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

CONTENTS

Annexes

SECTION A. General description of small-scale project activity

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

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Project title: Estelar CDM Project.

PDD Version number: 5.

Date: July 27th, 2009.

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

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The Estelar CDM Project (hereafter referred to as “Estelar Project”) consists on the supply of clean hydroelectric electricity to the Brazilian National Interconnected System (SIN) through the implantation and operation of Small Hydropower Plants (SHPs) Bandeirante, Barra Escondida, Belmonte and Prata, located in the state of Santa Catarina, Southern Region of Brazil, with an installed capacity of 11.85 MW, using a small reservoir, with low environmental impact.

The main objective of the SHPs Bandeirante, Barra Escondida, Belmonte and Prata is to help attending the growing demand for energy in Brazil, due to the country’s economical and population growth, supplying clean and renewable energy, contributing, thus, to the environmental, social and economical sustainability, by increasing the participation of clean and renewable energy in relation to the country’s total consumption of electricity.

The project activity reduces the emissions of green house gases (GHG), avoiding the generation of electricity through sources of fossil fuels with consequent CO_2 emissions, which would be produced if the project did not exist. The supply of clean and renewable electricity will bring an important contribution to environmental sustainability, reducing the emissions of carbon dioxide taking place in the absence of this project.

Energética Saudades S.A is a special purpose company established in 2007 as an independent producer of electric energy with the objective of exploiting the hydraulic potential of Rio Saudades, in the state of Santa Catarina.

Companhia Energética Rio das Flores is also a special purpose company created to act in the area of electricity generation industry through the construction and implantation of SHPs Prata, Bandeirante and Belmonte. Its headquarters are located in the city of Florianópolis, in Santa Catarina.

SHPs Bandeirante, Barra Escondida, Belmonte and Prata, contribute to the sustainable development of the country once contributing to the economic growth without compromising the future generations, respecting the concept of Sustainable Development, established by Brundtland Report, elaborated by the World Commission on Environment and Development, which defines the term “sustainable development" as "the development that satisfies the present necessities, without compromising the capacity of future generations of supplying their own necessities"[1].

The sustainable development is obtained through the following actions:

(a) Through SHPs Bandeirante, Barra Escondida, Belmonte and Prata, clean and renewable energy will be dispatched to the Brazilian National Interconnected System, displacing possible entrepreneurships that would generate energy through the burning of fossil fuels, avoiding, thus, the emission of pollutant gases to the atmosphere and preserving the environment to future generations.

(b) The construction of small hydroelectric power plants similar to SHP Bandeirante, Barra Escondida, Belmonte and Prata, boosts the local economy, once it provides a technological chain that influences the social-economical activities of the region where the project is located. The operation and the maintenance of the Project require the support of the region's service providers, working in the most diverse areas such as: engineers, professionals related to the environment, professionals in the area of health, administrative and juridical area, mechanics, vise operators, technicians, etc. It is fomented, therefore, the economy related to the third sector, contributing once more to the generation of jobs, collection of taxes and economic growth of the region.

(c) The SHPs Bandeirante, Barra Escondida, Belmonte and Prata electricity generation, provides the basic conditions for the installation of new businesses and entrepreneurships in the region that will make possible the generation of new jobs and revenue for the municipalities involved, besides providing a greater trust in the electrical system of Santa Catarina and, consequently, being less dependent on the electric generation of other states in the country.

(d) Besides SHPs Bandeirante, Barra Escondida, Belmonte and Prata present low environmental impacts, with the formation of a small reservoir and elevated power density, the companies involved in the projects will make considerable investments in environmental programs and actions. It will be developed environmental programs on the physical, biotic and anthropic environment to mitigate possible project's environmental impacts. It can be highlighted the program of environmental education that will contribute to the awareness of the population in the municipalities involved in the entrepreneurships about environmental and ecological issues.

(e) The implantation of the entrepreneurship presupposes the acquisition of high-technology equipment, which will be acquired through the manufacturers settled in the national territory. The use of this equipment demands training and capacity for the local workers, coming from the manufacturers themselves. With this, the companies obtain more experience and the technology becomes more widely divulged and consolidated in the region and in the country as a whole.

[1] WCED [CMMAD], 1987. Our Commom Future [Nosso Futuro Comum]. The World Commission on Environment and Development [Comissão Mundial sobre Meio Ambiente e Desenvolvimento]. Oxford University Press.

