW. Hence all calculations in this PDD are done with 4.8MW.

The plant is connected to the Rondônia-Acre isolated electricity system, located in Rondônia State, north region of Brazil. The plant is located in a very remote area, and will provide electricity to help develop this area both socially and economically. To supply electricity to this area has always been a difficult issue to be solved; moreover, in this remote area, the solution for the electricity supply problem has frequently been the implementation of isolated electricity systems based on thermal power plants, fired by fossil fuels. This project will increase the supply of electricity to the grid, offsetting thermal generation with a renewable source of energy, and consequently reducing CO_2 emissions.

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

- Contributes to local environmental sustainability.
- Contributes towards better working conditions and increases employment opportunities in the area where the project is located.
- Contributes towards better revenue distribution for helping to improve local and regional economic development.
- Contributes to development of technological capacity because all technology, hand labour and technical maintenance will be provided domestically in Brazil.
- Contributes to regional integration and connection with other sectors.
- Increases the contribution of small scale hydroelectricity projects to electricity generation in the region, and therefore, it may encourage other similar companies that want to replicate this project.

A.3. Project participants:

Table 1 - Saldanha Small Hydroelectric Project participants

Name of Party involved ((host) indicates a host party)	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Hidroluz Centrais Elétricas Ltda.	No
The Netherlands	EcoSecurities Group PLC	No

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.:

North region of Brazil, Rondônia State.

A.4.1.3. City/Town/Community etc:

Municipality of Alta Floresta d'Oeste.

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

SHP Saldanha is located in Saldanha River. The exact location of the project is defined using GPS coordinates: Latitude 11 º 59'09" S and Longitude 62 º10'38"W.

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

The category for the project activity according to Appendix B of the UNFCCC's published simplified procedures for small-scale activities is:

Type I: Renewable Energy Project
Category I.D.: Grid Connected Renewable Energy Generation
AMS I.D, version 13, 14 December 2007[1] is applicable since the total installed capacity of the Hydro Electric Project is below the 15 MW threshold.

The project consists of renewable electricity generation from a run-of-river small hydro power plant, supplying electricity to the Rondônia-Acre isolated system. The small hydro power plant consists of 2 turbines of 2.5MW capacity each, and has a total installed capacity of 5.0 MW, i.e., below the eligibility threshold of 15 MW for small scale projects.

Table 2 – Technical description[2]

GENERATOR	
Manufacturer	GE
Capacity (KVA)	3300
Power factor	0.8
Power yield	0.962
TURBINE	
Manufacturer	HISA
Type	Francis
Capacity (MW)	2.506

By legal definition of the Brazilian Power Regulatory Agency (ANEEL – *Agência Nacional de Energia Elétrica*), resolution no 652, issued on December 9th, 2003, small hydro in Brazil must have installed capacity greater than 1MW but not more than 30MW and with reservoir area less than $3km^2$. Also, 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" (Eletrobrás, 1999).

In addition, Run-of-River schemes do not include significant water storage, and must therefore make complete use of the water flow.

SHP Saldanha uses Brazilian Francis type turbines with a horizontal axis (Hydraulic reactor turbine in which the flow exits the turbine blades in a radial direction) and Brazilian generators. The technology

[1] According to the definition of Small Scale renewable energy project activity in the Paragraph 6 of the Decision 17/cp.7 in the document FCCC/CP/2001/13/ADD/2, and the Appendix B to the decision 21/cp.8 of the document FCCC/CP/2002/7/Add.3, of simplified procedures for small-scale activities: Type I.D – Renewable Electricity Generation for a Grid, as "This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.

[2]Capacities as stated in the equipment plates.

used on SHP Saldanha is environmentally safe and sound, for being a run-of-river power plant requiring for a minimum diversion dam, which stores water sufficient to generate electricity for short periods of time; for the SHP Saldanha the reservoir area is 0,0075 km^2.

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

Table 3 - Annual estimation of emission reduction

Years	**Annual estimation of emission reductions in tonnes of CO2e**
2008 (August - December)	11,691
2009	28,059
2010	28,059
2011	28,059
2012	28,059
2013	28,059
2014	28,059
2015	28,059
2016	28,059
2017	28,059
2018(January - July)	16,368
Total estimated reductions (tonnes of CO2e)	280,590
Total number of Crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	28,059

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

The project will not receive any public funding from Parties included in Annex I.

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

Based on the information provided in Appendix C of the simplified modalities and procedures for small-scale CDM activities, this small-scale renewable energy project is not part of a larger emission-reduction project, i.e. it is not a debundled component of a larger project or program, given that this is a unique CDM project proposed by the project developer. The project participants have not registered or operated (therefore, they are not engaged in any way) in any other small-scale CDM project activities in hydro power or by using any other technologies within the project boundary, and surrounding the project boundary.

SECTION B. Application of a baseline and monitoring methodology

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

The proposed project activity falls under Type/Category I.D - Grid connected renewable electricity generation - I.D/Version 13, 14 December 2007.

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

According to the sectoral scope list presented by UNFCCC (http://cdm.unfccc.int/), the project is related to sectoral scope 1 Energy industries (renewable - / non-renewable sources).

The SHP Saldanha is applicable to small scale project type I (Renewable Energy), methodology I.D. - Renewable electricity generation - because it fits into the applicability requirements demanded by this category, which comprises renewable sources of energy, such as hydro, in order to supply electricity to an electricity distribution system that is supplied by at least one fossil fuel generating unit. SHP Saldanha project will supply renewable electricity to Rondônia-Acre Isolated System.

The total installed capacity of the project activity is 5.0 MW which is below the eligibility limit of 15 MW for small scale projects.

B.3. Description of the project boundary:

According to AMS I.D the project boundary for the proposed project is defined as the physical, geographical site of the renewable generation source.

This includes the electricity grid that previously provided electricity to the municipality of Alta Floresta D'Oeste, which is not connected to the national grid, and will include all direct emissions related to the mix of electricity produced for those generators that will be displaced by the Project.

Conforming to the guidelines and rules for small-scale project activities, the emissions related to production, transport and distribution of the fuel used in the power plants in the baseline are not included in the project boundary, as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport and distribution of electricity are also excluded from the project boundary.

B.4. Description of baseline and its development:

The baseline for the SHP Saldanha was established with reference to the methodology applicable to the project activity category I.D for grid connected renewable energy generation. All assumptions and rationale of the baseline development as well as all data used to determine the baseline emissions are described in this section.

The project consists of a new electricity generation facility that will supply electricity to the grid. As stated in the methodology, 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 in B.6.1.

