

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

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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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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 04
13/11/07

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 CO₂ 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 ° 59'09" S and Longitude 62 ° 10'38" 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 10, 23 December 2006¹ 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 description²

	Generation Unit 1	Generation Unit 2
Turbine type	Francis	Francis
Turbina Manufacturer	HISA	HISA
Generator Model	GE 2.5 MW	GE 2.5 MW
Unit Installed Capacity	2.5 MW	2.5 MW

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 3km². 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 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 km².

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 Turbine Technical Proposal for SHP Saldanha Francis Turbine Technical Design, HISA, 2004.

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
Set-Dec Year 1	9,324
2008	27,971
2009	27,971
2010	27,971
2011	27,971
2012	27,971
2013	27,971
2014	27,971
2015	27,971
2016	27,971
Jan-Aug 2017	18,647
Total estimated reductions (tonnes of CO ₂ e)	279,710
Total number of Crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	27,971

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 10, 23 December 2006.

<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.

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 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.

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 renewables, 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 consumption³.

- 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.

Table 6 - Small hydro units construction costs in different Brazilian regions – R\$/kW⁴

	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

³ Brazilian Court of Audit, 2004.

⁴ Tolmasquim, M. T., 2004.

Furthermore, the subsidy for the construction is not fully paid when the subrogation is conceded. The repayments are amortized every month for a maximum of 5 years, 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 postponed to the following months. 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 and to receive the subsidy. 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 in this case: the construction of a thermal plant unit and the construction of a hydro 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 clearly demonstrated on the spreadsheet for CERs and financial analysis calculations in the tables in Annex 5 (Saldanha calculation v03 2007.04.04).

The results of the calculation clearly showed the NPV and IRR results for both scenarios: for a thermal plant, the NPV corresponds to around R\$ 9,6 million in 10 years, while for a hydro plant, the NPV is minus R\$ 1,7 million. Also, the IRR for the thermal is 64% against an IRR of 10% for the hydro. It clearly demonstrates what was mentioned above: comparing the advantages of a thermal and a hydro plant, the thermal plant is still more attractive. Furthermore, the thermal plant does not present any risk related to rain variation.

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

NET PRESENT VALUE IRR	THERMAL PLANT		SMALL HYDRO
	Discount rate	10 years	10 years
	12%	R\$ 9.646.117,98	(R\$ 1.705.715,02)
		64%	10%

**The data used for the financial analysis is provided in Annex 5.

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.

⁵ http://www.eletrobras.com.br/EM_Atualizacao_SistIsolados/default.asp

Table 8 – Number of units and installed power in 2005 - Thermal units

Estado	Concessionária	Nº de Unidades		Potência Nominal (kW)	
		2004	2005	2004	2005
ACRE	ELETRONORTE	24	24	94.400	94.407
	ELETOACRE	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 PARQUE TÉRMICO		1234	1340	2.326.926	2.533.215

Table 9 – Number of units and installed power in 2005 – Hydro units⁶

Estado	Concessionária	Nº de Unidades		Potência Nominal (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 PARQUE HIDRÁULICO		13	50	541.000	95.379

Nota: ⁽¹⁾ Prevista repotenciação da 2ª unidade geradora da UHE Coaracy Nunes para maio de 2006.

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.

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

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.

Table 10 - Summary of barriers Analysis

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

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:

AMS I.D offers the following choices for preparing the baseline calculation for this type of project activity:

(a) A Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered.

OR

(b) The weighted average emissions (in kg CO₂equ/kWh) of the current generation mix.

Considering the available guidelines and the project activity, the Rondônia-Acre isolated system has been chosen for baseline analysis using method (a) for the baseline calculations.

$$BE_y = EG_y * EF_y \quad (1)$$

the **baseline emissions** (BE_y) resulting from the electricity supplied and/or not consumed from the grid are calculated as follows:

Where:

EG_y is the annual net electricity generated from the Project in year y

EF_y is the baseline emission factor in year y .