A.3. Project participants:

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Energética Saudades S.A. is the owner of Small Hydropower Plant Barra Escondida and it is responsible for all activities related to the implementation and operation of the plants.

Compania Energética Rio das Flores is the owner of Small Hydropower Plants Bandeirante, Belmonte and Prata and it is responsible for all activities related to the implementation and operation of these plants.

Energética Saudades S.A. and Companhia Energética Rio das Flores have as common shareholders QBEC Projetos e Consultoria Ltda. and DW Engenheiros Associados Ltda.

Enerbio Consultoria Ltda advises Energética Saudade S.A. and Companhia Energética Rio das Flores to develop CDM Project and to monitor the CERs to be generated from the Estelar Project.

The table below present private and public parties and entities involved in the activity.

Table 1 – Private and public parties and entities involved in the activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Private Entity: Energética Saudades S/A.	No
	Private Entity: Companhia Energética Rio das Flores	
	Private Entity: Enerbio Consultoria Ltda	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Detailed information for contact with the party (ies) and with the public/private entities involved in the project activity are related in Annex 1.

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

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

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A.4.1.1. Host Party(ies):

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Brazil.

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

Region: South of Brazil.

State: Santa Catarina.

A.4.1.3. City/Town/Community etc:

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SHP Barra Escondida - Municipality of Saudades.

SHPs Bandeirante e Prata - Municipality of Bandeirante.

SHP Belmonte – Municipality of Belmonte.

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

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The implantation of the SHPs Bandeirante, Barra Escondida, Belmonte and Prata, is located in the state of Santa Catarina, south region of Brazil.

SHP Barra Escondida will be implanted in the municipality of Saudades, in the Basin of Uruguai River, sub-basin 73, in Saudades River. The coordinates of the entrepreneurship are Latitude 26º54'14" South and Longitude 53º01'47" West.

SHP Belmonte will be constructed in Flores River, municipality of Belmonte, located in the coordinates 26º50'00" South and 53º40'00" West.

SHPs Bandeirante and Prata will also be constructed in Flores River, in the municipality of Bandeirante. SHP Bandeirante is located in the coordinates 26º47'58" South and 53º40'00" West, and SHP Prata, in the coordinates 26º45'45" South and 53º39'56" West.

The access to the power plants of these SHPs will be done according to the description below:

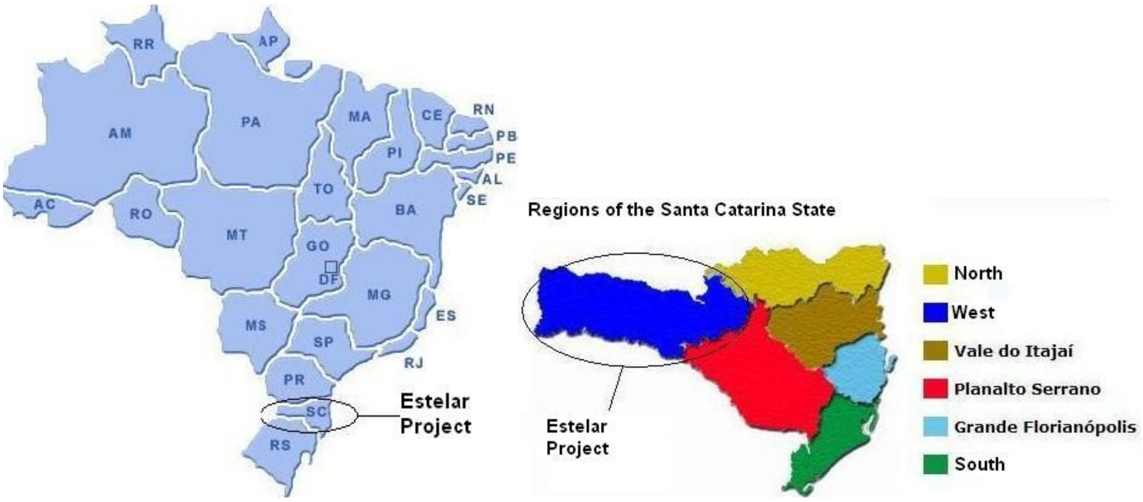
- SHP Prata – the access to the region of this SHP is done through the city of São Miguel do Oeste, advancing 16km of paved road to the municipality of Bandeirantes, following westwards the secondary access to the community of Prata.