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

Table 4 - key information and data used to determine the baseline scenario

Variable	Unit	Data Source
Operating Margin Emissions Factor ($EF\_OM_{y,}$ in tCO_2/MWh)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON
Build Margin Emissions Factor ($EF\_BM_{y,}$ in tCO_2/MWh)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON
Baseline Emissions factor (EF_y)	tCO_2/MWh	ANEEL, Eletrobras S.A, ELETRONORTE and CERON

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

Table 5 - Baseline grid

Units	Type	Installed Capacity (MW)
Rio Branco	Hydro	6.90
Cabixi II	Hydro	2.80
Termonorte II	Thermal	349.95
Monte Belo	Hydro	4.80
PCH Altoe	Hydro	1.10
Alta F. D'Oeste	Hydro	5.00
PCH ST. Luzia	Hydro	3.00
Termonorte I	Thermal	68.00
PCH Cachoeira	Hydro	11.12
PCHs Castaman 2	Hydro	0.50
PCH Cabixi 1	Hydro	2.70
Rio Acre	Thermal	45.80

PCHs Castaman 3	Hydro	1.48
Rio Branco II	Thermal	32.40
PCHs Castaman 1	Hydro	1.50
Samuel	Hydro	216.00
PCH Rio Vermelho	Hydro	2.60
UTE Colorado	Thermal	10.95
UTE Vilhena	Thermal	23.75
Rio Madeira	Thermal	83.00
Rio Branco I	Thermal	18.10
Barro Vermelho	Thermal	49.60

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:

According to the Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, evidence to why the proposed project is additional has to be offered under the following categories of barriers: (a) investment, (b) technological, (c) prevailing practice and (d) other barriers. The barrier analysis was done based on information from the time when the decision was taken.

In order to analyze the barriers to the project activity, the following two scenarios were considered:

- Scenario 1 - The continuation of current activities – This scenario represents the continuation of current practices, which is electricity generation is met by the implementation of thermoelectric plants, with internal combustion technology, diesel fuelled. In this scenario the grid remains with significant participation of fossil fuel units on Rondônia-Acre isolated system.
- Scenario 2 - The construction of the new renewable energy plant – This scenario represents the use of a new renewable source – a small hydro generation plant, considered neutral in terms of GHG emissions, i.e. undertake the Project Activity not as a CDM project.

The result is a matrix that summarizes the analyses, providing an indication of the barriers faced by each scenario; the most plausible scenario will be the one with the fewest barriers.

The barriers are as follows:

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

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

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

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

General Context

According to the audit report elaborated from the Brazilian Court of Audit (2004), the Brazilian Electricity System mainly consists of an interconnected system that includes the South, Southeast, Middle-West, Northeast and part of the North Regions. The North Region is predominantly supplied by isolated systems, which are diesel fuelled. In 1993, in order to promote the development of the North Region, the Brazilian Government adopted a law - 8631/93 - that obligated all energy concessionaires to divide proportionally the fuel consumption costs from the isolated systems. Therefore, the electricity would be available in the North Region with a reasonable price. This obligation is called CCC (From Portuguese "Conta Consumo de Combustíveis", which means 'Fuel Consumption Account'), and creates an effective subsidy for electricity generation in isolated grids.

Besides the CCC obligation, the government also created the 'CCC Subrogation' in 1999 (law no. 9648/98). This policy was implemented because the CCC only applied to electricity generation from thermal units fired by fossil fuels. The CCC subrogation now says that renewable energy can also apply for the subsidy. Therefore, the subrogation of CCC resources facilitates the replacement of fossil fuel consumption by other alternative and renewable sources, as for example, hydro energy (Tolmasquim, 2004).

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

According to the "ANEEL CCC + CCC subrogation utilization guide", other legal devices need to be created in order to help switch energy generation from fossil fuels to renewable, and the Kyoto Protocol is suggested as one such alternative.

Moreover, the project would also face economical and prevailing practice barriers described in the barrier analysis below.

With respect to the **investment barriers**:

- The continuation of current practices (Scenario 1) does not pose any investment barrier to the project developer, and requires no further financing. The greater part of the energy supplied to the isolated system being considered by this project comes from diesel fuelled thermal units. From a total of 941,05 MW of installed capacity in the Rondônia-Acre system, 681.55 MW comes from thermal units. Moreover, this scenario is not likely to change since all fossil fuel fired thermal generation units in the isolated system are subsidized by the CCC. This subsidy is easy to collect and provides no incentive to improve efficiency related to fossil fuel consumption[3]. In case of a construction of a new thermoelectric plant to meet the demand, it does not pose any significant investment barrier to the project developer. The investment necessary to build a thermoelectric plant is considerably lower than the investment to build a renewable plant and the fuel consumption costs are totally subsidized. Thermoelectric plants are attractive enough to make an investor take the risk of this kind of project. A comparison of the Scenarios 1 and 3 can be found in Table 7.

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

  Lack of long-term financing available for medium sized investors. According to the report provided by the Brazilian Court of Audit (2004), there are two main barriers to the long-term financing for medium sized investors: the required presentation of a Power Purchase Agreement in advance and the behaviour of utilities that have no obligation or interest to substitute the use of fossil fuels for renewable resources, even if investors present feasible and economically attractive projects. Therefore, utilities option to continue using fossil fuel to generate electricity weakens the CCC-subrogation mechanism.

  Lack of interest from energy utilities. As per the Brazilian Court of Audit (2004), North-Brazilian utilities prefer to guarantee the CCC subsidies to their fossil fuel plants, rather than supporting investments on generation based on renewable sources,. Moreover, the poor financial situation of the North-Brazilian utilities discourages investors from financing renewable energy projects within that region. This situation is exacerbated because investors must have a pre-set energy selling contract (PPA) signed between the producer and the buyer as a compulsory document in order to access the subsidy. To conclude, the points highlighted above and the lack of enforcement for utilities to shift from fossil fuels to renewable energies weakens the CCC Subrogation as a subsidy, and encourages utilities to continue with fossil fuel generation units.

  Cost escalation in isolated systems. Finally, the implementation costs for small hydro units in the North Region are considerably higher than in other regions. Camargo, quoted in Tolmasquim (2004), verified that the implementation costs for hydro up to 10 MW in isolated systems are considerably higher than in other regions, as shown on Table 6. This is due to difficulties better detailed in the prevailing practice barrier, related to logistics, transportation etc. Based on the same author, even with the CCC Subrogation benefits, the average energy cost for this region is still high.

[3] Brazilian Court of Audit, 2004.