The **baseline emissions factor** (EF_y) is a weighted average of the EF_{OM_y} and EF_{BM_y} :

$$EF_y = (\omega_{OM} * EF_{OM_y}) + (\omega_{BM} * EF_{BM_y}) \quad (2)$$

Where:

EF_{OM_y} is the operating margin carbon emissions factor

EF_{BM_y} is the build margin carbon emissions factor

and the weights ω_{OM} and ω_{BM} are by default 0.5.

The **Operating Margin emission factor** (EF_{OM_y}) is calculated using the following equation:

$$EF_{OM_y} (tCO_2 / MWh) = \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j,y}} \quad (3)$$

Where:

$F_{i,j,y}$ is the amount of fuel i (in GJ) consumed by power source j in year y ;

j is the set of plants delivering electricity to the grid, not including low-cost or must-run plants and carbon financed plants;

$COEF_{i,j,y}$ is the carbon coefficient of fuel i (tCO₂/GJ);

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j .

The simple OM method was used since the system is predominantly thermal.

The **Build Margin emission factor** (EF_{BM_y}) is the weighted average emission factor of a sample of power plants m . This sample includes either the last five plants built or the most recent plants that combined account for 20% of the total generation, whichever is greater (in MWh). The equation for the build margin emission factor is:

$$EF_{BM_y} (tCO_2 / MWh) = \frac{[\sum_{i,m} F_{i,m,y} * COEF_{i,m}]}{[\sum_m GEN_{m,y}]} (4)$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and GEN_m are analogous to the OM calculation above.

For this project, EcoSecurities calculated a unique combined margin, according to Rondônia isolated system data. See Annex 3 for more details.

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

Data / Parameter:	EF_v
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 methodology ACM0002.
Any comment:	The data was calculated ex-ante so that will not need to be revised within crediting period.

Data / Parameter:	EF_{OM}
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 choice of data or description of measurement methods and procedures actually applied :	The Operating Margin Emission Factor is determined ex-ante considering the 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:	EF_BM
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° 349, October 5 th 2004
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:

Parameter	Formula	Value	Unit
EF_BM	provided in section B.6.2	1.0160	tCO ₂ /MWh
wBM	-	0.5	-
EF_OM	provided in section B.6.2	0.8682	tCO ₂ /MWh
wOM	-	0.5	-
EF	provided in section B.6.2	0.9421	tCO ₂ /MWh
Installed_capacity		4.8	MW
Auxiliary_consumption		0.015	MW
load_factor		71%	%

EG _y	=(Installed_capacity - Auxiliary_consumption) * load_factor * 8760	29,691	MWh
BE	= EG * EF	27,971	tCO ₂
PE		0	tCO ₂
ER	= BE – PE	27,971	tCO ₂

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER: Emission reduction (t CO₂e)

BE: Baseline emissions (t CO₂e)

PE: Project Emissions (t CO₂e)

L: Leakage emissions (t CO₂e)

y: a given year

$PE_y = 0$ as emissions by sources are zero since hydroelectric power is a zero CO₂ emissions source of energy.

According to AMS I.D Version 10, 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) and (2) are used to estimate baseline emissions.

$$BE_y = EG_y * EF_y \quad (1)$$

Where:

BE_y is the baseline emissions (tCO₂e)

EG_y is the annual net electricity generated from the Project (MWh)

EF_y is the baseline emission factor (tCO₂e/MWh).

$$EF_y = \omega_{OM} * EF_{OM_y} + \omega_{BM} * EF_{BM_y}$$

Where:

EF_y : baseline emission factor (tCO₂e / MWh)

ω_{OM} : Operation Margin weight, which is 0.5 by default

EF_{OM_y} : Operational Margin emission factor (tCO₂e / MWh)

ω_{BM} : Build Margin weight, which is 0.5 by default

EF_{BM_y} : Build Margin emission factor (tCO₂e / MWh)

Therefore, using the approach above and the data shown in Annex 3, the baseline emissions will be 27,971 tCO₂e/year or 279,710 tCO₂e for the 10-year crediting period.