- SHP Belmonte – the access to the region is done through the municipality of São Miguel do Oeste, advancing 13 km of paved road to the municipality of Descanso, going westwards to Belmonte. From Belmonte, through a vicinal unpaved road in an interval of 9.5 km, we arrive at the site of the entrepreneuship, 2.76 km from Rio das Flores river's mouth.

- SHP Bandeirante – the access is also through São Miguel do Oeste, advancing 16 km of paved road towards the municipality of Bandeirante. From there, going south, in an interval of 3.2 km through a vicinal road, we arrive at the local of the entrepreneurship.

- SHP Barra Escondida – the access to the municipality of Saudades can be done through the motorway SC-469, 11 km from BR-282, in the West area of the state, entering the municipality of Pinhalzinho. From Saudades, the access to the PC is done through an unpaved road.

Map 1 – Localization of Estelar Project:



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

Estelar Project fits the category I.D., used for projects which use renewable energy technologies to supply electricity to a grid.

SHPs Bandeirante, Belmonte and Prata, and the SHP Barra Escondida, will use the hydraulic potential of Flores River and Saudades river, respectively, to generate electricity with an installed capacity of 11.85 MW. SHPs of Estelar Projects are run-of-river hydroelectric power plant with small reservoirs.

The table below presents the main technical parameters of SHPs Bandeirante of the project:

Table 2: Technical Characteristics of SHPs Bandeirante, Barra Escondida, Belmonte and Prata.

Technical Characteristics	SHP Bandeirante	SHP Barra Escondida	SHP Belmonte	SHP Prata
Installed Capacity (MW)	3.0	2.25	3.6	3.0
Reservoir Area (km^2)	0.183	0.0551	0.420	0.155
Assured Energy (MW)	1.76	1.25	2.02	1.68
Turbines				
Quantity	2	2	2	2
Type	Francis	Francis	Kaplan Tubular	Francis
Nominal Capacity (kW)	1.563	1.125	1.865	1.563
Maximum Perfomance	92%	93,5%	92%	92%
Generators				
Unit Nominal Capacity (kVA)	1.66	1.25	1.66	1.66
Power Factor	0.9	0.9	0.9	0.9
Dam				
Type	Concrete	Gravity Concrete and compact ground	Concrete	Concrete
Maximum Height (meters)	10	7	16	10
Power House				
Type	Sheltered	Sheltered	Sheltered	Sheltered

The equipments and technologies to be employed in the project will be developed in Brazil and have already been successfully applied to similar projects in the country and in the world. The technology applied is well established in the sector, since Francis and Kaplan turbines are the most widely used in hydropower plants projects in the world. The entrepreneurships' implantation will also be responsibility of national companies, providing, therefore, development and employment of national workforce.

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

Using the monthly baseline emission factor calculated as presented on the item B.6 and Annex 3 of this PDD, the complete implementation of the Estelar Project, connected to the Brazilian Interconnected System, will generate a total reduction of **69.939 tCO_2e** during the first 7-year-period, described in the table below:

Table 3: Estimation of emissions reduction of the Estelar Project

Year	Annual estimation of emission reductions (tCO_2e)e
***2010**	4,353
2011	10,411
2012	10,679
2013	10,679
2014	10,679
2015	10,679
2016	10,679
2017	1,780
Total Estimated Reductions (tCO_2e)	**69,939**
Total Number of Crediting Years	**7**
Annual average over the crediting period of estimated reductions (tCO2e)	**9,991**

- *Prevision for Starting date of the crediting period: March/2010.
- Prevision for starting date of operation: Barra Escondida – December/2008; SHP Prata – March/2010; SHP Bandeirante – November/2010 and SHP Belmonte – February/2011;.
- The estimation of the project emission reduction of the project is based on the Assured energy of SHPs, in accordance with table 2 of item A.4.2.

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

No public funding for the CDM's project activities was solicited by parties involved in Annex I.

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

According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, a small scale project is considered part of a large project if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

In relation to the Estelar Project, there is no other small scale project activity which fits the criteria mentioned above; therefore, the proposed project activity is not a debundled component of a large project activity.