Table 6 - Small hydro units construction costs in different Brazilian regions – R$/kW[4]

	North/Isolated	Northeast	Middle-West	Southeast	South
Small plants (1-10 MW)	4,000	3,500	3,500	2,800	2,800
Other plants (10-30 MW)	4,000	3,500	3,500	3,000	2,800

Furthermore, the subsidy for the construction is not fully paid when the subrogation is conceded. The repayments are amortized every month for a long period, and the amount paid is directly related to the amount of electricity produced. As a consequence, if the electricity producer generates less electricity than the amount assured in the contract, the subsidy is paid proportionally to that new value and the rest of the repayments are be postponed. The electricity production of any run-of-river power station is dependent on sufficient precipitation and therefore highly variable and difficult to predict.

In conclusion, although both renewable and non-renewable plants may receive a subsidy, it is easier, faster and cheaper for thermal plants to be put into operation, receive the subsidy and generate profit. Moreover, there are fewer complications involved in the operation of conventional thermal plants (better detailed under 'prevailing practice') than in the operation of small hydro power plants.

To evidence this, a financial analysis was developed comparing the two possible scenarios to supply the system: the construction of a thermoelectric plant and the construction of a hydroelectric plant. This analysis was elaborated based on data from ANEEL (National Energy Agency), Eletrobrás (responsible for Isolated Systems recorded data), IEA (International Energy Agency) and the project proponent. All those references are presented in the Annex 5.

The most suitable financial indicator for the Investment Comparison analysis is the Internal Rate of Return (IRR). The IRR is the annualized effective compounded return rate which can be earned on the invested capital, i.e., the yield on the investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments, in this case represented by the benchmark value. The results of the analysis are presented in Table 7, further information about the analyses can be found in the Annex 5. Therefore Table 7 presents two analyses: Benchmark analysis and Investment Comparison analysis.

The basis for the selected benchmark used in the financial analysis is the SELIC rate (Sistema Especial de Liquidação e Custodia, that is, Special System of Clearance and Custody), set by the Banco Central do Brasil (Central Bank of Brazil)); this rate represents the expected return of a low risk investment fund. The value adopted in the calculation is the average value for the 3 year previous to the Project start, subtracted of one standard deviation for conservativeness. Thus the probability to have a rate equal or higher than the rate used in the calculation is 84%.

Table 7 - Comparative analysis between a Thermal and a Hydro Plant

Scenario	IRR

[4] Tolmasquim, M. T., 2004.

Hydroelectric Plant	5.01%
Thermoelectric Plant	18.39%
Benchmark	16.56%

The Investment Comparison analysis clearly shows that the most suitable Scenario is the Scenario 1. This conclusion is supported by the fact that the thermoelectric plant IRR is higher than the hydroelectric plant IRR. The rate of return of thermoelectricity generation enterprises in Isolated Systems, such as the Project Grid, is high; the justification for this fact is the subsidy for fuel consumption.

The IRR of the construction of a hydroelectric plant, Scenario 2, is also lower than the benchmark, indicating that the construction of the Project, without any incentives other than the CCC-Subrogation subsidy, is not financially attractive for a rational investor.

To turn the benchmark analysis more consistent a sensitivity analysis was conducted by altering the following parameters:

- Electricity generation increase;
- Electricity tariff increase;
- O&M costs reduction;
- Investment reduction.

These parameters were selected as they are the most likely to fluctuate over time. In the case of the Scenario 2, financial analyses were performed altering these parameters the enough to make the project feasible, then the output value of the alteration for each parameter is compared with the most likely alteration value. Most likely alteration values are supported by studies, article or even by technical conditions.

If the most likely alteration value for any parameter is higher than the alteration necessary to make the project feasible, then there is a possible scenario that makes the project feasible. Table 8 presents the results of the sensitivity analysis. For more information about the sensitivity analysis, refer to Annex 5.

Table 8 - Scenario 2 (hydroelectric plant) sensitivity analysis

Parameter	Variation necessary to feasibility	Most likely/highest expected variation	IRR considering the most likely variation
Electricity Generation	147.16%	36.88%	8.44%
Electricity tariff	110.43%	10.47%	6.38%
O&M Costs	-442.48%	-100.00%	8.13%
Investments	-51.21%	-13.08%	6.76%

The most likely variation value for the electricity generation is represented by the maximum output of the Project equipment.

The most likely variation value for the electricity tariff is based on a study which evaluates the electricity tariff in many parts of the Host Country. The value was calculated as the difference between the tariffs applicable to the project region, North Region, and the highest tariff in the Host Country, in this case the tariff applicable to the Midwest Region.

Specific for this project, O&M cost is not a critical parameter. Even considering zero for O&M costs, i.e. reduction of 100%, the IRR of the Scenario 2 is lower than the benchmark.

The most likely variation value for investments is based on a study which presents different scenarios (optimistic, pessimist and most likely) for the invested value of a Small Hydropower Plant. The value was calculated as the difference between the optimistic scenario, in which the investment is the lowest, and the pessimist scenario, in which the investment is the highest.

After conduce the sensitivity analysis, it can be concluded that the Scenario 2 faces significant investment barriers that would prevent its implementation, and is not attractive for a rational investor.

With respect to the **technological barriers**:

- In the case of Scenario 1 (continuation of current practices), there are no technical/technological barriers as this simply represents a continuation of current electricity generation practices which have been proven to work, and does not involve implementation of any new technology or innovation.
- In the case of Scenario 2, there are no significant technical/technological barriers. All the technologies involved in this scenario are available in the market, and have been used effectively in the Host Country.

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

- The continuation of current practices (Scenario 1) presents no particular obstacles. This is by definition the prevailing practice in the region.

- In the case of Scenario 2, there are barriers that would have to be overcome. According to the Brazilian Court of Audit (2004), even though the CCC subrogation is considered an attractive alternative to reduce the use of fossil fuel in the isolated system, until the end of 2004 only 12 plants were approved for the CCC Subrogation and only 6 are operating. The lack of interest from the local concessionaires in subscribing to this program is not only related to financial reasons but also to the more attractiveness of the subsidy for fossil fuel thermal plants.

  Concluding the prevailing practice study shows that in the North region, specifically in Rondônia, most plants use fossil sources as fuels, while hydro plants have always been a minority (comparing the Operational Plans for 2001 until 2005).