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

Years	Estimation of project activity emission reductions (tonnes of CO ₂ e)	Estimation of baseline reductions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of emission reductions (tonnes of CO ₂ e)
Set to Dec 2007	0	16.316	0	16.316
2008	0	27.971	0	27.971
2009	0	27.971	0	27.971
2010	0	27.971	0	27.971
2011	0	27.971	0	27.971
2012	0	27.971	0	27.971
2013	0	27.971	0	27.971
2014	0	27.971	0	27.971
2015	0	27.971	0	27.971
2016	0	27.971	0	27.971
Jan to Ago 2017	0	11.655	0	11.655
Total (tonnes of CO ₂ e)	0	279.710	0	279.710
Average	0	27.971	0	27.971

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	29,691
Description of measurement methods and procedures to be	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 (meter model ELSTER ALPHA A2R,

applied:	with accuracy of $\pm 0.2\%$) - 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):	According to national standards, meters will be calibrated periodically. 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. Below 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 industry standards. Moreover, meter(s) are calibrated by the distribution concessionaire CERON - which signs a long term PPA with the plant - in accordance with national standards established by INMETRO (*"Instituto Nacional de Metrologia, Normalização e Qualidade Industrial"* - entity responsible for calibration standards) and recalibrated according to the manufacturer specifications, but at least once every 3 years.

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.

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

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

The 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:

Marcelo Aguiar
 Rua Lauro Müller, 116, room 4303
 Rio de Janeiro- RJ
 Brazil 22290-160
 Phone. 55 (21) 2275 9570
 Email marcelo.aguiar@ecosecurities.com
 Website www.ecosecurities.com

SECTION C. Duration of the <u>project activity</u> / <u>crediting period</u>

C.1 Duration of the <u>project activity</u>:

C.1.1. <u>Starting date of the project activity</u>:

01/04/2004⁷

C.1.2. <u>Expected operational lifetime of the project activity</u>:

30y-00m

⁷ The date that better determine the starting date of the project activity is the start of the plant construction. Older facts can't ensure the project implantation.

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 01/09/2007, or on the date of registration of the CDM project activity, whichever is later.

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/Dez/2005 for SHP Saldanha.

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
Telephone:	+55 69 3442 1660
FAX:	+55 69 3442 1660
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
Department:	-
Mobile:	+55 69 9961 1660
Direct FAX:	+55 69 3442 1660
Direct tel:	+55 69 3442 1660
Personal E-Mail:	erona@erona.com.br

Credit buyer and project advisor:

Organization:	EcoSecurities Group Plc.
Street/P.O.Box:	40 Dawson Street
Building:	
City:	Dublin
State/Region:	
Postfix/ZIP:	02
Country:	Ireland
Telephone:	+353 1613 9814
FAX:	+353 1672 4716
E-Mail:	cdm@ecosecurities.com
URL:	www.ecosecurities.com
Represented by:	
Title:	COO & President
Salutation:	Dr.
Last Name:	Moura Costa
Middle Name:	
First Name:	Pedro
Mobile:	
Direct FAX:	
Direct tel:	+44 1865 202 635
Personal E-Mail:	pedro@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****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 obtained from CERON from report "RELATÓRIO MENSAL - ENERGIA SUPRIDA", years 2001 to 2005
2. Data from TERMONORTE report to CERON
3. Data obtained from CERON from report "RESUMO DE GERAÇÃO TÉRMICA", years 2001 to 2005
4. Data from Programa Mensais de operação para o ano de 2004, http://www.eletronorte.com.br/EM_Atualizacao_SistIsolados/default.asp
5. personal communication with CERON for 2004 data
6. Aneel BIG
7. Data from Programa Mensais de operação para o ano de 2005, http://www.eletronorte.com.br/EM_Atualizacao_SistIsolados/default.asp
8. Data from Plano Anual de Operação 2005, pág. 9, item 3.3
9. Data obtained from ELETRONORTE from report "Mapa Oleo Diesel", years 2003 to 2005
10. Data obtained from ELETRONORTE from report "Relatório Integrado do Desempenho Empresarial" (RIDE), years 1994 to 2005
11. Data from GTON8 Brazilian Annual Operational Plan- 2002-2005 - ELETROBRAS
12. Data from GTON Brazilian Monthly Operational reports-2002-2005 - ELETROBRAS

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

A summary of the calculation is provided below.