For more information: http://cdm.unfccc.int/EB/036/eb36_repan27.pdf

SECTION B. Application of a baseline and monitoring methodology

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

- Version 13 of Category I.D – "Grid connected renewable electricity generation".
- Version 1.01 of the "Tool to calculate the emission factor for an electricity system".

For more information: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

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

The category I-D applies to the project activities of renewable energy generation connected to the grid. Therefore, Estelar Project can be classified in the I.D. category, because it presents the following characteristics:

- The project activity consists on the supply of clean hydroelectric electricity to the Brazilian National Interconnected System through the implantation and operation of the Small Hydroelectric Power Plants (SHPs) Bandeirante, Barra Escondida, Belmonte and Prata, displacing, this way, electricity generated from fossil fuels that would occur in the absence of the project.

- The project activity has a total installed capacity of 11.85MW, not exceeding 15MW of maximum capacity, limit stipulated for the classification of a project as a small scale one.

B.3. Description of the project boundary:

According to the methodology I.D, the boundary of a renewable energy generation connected to the grid project encompasses the physical and geographical site of the renewable generation source. Thus, the Estelar Project Boundary is restricted to the physical-geographical area of localization of the SHPs.

Once the SHPs will be connected to the National Interconnected System (SIN), a brief description of SIN may be carried out for illustrative effects. The National Interconnected System (from the Portuguese: Sistema Interligado Nacional - SIN) is managed by ONS (Operator of the Electric National System), which is responsible for all activities related to the operation's planning. The ONS traditionally subdivides the National Interconnected System into four subsystems interconnected: the South Subsystem, the Southeast/Midwest Subsystem, the North Subsystem and the Northeast Subsystem. These Subsystems are related to the Brazilian geographic regions: South Region, the Southeast/Midwest Regions, the North Region and the Northeast Region.

Due to the offer's real availability and the consumption behavior in each region, ONS establishes inter-regional energy exchange politics, besides exceptional attitudes to thermal generation dispatch, in case the storage levels of water significantly reduce and tend to violate the security curves. These conditions are permanently monitored and available to the electric industry agents.

In May 2008, through the resolution nº 8, Brazilian DNA defined that the National Interconnected System should be considered a unique electricity system and that this configuration is valid for calculating the emission factors of CO_2 used to estimate the emissions reductions of greenhouse gases of energy generation connected to the national interconnected grid CDM projects.

B.4. **Description of baseline and its development:**

Baseline

The baseline of the project component related to the generation of renewable energy connected to the grid is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner according to a combined margin (CM), resulted of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system".

The baseline emission (BEy) resulted from the electricity supplied and/or not consumed by the grid is calculated, as follows:

BEy = EGy* EFgrid,CM,y **Equation 1**

Where:

BEy = Baseline Emission in year y (t CO_2e/year)
EGy = Electricity supplied by the project activity to the grid (MWh)
EFgrid,CM,y = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

The baseline emission factor (EFgrid,CM,y) is calculated with an weighted average of operating margin emission factor and build margin emission factor, as described below:

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

Equation 2

Where:
EFgrid, BM,y = Build margin CO_2 emission factor in year *y* (tCO_2e/ MWh)
EFgrid, OM,y = Operating Margin CO_2 emission in year *y* (tCO_2e/ MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

Calculation of EFgrid, OM,y and EFgrid, BM,y

According to the "Tool to calculate the emission factor for an electricity system", in case the DNA (Designated National Authority) of the project' host country has published a delineation about the project's electricity systems and about the connected electricity system, these delineations must be used.

This way, in May, 2008, the Brazilian DNA defined that the National Interconnected System must be considered as a Unique Electricity System and that this configuration will be valid for calculating the emission factors of CO_2 used to estimate the emission reductions of the greenhouse gases from CDM projects of electricity generation energy connected to the national interconnected grid.

From this moment, the Brazilian Designated National Authority started to publish the operating margin emission factors through the method of dispatch data analysis and the build margin emission factors for the Brazilian Electrical System, following the methodological tool to calculate the emission factor for an electricity system, approved by the Executive Board of CDM and published in annex 12 of CE's Report 35.

The CO_2 emission factors from electricity generation verified in the Brazilian National Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by ONS. The procedures for calculation were elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

As for the calculation of operating margin emission factor through the dispatch data analysis, the Brazilian Designated National Authority uses the generation dispatch data centrally dispatched by ONS, this data must be updated annually during the monitoring.