ELETRONORTE is the concessionaire responsible for generation and transmission activities inside the Porto Velho System, the main electricity system in Rondônia. Originally, the Porto Velho system comprised 1 large hydro unit (UHE Samuel) and 8 thermal units (Rio Branco I, TEU Colorado, TEU

Vilhena, Rio Branco II, Rio Acre, Rio Madeira, Termonorte I and Termonorte II) (Eletrobrás Operational Plan, 2001). According to the Operational Plan, all thermal units were part of the "Thermoelectric Priority Program", which focused on increasing the electricity supply for Rondônia State. The main reason for this initiative was due to water level instability of Samuel's hydro reservoir. Besides Eletronorte, CERON is the concessionaire responsible for distribution and transmission activities for the interior of Rondônia. According to the same Plan, in 2001, there were 41 isolated systems in Rondônia, from which 39 were fuelled by diesel oil.

From 2001 to 2005, thermal electricity generation inside the isolated system increased continuously. According to the Operational Plan (2003), forecasted hydro generation corresponded to 2,048 GWh, while thermal generation corresponded to 6,991 GWh. Furthermore, according to this same plan, thermal generation was projected to increase by 9% and hydro generation to decrease by 5%[5]. Still, in the Operational Plans for 2004 and 2005, a comparison between thermal and hydro generations always indicates a clear predominance of thermal generation. This can be better visualized in the tables below.

Tables 8 and 9 bellow are directly taken from the Operational Plan for 2005 (the most recent available representative plan). They show the total number of thermal and hydro units (both small and large hydropower plants, respectively PCH and UHE) in Rondônia up to the year 2005, and their respective installed capacity, considering units from both local utilities: CERON and ELETRONORTE.

Table 9– Number of units and installed power in 2005 - Thermal units

State	Concessionaire	# of units		Nominal Capacity (kW)	
		2004	2005	2004	2005
ACRE	ELETRONORTE	24	24	94.400	94.407
	ELETROACRE	66	66	35.484	32.572
AMAPÁ	ELETRONORTE	7	30	122.800	145.800
	CEA	17	15	23.320	18.045
AMAZONAS	MANAUS ENERGIA	66	116	822.700	900.200
	CEAM	368	426	211.021	325.363
PARÁ	CELPA	180	155	97.992	95.614
	JARI CELULOSE	11	11	70.570	69.865
RONDÔNIA	ELETRONORTE	12	12	549.900	549.900
	CERON	154	148	90.333	101.060
RORAIMA	BOA VISTA ENERGIA	3	3	62.000	62.000
	CER	97	114	25.430	23.670
BAHIA	COELBA	5	5	1.578	1.578
MARANHÃO	CEMAR	3	3	872	872
MATO GROSSO	CEMAT	208	206	109.092	105.039
MATO G. DO SUL	ENERSUL	3	3	4.500	4.500
PERNAMBUCO	CELPE	10	3	4.934	2.730
Total thermal units		1234	1340	2.326.926	2.533.215

[5] http://www.eletrobras.com.br/EM_Atuacao_SistIsolados/default.asp

Table 10– Number of units and installed power in 2005 – Hydro units[6]

State	Concessionaire	# of units		Nominal Capacity (kW)	
		UHE	PCH	UHE	PCH
AMAZONAS	MANAUS ENERGIA	5	-	250.000	-
RONDÔNIA	ELETRONORTE	5	-	216.000	-
	CERON	-	23	-	57.404
RORAIMA	CER	-	2	-	5.000
AMAPÁ	ELETRONORTE	3	-	75.000 (1)	-
MATO GROSSO	CEMAT	-	25		32.975
Total thermal units		13	50	541.000	95.379

Nota: (1) Prevista repotenciação da 2ª unidade geradora da UHE Coaracy Nunes para maio de 2005.

Considering the year 2005, Table 8 shows that the total installed capacity from thermal units in Rondônia is approximately 650 MW.

On the other side, Table 9 shows that, for the year 2005, the total installed capacity from hydro units in Rondônia is approximately 273 MW. However, most of that electricity is generated by large hydro plants. Therefore, considering only small scale hydro units in Rondônia, the total installed capacity would drop to 57 MW.

Based on these data, energy generated in Rondônia from thermal plants are responsible for 70% of the total installed capacity, large hydros are responsible for 23 % and small hydro has a much lower share of 7% of the total installed capacity.

It is clearly demonstrated that the prevailing practice in terms of energy generation in Rondônia is predominantly thermal. Consequently, the tendency in that region is rather the construction of fossil fuels units than the construction of hydro units.

To summarize, the **Baseline Scenario** for the Rondônia-Acre Isolated System is to continue generating electricity based mainly on fossil fuel consumption.

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

- No other barriers for both scenarios are identified.

The table 10 below summarizes the results of the analysis regarding the barriers faced by each of the plausible scenarios. Scenario 1 faces no barriers, whereas Scenario 2 faces investment barriers and is not prevailing practice.

[6] UHE in Portuguese stands for Large Hydro Units; and PCH stands for Small Hydro Units.

Table 11- Summary of barriers Analysis

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

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

- The **Baseline Scenario** is the continued use on the Rondônia-Acre Isolated System of electricity based mainly on diesel consumption.
- **The Project Scenario** is the construction of a new hydroelectric plant of 5.0 MW in total. The new plant will displace grid electricity from a more carbon-intensive source, resulting in significant GHG emission reductions. The Project Scenario is additional in comparison to the baseline scenario, and therefore eligible to receive Certified Emissions Reductions (CERs) under the CDM.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

Emission reductions due to displacement of electricity:

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

$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year y (tCO2/yr)
EG_y	Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)
$EF_{grid,CM,y}$	CO2 emission factor for the electricity displaced due to the project activity during the year y (tCO2/MWh)

Step 1: Identify the electric system:

The Project Activity is connected to the Rondônia-Acre Isolated System.

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

The grid emission factor is calculated using the method (a) of the Tool, Simple OM. Low-cost/must-run resources, in the grid, constitute less than 50% of total grid generation in average of the five most recent years. The OM was calculated *ex-ante*, using the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission. For more information please see Annex 3.

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

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

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

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

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

The group of plants that comprise 20% of the total generation was chose to calculate the Build Margin emission factor *ex-ante* based on the most recent information available on plants already built for sample group m at the time of PDD submission. From the two options, the sample group that comprises the larger annual generation is the group of plants that comprise 20% of the total generation.

In terms of vintage of data, option 1 of the “Tool to calculate the emission factor for an electricity system” was chosen.

Step 5: Calculate the Build Margin emission factor:

The calculation was done as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, applying *Option 1* of the methodology, as follows:

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

Where:

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

Step 6: Calculate the combined margin emissions factor:

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

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad (4)$$

Where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{grid,OM,y}$ and $EF_{gird,BM,y}$ are calculated as described in previous Steps above and are expressed in tCO_2/MWh.