Table 11 - 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
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 12. Emission Factor for the Rondônia Isolated System

Rondonia-Acre System		
	<i>EF_{OM}</i> (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
<i>EF_{OM,SIMPLE}</i>	0,8682	0,5
<i>EF_{BM, 2005}</i>	1,0160	0,5
<i>EF_y</i> (tCO ₂ /MWh)	0,9421	

Table 13. 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.

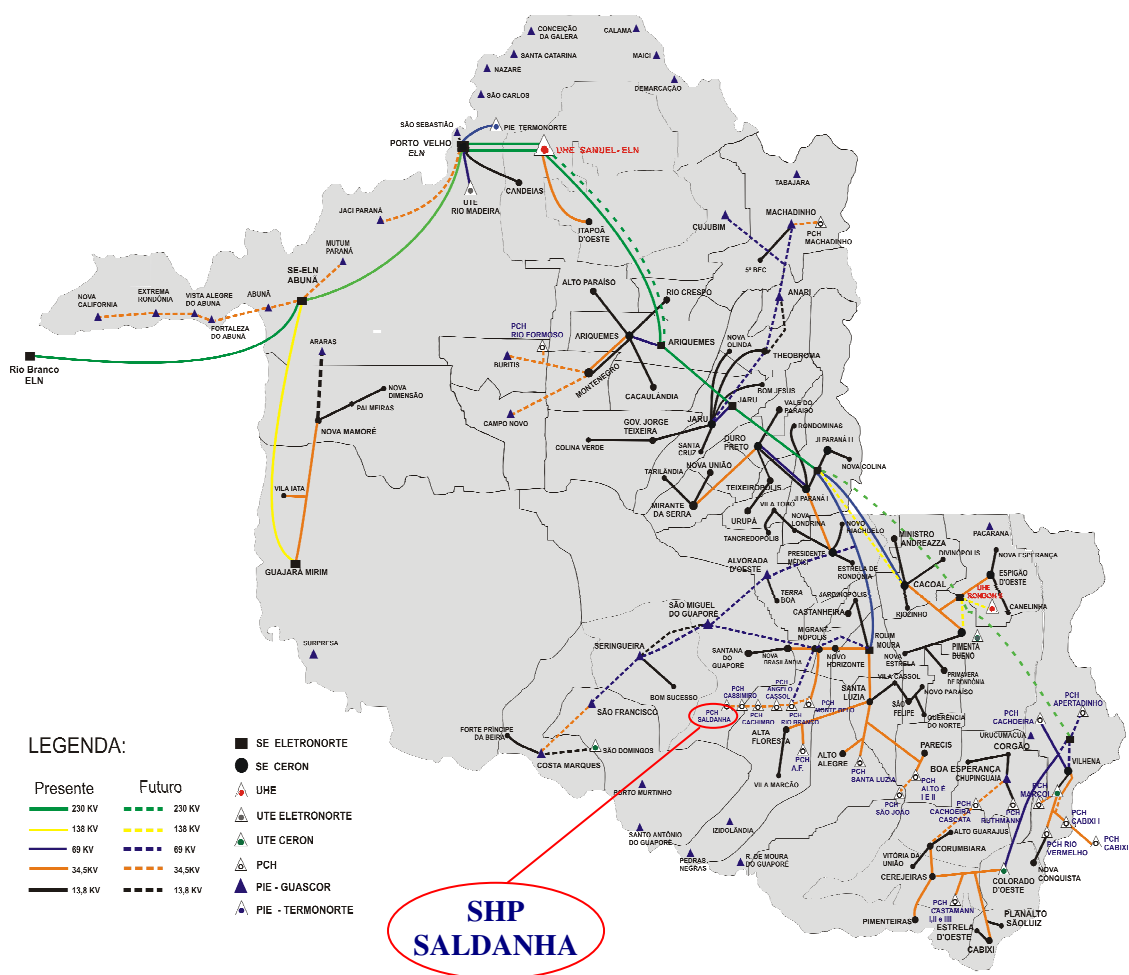


Figure 2. Isolated System in Rondônia State (Eletrobras)

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 10, December 23rd 2006.