For the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated *ex-ante*. For the third crediting period, the built margin emission factor calculated for the second crediting period should be used.

The build margin emission factor for the year 2007 was used for an ex-ante estimation of CERs generation, since they are the latest data available.

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:

As the start date of the project activity is before 2th August 2008 and the start date is prior to the date of of the publication of the PDD for Global Stakeholder consultation, Project Participants should prove that the CDM was seriously considered in the decision to proceed with the project activity.

It is described below the evidences of the project participants awareness of the CDM prior to the project activity start date and the actions that were taken to secure the CDM Status.

- The Board of Directors Meeting Minute of 1th December 2007 (item 18) shows that the CDM was seriously considered. This minute establishes that the company must hire a consulting company to develop the Carbon Credit Project to make possible future revenues to adequate the project economic situation with market rates of return and make the projects feasible;
- From this date, the entrepreneurs started to look for project developers in the Brazilian Market through emails and phone calls. One of the companies consulted was Enerbio Consultoria;
- In the Board of Directors Meeting Minute of 06th May 2008 (item 7), it was established the necessity of evaluation of the proposals for carbon credit project development;

- In 25th June 2008, Enerbio Consultoria sent the proposals to the entrepreneurs;
- In 26th June 2008, Enerbio Consultoria sent an email to the entrepreneurs requiring information to develop the PDD;
- In 1th July 2008, Enerbio Consultoria and Entrepreneurs (Energética Saudades e Energética Rio das Flores) assigned a contract which establishes that Enerbio Consultoria has the responsibility to develop the CDM Project and to negotiate the CERs. A copy of some pages of this contract where the object and the assignment date can be seen was provided to DOE;
- In 24th July 2008, Enerbio Consultoria sent an email requiring DOE proposals to validate the CDM Project;
- In 15th August 2008, project participants accepted the proposal of Bureau Veritas Certification Holding SAS to perform the validation process..

All Minutes and E-mails mentioned were supplied to the DOE.

The Annex A of attachment B of Simplified modalities and procedures for small-scale CDM project activities establishes that the project participants shall provide an explanation to show that the Project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the Project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the Project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the Project activity and so would have led to higher emission;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the Project activity, for another specific reason identified by the Project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new Technologies, emissions would have been higher.

Before analyzing the barriers faced by Estelar Project, it is necessary to describe the alternative scenarios that would probable take place in the absence of the project activity.

The realistic alternatives to the project activity are:

- The continuity of the current situation, with electricity being generated by the current composition of generation of the National Interconnected System, more specifically Subsystem South;
- The construction of new thermal power plant;
- The implementation of project without incentives from CDM.

In order to provide an ample view on the alternative scenarios, it is valid to sketch a panorama of the current Brazilian electrical sector and its projection for the future.

According to Aneel[2], the installed capacity existent in Brazil in July 2008 was as presented in the table below:

[2] *Source: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp (30/07/2008).*

Table 4: Generation Capacity in Brazil – Entrepreneurships in Operation

Entrepreneurships in Operation		
Type	**Power (kW)**	**%**
CHG	115,302	0.11
EOL	247,050	0.24
SHP	**2,098,933**	**2.08**
SOL	20	0
HPP	75,066,931	74.04
UTE	21,837,506	21.54
UTN	2,007,000	1.98
Total	**101,382,742**	**100**

Caption for table 4:

- *CHG: Hydro Power Plant Central Generation (Installed capacity minor than 1 MW)*
- *EOL: Wind Power Plant*
- *SHP: Small Hydro Power Plant (Installed capacity greater than 1 MW and less than 30 MW)*
- *HPP: Hydro Power Plant (Installed capacity greater than 30 MW)*
- *UTE: Thermal Power Plant*
- *UTN: Nuclear Thermal Plant*
- *SOL: Solar Power Plant*

Through the analysis of table 4, it can be noticed that only 2.08% of the country's installed capacity are generated through small hydroelectric power plants and that the main types of entrepreneurships responsible for the greatest parcel of contribution to the country's installed capacity are: large scale hydroelectric power plants (74.04%) and the thermoelectric power plants (21.54%).

The greatest part of hydroelectric power plants (HPPs) was implanted through investments from the State, when the electric sector was still centrally regulated. They present the characteristic of using great reservoir areas with high socio-environmental impacts, once the Brazilian legislation was still soft in the past concerning the implantation of entrepreneurships for energy generation.