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

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Baseline Emission Factor
Source of data used:	CERON, Termonorte, Eletronorte, Eletrobrás
Value applied:	0.9421
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Baseline Emission Factor calculation consists of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved Tool to calculate the emission factor for an electricity system .
Any comment:	The data was calculated ex-ante so that will not need to be revised within crediting period.

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin Emission Factor
Source of data used:	CERON, Termonorte, Eletronorte, Eletrobrás
Value applied:	0.8682
Justification of the	The Operating Margin Emission Factor is determined ex-ante considering the

choice of data or description of measurement methods and procedures actually applied :	full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission.
Any comment:	The data was calculated ex-ante so that will not need to be revised within crediting period.

Data / Parameter:	$\mathbf{EF_{grid,BM,y}}$
Data unit:	tCO_2/MWh
Description:	Build Margin Emission Factor
Source of data used:	CERON, Termonorte, Eletronorte, Eletrobrás
Value applied:	1.0160
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Build Margin Emission Factor is determined ex-ante considering the generation-weighted average emission factor of a sample of power plants.
Any comment:	The data was calculated ex-ante so that will not need to be revised within crediting period.

Data / Parameter:	Installed Capacity
Data unit:	MW
Description:	The installed capacity
Source of data used:	Aneel resolution n^{o} 349, October 5th 2004 and Equipment Manual
Value applied:	5.0 MW
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data refers to the total installed capacity of the SHP Saldanha.
Any comment:	There are two generator units, each with installed capacity of 2.5MW.

B.6.3 Ex-ante calculation of emission reductions:

The ex-ante emission reductions values and calculations are as follows:

EMISSION REDUCTION CALCULATIONS: 1D METHODOLOGY

Starting crediting period (year)	2008
Starting crediting period (month)	8
Ending crediting period (year)	2019
Ending crediting period (month)	7

Data from electricity grid:

Combined margin	tCO_2/MWh	0.9421

Project Generation:

Installed capacity	MW	4.80
Guaranteed Power	MW	3.40
Reference Electricity generation	MWh/year	29,784.00

Baseline Emissions

Baseline Emissions (first year)	tCO_2e	11,691
Baseline Emissions	tCO_2e	28,059

Project Emissions

Default emission factor for emissions from reservoirs	$KgCO_2$/MWh	0	Power density greater than 10 W/m²
Project Emissions (first year)	tCO_2e	0	
Project Emissions	tCO_2e	0	

Emission Reduction Calculations per phase:

Annual GHG emission reductions 1st year	tCO_2/1styr	**11,691**
Annual GHG emission reductions	tCO_2/yr	**28,059**

$$ER_y = BE_y - PE_y - L_y$$

Where:

- *ER*: Emission reduction (t CO_2e)
- *BE*: Baseline emissions (t CO_2e)
- *PE*: Project Emissions (t CO_2e)
- *L*: Leakage emissions (t CO_2e)
- *y*: a given year

$PE_y = 0$, as emissions by sources are zero since hydroelectric power is a zero CO_2 emissions source of energy.

According to the methodology, a leakage calculation is only needed if the renewable energy equipment is transferred from another activity or to another activity. This is not the case with this project activity.

Therefore:

$$L_y = 0$$

$$ER_y = BE_y$$

Referring to Section B.6.1, equations (1) to (4) are used to estimate baseline emissions.

Therefore, using the approach above and the data shown in Annex 3, the baseline, project and leakage emissions are presented in section B.6.4, below.

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

Years	Estimation of project activity emission reductions (tonnes of CO_2e)	Estimation of baseline reductions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)
2008 (August - December)	0	11,691	0	11,691
2009	0	28,059	0	28,059
2010	0	28,059	0	28,059
2011	0	28,059	0	28,059
2012	0	28,059	0	28,059
2013	0	28,059	0	28,059
2014	0	28,059	0	28,059
2015	0	28,059	0	28,059
2016	0	28,059	0	28,059
2017	0	28,059	0	28,059
2018(January - July)	0	16,368	0	16,368
Total (tonnes of CO_2e)	0	280,590	0	280,590
Average	0	28,059	0	28,059

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh/year
Description:	Annual net electricity supplied to the grid
Source of data to be used:	Measured by CERON and project developer

Value of data	29,784
Description of measurement methods and procedures to be applied:	In order to monitor the electricity generated by the renewable technology, the data collected will be the hourly reading from the meter at the plant and the reading from the utility electricity meter used for issuing the energy sale invoice (this document will show the amount of energy supplied to the grid).
QA/QC procedures to be applied (if any):	Meters will be calibrated according to the manufacturer manual. Data collected has low uncertainty levels and to guarantee its accuracy it will be cross checked with the electricity sales receipts obtained from the grid operator.
Any comment:	Data will be archived at least for two years after crediting period.

B.7.2 Description of the monitoring plan:

The monitoring of this type of project consists of metering the electricity generated by the renewable technology. Bellow you find the description of monitoring procedures for data measurement, quality assurance and quality control.

Metering of Electricity Supplied to the Grid

The main electricity meter for establishing the electricity delivered to the grid will be installed at the input end of the transmission line (i.e. next to the substation at the plant). This electricity meter will be the revenue meter that measures the quantity of electricity that the project will be paid for. As this meter provides the main CDM measurement, it will be the key part of the verification process.

Data will be measured continuously and at the end of each month the monitoring data will be filed electronically and a back-up will be made regularly. The project developer needs to keep the purchase invoices. Data will be archived electronically and on paper and will be kept for at least two years after the end of the crediting period.

The electricity meter should meet relevant local standards at the time of installation. The meter will be installed by the electricity company in accordance with Brazilian standards. Records of the meter (type, make, model and calibration documentation) will be retained in the quality control system.

Quality Control and Quality Assurance

Quality control and quality assurance procedures will guarantee the quality of data collected. The electricity meter(s) will undergo maintenance subject to the manufacturer standards. Moreover, meter(s) are maintened by the distribution concessionaire CERON - which signs a long term PPA with the plant.

To guarantee the consistency and accuracy of the data collected from the meter(s), data will be cross-checked with the sale invoices which will show the amount of energy supplied to the grid.

Before the crediting period starts, the organisation of the monitoring team will be established and clear roles and responsibilities will be assigned to all staff involved in the CDM project

Data will be read off the meter and energy sales invoices will be collected from the small hydro by the plant operation personnel. This information will be transferred to EcoSecurities on a monthly basis in order to monitor emission reductions.