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 ANALYSIS****CUSTOS DE IMPLANTAÇÃO DA PCH (R\$)**

Source: SHP Saldanha Feasibility Study

CIVIL CONSTRUCTION AND ENVIRONMENTAL COSTS	10.441.517,87
MACHINERY / EQUIPMENT / TRANSPORTATION COSTS	4.900.880,18
TRANSMISSION SYSTEM COSTS	6.440.909,56
ROLIM MOURA SUBSTATION	6.500.000,00
TOTAL	28.283.307,61

PROJECT FINANCIAL ANALYSIS

SMALL HYDRO (Saldanha)	Value	unit	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
INCOME													
I) Electricity Generation													
Installed Capacity	4.8	MW											
Capacity factor	71%												
Net Energy	29.691	MWh/year											
Electricity Price	108,00	R\$/MWh		108,00	108,00	108,00	108,00	108,00	108,00	108,00	108,00	108,00	108,00
Electricity Revenues		R\$		3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90
II) Sub Rogation CCC													
CCC sub rogation	R\$ 13.791.010,50	R\$											
%	49%												
nº of installments (Months)	16												
SubRogation CCC Revenues				10.343.257,88	3.447.752,63	-	-	-	-	-	-	-	-
TOTAL REVENUES		R\$		13.549.877,78	6.654.372,53	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90
COSTS & INVESTMENT													
I) Investment		R\$											
CCC sub rogation	R\$ 13.791.010,50	R\$											
%	49%												
Total cost	R\$ 28.283.307,61												
TOTAL INVESTMENTS				(28.283.307,61)									
II) O&M													
Operating and Maintenance Costs	28	R\$/MWH		(27,99)	(27,99)	(27,99)	(27,99)	(27,99)	(27,99)	(27,99)	(27,99)	(27,99)	(27,99)
Total Operational Costs		R\$		(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)
TOTAL COSTS AND INVESTMENTS				(28.283.307,61)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)	(831.043,15)
Small Hydro Cash Flow				(28.283.307,61)	12.718.834,62	5.823.329,37	2.375.576,75	2.375.576,75	2.375.576,75	2.375.576,75	2.375.576,75	2.375.576,75	2.375.576,75

THERMO PLANT	Value	unit	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
INCOME													
I) Electricity Generation													
Installed Capacity	4.8	MW											
Net Energy	29691	MWh/year		29691	29691	29691	29691	29691	29691	29691	29691	29691	29691
Electricity tariff PPA	108.00	R\$/MWh		108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00
Electricity Revenues		R\$		3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90	3.206.619,90
II) CCC revenues													
Fuel costs			-	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46
CCC quota	100%												
CCC Revenue			-	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46
TOTAL REVENUES		R\$		27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36	27.648.189,36
COSTS & INVESTMENT													
I) Investment			R\$										
Installation Cost	600.000,00	R\$/MW											
Investment Cost	42,00	R\$/MWh											
TOTAL INVESTMENTS	4.127.018,85		4.127.018,85										
II) O&M													
Operating and Maintenance Costs	28	R\$/MWh		831.345,90	831.345,90	831.345,90	831.345,90	831.345,90	831.345,90	831.345,90	831.345,90	831.345,90	831.345,90
Fuel consumption	392,00	L/MWh		11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60	11.638.842,60
Fuel prices	2,10	R\$/L											
Fuel costs				24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46	24.441.569,46
Total Operational Costs		R\$		25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36	25.272.915,36
TOTAL COSTS AND INVESTMENTS			(4.127.018,85)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)	(25.272.915,36)
Thermal plant Cash Flow			(4.127.018,85)	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00	2.375.274,00

Colour indication of data sources

SHP Saldanha PPA contract

SHP Saldanha Feasibility Study

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