In the case of thermoelectric energy generation, according to table 5[3], it can be noticed that 75.7% of the fuels used in Brazil are from fossil sources, which emits a higher quantity of Greenhouse gases

Table 5: Sources of Energy Explored in Brazil

Class of FuelsTypes Used in Brazil – Entrepreneurships in Operation			
Fuel	**Quantity**	**Power (kW)**	**%**
Biomass	296	4,380,597	20.11
Fossil	698	16,525,582	75.77
Others	22	899,328	4.12
Total	1016	21,837,507	100

[3] *Source: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/Combustivel.asp (30/07/2008)*

Table 4 and table 5 present current data of national matrix. In 2006, the Ministry of Mines and Energy elaborated the Decennial Plan for Electric Energy Expansion to the period of 2006-2015, establishing three possible scenarios, based on the growth projection of the Gross Domestic Product (GDP) of the country. We adopted this analysis the scenario pointed out by the MME as the most likely to happen, called reference scenario. This reference scenario adopts the premises to estimate the necessity of expansion of the Brazilian electrical sector.

It is important to highlight that from the additional offer of 10,486 MW coming from thermoelectric Plants, the projection indicates that 1,769 MW will be generated from the entrepreneurships that will dispatch energy to SIN through the South Subsystem. The thermoelectric plants projected to start their operation through the South Subsystem in the period of 2006-2015 are described below:

Table 6: Thermoelectric Power Plants to be connected to the Brazilian South Subsystem predicted in the Decennial Plan for the Expansion of the Electrical Sector.

Power Plant	Capacity (MW)	Fuel	Start of Operation
Canoas	250	Natural Gas	January/08
Araucária	469	Natural Gas	December/08
Jacuí	350	Mineral Coal	December/08
Candiota III	350	Mineral Coal	December/09
Carvão Indic. S	350	Mineral Coal	December/10
Total	**1,769**		

It is also important to highlight that there are currently 8 thermoelectric plants in Brazil, operating with mineral coal, totalizing an installed capacity of 1,455 MW, according to the table[4] below:

Table 7: Thermoelectric Power Plants in Operation in Brazil

Power Plant	Capacity (MW)	State
Figueira	20	Paraná
Charqueadas	72	Rio Grande do Sul
Pres. Médici A e B	446	Rio Grande do Sul
São Jerônimo	20	Rio Grande do Sul
Jorge Lacerda I e II	232	Santa Catarina
Jorge Lacerda III	262	Santa Catarina
Jorge Lacerda IV	363	Santa Catarina
Alunorte	40	Pará
Total	**1,455**	

In Brazil, 7 of the 8 thermo electric entrepreneurships that generate electricity by coal are located at the south region, where Estelar Project is located.

Traced a panorama of the current energetic matrix in Brazil and its perspective for the future, it can be established with more precision the barriers faced by the project.

[4] Source: Aneel - http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

Barriers

The first barrier faced by the project is the financial one. The implementation of the project activity without CDM is not financially feasible; once the weighted average cost of capital of the SHPs of the project is considerably above the Project's Internal Rate of Return (IRR) of the SHPs of the Project.

The cash flow of the SHPs of the Project and the main assumptions used in the financial projection are shown in annex 5 of this PDD.

The project's Internal Rate of Return of the Project's SHPs resulted from the cash flow presented in Annex 5 show the following values:

Table 8: Internal Rate of Return of the Project

SHP	Barra Escondida	Bandeirante	Belmonte	Prata
IRR of the Project	10.17%	8.56%	8.74%	8.10%

WACC (Weighted Average Capital Cost)

The Weighted Average Capital Cost is calculated through the composition of costs and the participation percentage of each source of capital in the capital structure of the company. The Weighted Average Capital Cost of Estelar Project was calculated according the equation below:

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

Equation 3

Where

E/V = Percentage of Equity in Capital Structure;
Re = Cost of Equity;
D/V = Percentage of Debt in Capital Structure;
Rd = Cost of Debt
Tc = Income Tax and Social Contribution in Brazil

To calculation of cost of equity was used the CAPM Model (Capital Assets Price Model), which indicates the following equation:

$Re = R_f + \beta_i (ERP)$ **Equation 4**

Where:

Re = Cost of Equity;
R_f = Rate of Return of a Risk Free Asset;
β_i = Beta Coefficient;
ERP = Equity Risk Premium;

Some theoreticians and specialized agencies, such as Institute Ibbottson recommend adding to the capital cost a prize for the size for small scale companies. Conservatively, this prize will not be added.