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

The application of the baseline and monitoring methodology was completed on 22/12/2006. The entity determining the monitoring plan as the Carbon Advisor is EcoSecurities Group Plc. For further detail, contact:

Leandro Noel
Rua Lauro Müller, 116, room 4303
Rio de Janeiro- RJ
Brazil 22290-160
Phone. 55 (21) 2546 4150
Email Leandro.noel@ecosecurities.com
Website www.ecosecurities.com

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:

26/11/2003[7]

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

30y-00m

[7] The date that better determine the starting date of the project activity is the date when equipments were purchased.. Older facts can't ensure the project implantation, for more information about the starting date of the Project Activity, please refer to Annex 3.

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:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The crediting period will start on 01/08/2008, or on the date of registration of the CDM project activity

C.2.2.2. Length:

10y-00m

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 Project generates no emissions of greenhouse gases and produces no toxic waste, and has limited, controlled and reversible effects on the environment because the project is a run of river small hydro, using water directly from the river with a small storage area designed only to allow the water intake to operate. The project has easy integration in the landscape and has compatibility with the protection of water, fauna and flora.

As for the regulatory permit, the project developer (Hidroluz Centrais Elétricas Ltda) has authorization to operate as an independent power producer issued by ANEEL (ANEEL Resolution nº 727, issued on 18/dez/2002), and received authorization to operate the SHP Saldanha on 5/Oct/2004 (ANEEL Resolution nº 349).

As for the environmental permits, the project has the necessary environmental licenses. The license of operation was issued by the state environmental agency, NUCOF/SEDAM, LO number 0001546 issued on 19/12/2005 for SHP Saldanha, and renewed on 13/12/2007 with the issuance of the LO number 0004371.

A PCA (Environment Control Plan) was developed in order to identify and undertake ultimate environmental impacts due to the project activity. Regarding the PCA, the project activity has no significant negative impacts to the environment, offering overall benefits to the local society; moreover, the PCA analyzes the undertaking in environmental perspectives, identifying and assessing the possible environmental impacts and listing its mitigation actions.

Also, a PRDA (Program for Recovering of Degraded Areas) and a Monitoring Plan was developed with the purpose to analyse and address eventual negative impacts derived from the project activity.

All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency.

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 activity does not incur any significant environmental impacts.

SECTION E. Stakeholders' comments

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

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

- City Hall of Alta Floresta d'Oeste;
- Environmental Agency of Alta Floresta d'Oeste;
- Chamber of Deputy of Alta Floresta d'Oeste;
- SEDAM Rondônia;
- Public ministry;
- Brazilian Forum of NGOs
- Alta Floresta Local Community Association

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation.

E.2. Summary of the comments received:

To date, no comments have been received.

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

To date, no comments have been received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Credit originator and project operator – Incomex:

Organization:	Hidroluz Centrais Elétricas Ltda.
Street/P.O.Box:	Linha 140 com Linha 50, Lote 85
Building:	Setor Rio Branco
City:	Alta Floresta
State/Region:	Rondônia
Postfix/ZIP:	78994-000
Country:	Brazil
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E-Mail:	hidroluz@erona.com.br
URL:	-
Represented by:	Represented by:
Title:	Director
Salutation:	Mr.
Last Name:	Lopes
Middle Name:	De Oliveira
First Name:	Eroná
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Direct FAX:	+55 69 3442 1660
Direct tel:	+55 69 3442 1660
Personal E-Mail:	erona@erona.com.br

Credit buyer and project advisor:

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Street/P.O.Box:	40 Dawson Street
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Telephone:	+353 1613 9814
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E-Mail:	info@ecosecurities.com
URL:	www.ecosecurities.com
Represented by:	
Title:	Group Treasurer
Salutation:	Mr.
Last Name:	Conor
Middle Name:	-
First Name:	Meegan
Department:	-
Mobile:	-
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	cdm@ecosecurities.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project will not receive any public funding from Parties included in Annex I.

Annex 3

BASELINE INFORMATION

Starting date of the Project Activity

The starting date of the project is the date when the construction started. There are documents dated before the date defined above, but those licenses cannot be considered a real action because most of SHP initiatives request these documents but do not go forward with the construction. In Brazil, licenses are a speculative tool, as demonstrated below:

The electric sector in Brazil is characterised by constant speculations. Recently, Gerson Kelmam, the director of ANEEL, confirmed this fact and said that the Agency would take actions to avoid speculations in the sector.

> *"What happens is that we have many SHPs that had been object of authorization, but they are not materialised. In other words, the entrepreneur receives the authorization to build the plant and, in many cases, has the installation license, but does not build", ..., "It is an authorization to use a public good that cannot be object of speculation. We are issuing 65 terms of summon to these [entrepreneur] authorized to construct Small Hydroelectric Plants justify themselves, because we are starting a process of cancellation of these authorizations" – Translated from Agência Brasil (the public communication company), April 30th, 2007 (http://www.agenciabrasil.gov.br/noticias/2007/04/30/materia.2007-04-30.3841294612/view).*

Although some efforts had to be done to have the ANEEL authorization and environmental licenses issued, we shall not state this date as the starting date of the project activity, given in Brazil, people get the authorization, then wait for investors to implement the project;

In the Project region, there are 4 hydroelectric plants under construction and 9 granted hydroelectric enterprises, *i.e.* authorised to be built, but did not start construction yet. Most of these plants have been authorised for a long time before the construction starts. For example SHP Espigão, is authorised since 05/03/02004 and the construction did not start; SHP Cachoeira Formosa, authorised since 26/04/2001; and the hydroelectric plant named Rondon II, now under construction, is authorized since 1991. (source: http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2 - visited on May 20th, 2008)

Considering the stated above, until the equipments purchase project developers can abandon the enterprise. The earliest real action of a Hydroelectric Project in Brazil must be equipments purchase.

Grid Emission Factor Calculation

The grid emission factor calculation was performed in accordance with the latest version of ACM0002. Rondônia-Acre system is isolated from Brazilian interconnected systems S-SE-CO and N-NE. The grid is predominantly thermal thus the Simple OM method was selected.

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

1. Data obteined from CERON from report "RELATÓRIO MENSAL - ENERGIA SUPRIDA", years 2001 to 2005
2. Data from TERMONORTE report to CERON
3. Data obteined from CERON from report "RESUMO DE GERAÇÃO TÉRMICA", years 2001 to 2005
4. Data from Programa Mensais de operação para o ano de 2004, http://www.eletrobras.com.br/EM_Atuacao_SistIsolados/default.asp
5. personal comunication with CERON for 2004 data
6. Aneel BIG
7. Data from Programa Mensais de operação para o ano de 2005, http://www.eletrobras.com.br/EM_Atuacao_SistIsolados/default.asp
8. Data from Plano Anual de Operação 2005, pág. 9, item 3.3
9. Data obteined from ELETRONORTE from report "Mapa Oleo Diesel", years 2003 to 2005
10. Data obteined from ELETRONORTE from report "Relatório Integrado do Desempenho Empresarial" (RIDE), years 1994 to 2005
11. Data from GTON8 Brazilian Annual Operational Plan- 2002-2005 - ELETROBRAS
12. Data from GTON Brazilian Monthly Operational reports-2002-2005 - ELETROBRAS

A summary of the calculation is provided below.

Table 12 - Data used to calculate EF

	2003		2004		2005	
	Total Generation (MWh)	Fuel Consumption (m^3)	Total Generation (MWh)	Fuel Consumption (m^3)	Total Generation (MWh)	Fuel Consumption (m^3)
PIE Rovema	-	-	-	-	3.053	852
Rio Branco	-	-	328	0	38.136	0
Cabixi II	23.577	0	23.577	0	12.828	0
Termonorte II	605.716	187.695	994.041	284.548	989.079	352.776
Monte Belo	23.652	0	23.652	0	26.920	0

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

PCH Altoe	7.595	0	7.928	0	8.709	0
Alta F. D'Oeste	25.935	0	26.908	0	26.467	0
PCH ST. Luzia	22.077	0	23.293	0	21.030	0
Termonorte I	310.426	74.737	257.014	61.292	439.150	104.242
PCH Cachoeira	55.440	0	57.970	0	60.087	0
PCHs Castaman 2	2.688	0	2.968	0	3.044	0
PCH Cabixi 1	16.639	0	16.435	0	18.281	0
Rio Acre	23.927	8.271	0	0	0	0
PCHs Castaman 3	7.955	0	8.785	0	9.012	0
Rio Branco II	9.055	2.838	23.907	7.355	41.207	12.613
PCHs Castaman 1	8.063	0	8.704	0	9.133	0
Samuel	831.738	0	727.499	0	650.627	0
PCH Rio Vermelho	9.276	0	14.193	0	15.369	0
Rio Madeira	43.684	14.144	42.748	13.504	76.784	24.514
Rio Branco I	92.255	30.455	164.510	55.970	152.514	51.424
Barro Vermelho	157.031	45.806	5.899	1.753	0	0
UTE Colorado	9.386	3.176	8.591	2.885	6.419	2.191
UTE Vilhena	16.489	4.866	19.813	5.978	20.996	6.145

Table 13 - Emission Factor for the Rondônia Isolated System

Rondonia-Acre System

	EF_{OM} (tCO_2/MWh)	Load (MWh)	
2003	0,8338	2.302.605	
2004	0,8325	2.458.762	
2005	0,9316	2.628.846	
	TOTAL	7.390.213	
	$EF_{OM,SIMPLE}$	0,8682	0,5
	$EF_{BM,2005}$	1,0160	0,5
	EF_y $(tCO2/MWh)$	0,9421	

Table 14 - Rondônia Isolated System Electricity Generation Sources

	2001	2002	2003	2004	2005	Average
Thermal Generation	578.565	875.330	1.267.971	1.516.522	1.729.201	**1.193.518**
Hydro Generation	1.022.173	855.439	1.034.635	942.240	899.645	**950.826**
Predominance	Hydro	Thermal	Thermal	Thermal	Thermal	**Thermal**

Grid selection

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

(i) The South/South-east/Midwest Interconnected System;
(ii) The North/North-East Interconnected System; and
(iii) The Isolated System (which represents 300 locations that are electrically isolated from the interconnected systems.

The proposed project activity will be connected to the Rondônia-Acre isolated system (Figure 2), and according to the approved methodology ACM0002, it is necessary to account all generating sources serving the system. As a result, the project proponent should research all power plants serving this system.

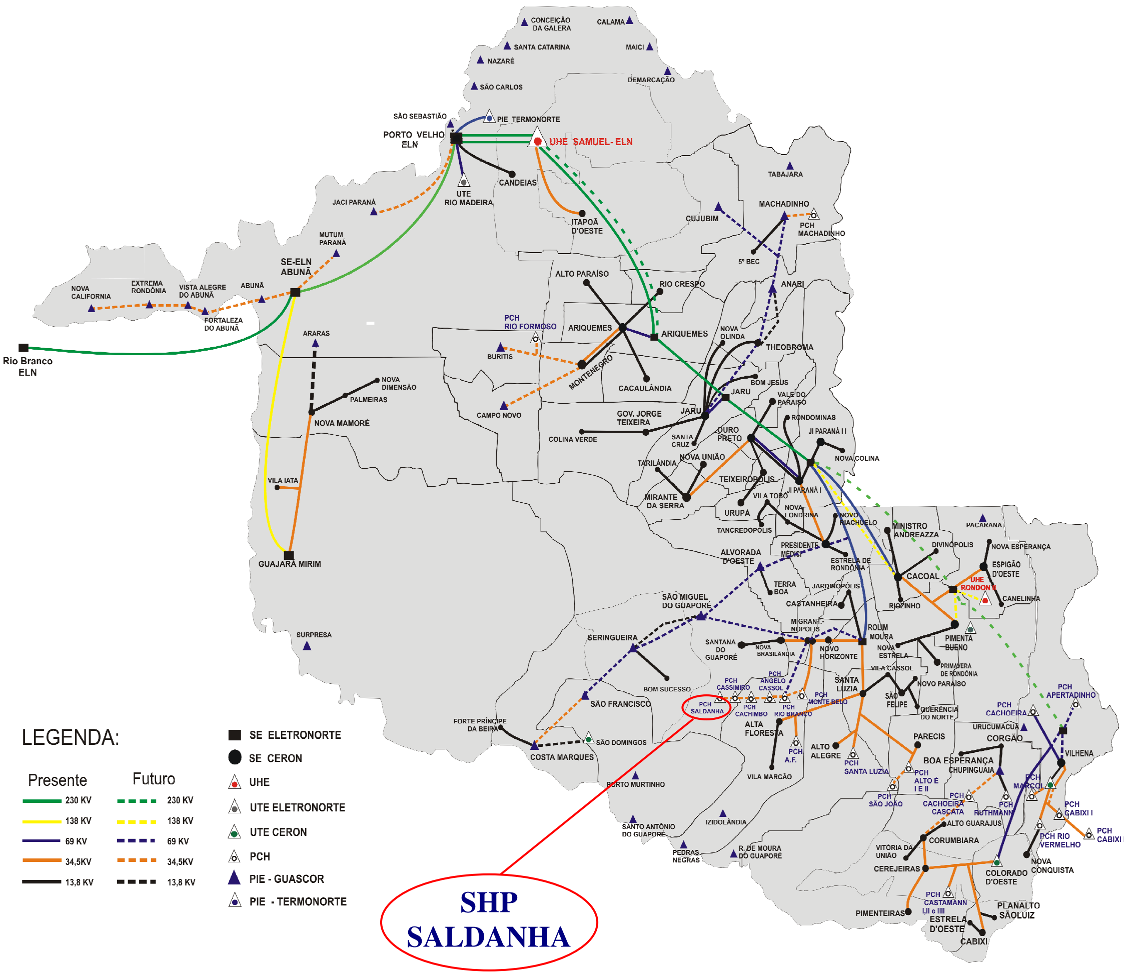

Figure 2. Isolated System in Rondônia State (Eletrobras)

Annex 4

MONITORING INFORMATION

The monitoring plan will be executed based on the simplified baseline and monitoring procedures established in the AMS-I.D, “Grid-connected renewable electricity generation” - Version 13, December 14, 2007.

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

Annex 5

FINANCIAL ANALISYS INFORMATION

To correctly address the cash flow timeline, a perpetuity value was inserted in the end of the 12-years period analysed. The perpetuity represents the value, in terms of present value, all future revenues and/or costs. Using the perpetuity the analysis considers an infinite cash flow. According to Samanez (2007) the perpetuity of a flow (Figure 1), can be calculated as:

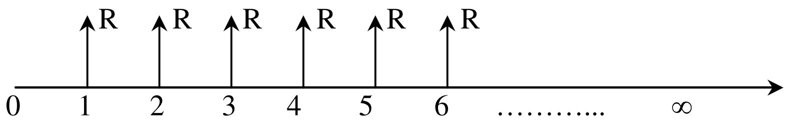

Figure 1 - Flow representing the perpetuity

$$P = R \cdot \left(\frac{1}{i} \right)$$

Where:

P	Is the perpetuity value, in terms of present value
R	Are the revenues in each year, from 0 to infinite;
i	Is the relevant income tax

For the project, the relevant income tax is represented by the SELIC rate.

The depreciation was calculated as 10% of the fixed assets of the Enterprise and is used only as a tax benefit. The value is based on default depreciation values set by the Brazilian government.

The expected electricity generation used in the financial analysis is sensibly higher than the used for Emission Reduction calculation purpose. This is a conservative approach, used only to simplify the analysis. The emission reduction calculation is based on a yearly electricity generation of 29784 MWh, reflecting the guaranteed generation of the PPA, while the financial analysis is based on a yearly generation of 32000 MWh. The sensitivity analysis conduced eliminates any kind of doubt related to the electricity generation.

		Unitary value	Unit	0	1	2	3	4	5	6	7	8	9	10	11	12	Perpetuity
Scenario 2	Investments	R$ 28,340,210.78	R$	(28,340,210.78)													0.00
	Subsidy	R$ 13,791,010.50	R$		10,343,257.88	3,447,752.63											0.00
	Electricity Generation	32,000.00	MWh														0.00
	Electricity Tariff	76.13	R$/MWh		2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	14,708,002.74
	O&M Costs	19.00	R$/MWh		(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(608,000.00)	(3,670,721.82)
	(-)Depreciation	1,995,223	R$		(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	(1,995,222.68)	0.00	0.00	0.00
	Taxes	34%	%		(3,459,906.37)	(1,115,434.58)	56,801.31	56,801.31	56,801.31	56,801.31	56,801.31	56,801.31	56,801.31	56,801.31	(621,574.40)	(621,574.40)	(3,752,675.51)
	(+)Depreciation				1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	1,995,222.68	0.00	0.00	0.00
	BaselineCash Flow		R$	(28,340,210.78)	8,711,511.51	4,160,478.04	1,884,961.31	1,884,961.31	1,884,961.31	1,884,961.31	1,884,961.31	1,884,961.31	1,884,961.31	1,884,961.31	1,206,585.60	1,206,585.60	7,284,605.41

Financial Analysis	Values
Discount Rate	16.56%
NPV	(R$ 10,477,741.56)
IRR	5.01%

		Unitary value	Unit	0	1	2	3	4	5	6	7	8	9	10	11	12	Perpetuity
Scenario 1	Investments	R$ 3,504,000.00	R$	(3,504,000.00)													0.00
	Subsidy		R$		0.00	0.00											0.00
	Electricity Generation	32,000.00	MWh														0.00
	Electricity Tariff	76.13	R$/MWh		2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	2,436,160.00	14,708,002.74
	O&M Costs	50.00	R$/MWh		(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(1,600,000.00)	(9,659,794.26)
	(-)Depreciation	350,400	%		(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	(350,400.00)	0.00	0.00	0.00
	Taxes	34%	%		(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(165,158.40)	(284,294.40)	(284,294.40)	(1,716,390.88)
	(+)Depreciation				350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	350,400.00	0.00	0.00	0.00
	BaselineCash Flow		R$	(3,504,000.00)	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	671,001.60	551,865.60	551,865.60	3,331,817.60

Financial Analysis	Values
Discount Rate	16.56%
NPV	R$ 316,500.08
IRR	18.39%

Hydro cash flow inputs	Reference
Investments	Project Developer data
Subsidy	ANEEL Resolution 349/2004
Electricity Tariff	Similar hydrolectric plant tariff in 2003
O&M Costs	Project Developer data
Depreciation	Default value based on ANEEL
Taxes	default taxes determined by the government

Thermo cash flow inputs	Value	Reference
Electricity generation (MWh)	32000	Hydro plant

Load Factor	0.84	Report from CERON - Relatório Integrado do Desempenho Empresarial da Unidade de Negócios de Rondônia (Ride) - 2003 to 2005
Installed capacity (MW)	4.38	Calculated
O&M costs (R$/MWh)	50	http://www.perfectum.eng.br/Diesel_OU_gas.html
Electricity tariff (R$/MWh)	76.13	Hydro plant
Instalation Cost (R$/MW)	800000	http://www.perfectum.eng.br/Diesel_OU_gas.html
total investment	R$ 3,504,000.00	Calculated

Annex 6

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