To calculation of the cost of debt was used the cost of lending estimated for entrepreneurship according to the current practice of BNDES loan for entrepreneurships of electricity generation in Brazil.

To calculate the weighted average capital cost was used the following assumptions:

<u>Cost of Equity</u>:

To calculate the cost of equity of each SHP , using the equation 3, the parameters adopted were the following:

- Re = Cost of Equity;
- R*f* = Rate of Return of U.S. Treasuries (T-Bond) between 1997 and 2007[5]+ Median of Brazilian Risk between 2003 and 2007[6] + Average of Adjustment between U.S[7] Inflation and Brazilian Inflation[8] in the period 2003 and 2007.
- β*i* = Project Beta. To calculate the Project Beta, it was used the following steps: 1º Step – It was obtained the Levered Beta between the Electric Energy Index (IEE)[9] and the Bovespa Index (Índice Ibovespa)[10] for the period 2003 to 2007; 2º Step – The Beta was Unlevered according the average capital structure of the companies that compose the IEE[11]; 3º Step – The Unlevered Beta was levered again according to the capital structure of the project. This Levered Beta was used for calculation of each SHP of Estelar Project cost of equity.
- ERP = Equity Risk Premium in Brazil, calculated by Aswath Damodaran[12] according to data of Standard & Poors.

The table below presents the values used on calculation of cost of equity.

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[5]Source: Based on Standard & Poors Data, available at "Historical Returns on Stocks, Bonds and Bills - United States" of the Section "Updated Data" of the website http://pages.stern.nyu.edu/~adamodar/

[6] Calculated Through the Average of the Index Índice EMBI + Brasil, available at: http://www.cbonds.info/index/search.php

[7] To measure the American Inflation the Index CPI – U. Available at: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

[8] To measure the Brazilian Inflation the Index IPCA was used. Available at: http://pt.wikipedia.org/wiki/Infla%C3%A7%C3%A3o#Hist.C3.B3rico_do_Quadro_Inflacion.C3.A1rio_no_Brasil

[9] The Electric Energy Index is composed by the stocks of the most representatives companies in the electric industry in the São Paulo Stock Exchange. Source of Data: São Paulo Stock Exchange. Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaAnuaisFechDia.asp?Indice=IEE

[10] Index calculated by São Paulo Stock Exchange which reflects the average perfomance of the prices in Brazilian Stock Market. The stocks members of the theoretical portfolio answer for more than 80% of the number of business and of the financial volume negotiated in the spot market of São Paulo Stock Exchange.. Source: Bloomberg

[11] The source of the data of the companies than compose the IEE and their capital structure was São Paulo Exchange (Bolsa de Valores de São Paulo). Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaCarteiraP.asp?Indice=IEE

[12] Available at http://pages.stern.nyu.edu/~adamodar/

Table 9: Values Used on Calculation of Cost of Equity

Parameters	SHP Barra Escondida	SHP Belmonte	SHP Bandeirante	SHP Prata
Equity	R$ 2,819,700	R$ 4,550,000	R$ 3,900,000	R$ 4,920,000
Debt	R$ 6,579,300	R$ 13,650,000	R$ 11,700,000	R$ 11,480,000
Taxes (Income Tax + Social Contribution)	34%	34%	34%	34%
Levered Beta	0.92	0.92	0.92	0.92
Unlevered Beta	0.62	0.62	0.62	0.62
Levered Beta - Capital Structure of the Project	1.56	1.83	1.83	1.56
Risk Free Tax (American T-Bond Average)	6.71%	6.71%	6.71%	6.71%
Brazilian Risk (Average of Country Risk) - (EMBI+BR)	3.14%	3.14%	3.14%	3.14%
Risk Premium	7.79%	7.79%	7.79%	5.54%
Inflation Adjustment	2.92%	2.92%	2.92%	2.92%
CAPM	**24.95%**	**27.06%**	**27.06%**	**24.95%**

Cost of Debt:

The cost of debt of Estelar Project is based on the cost of lending practiced for projects of Small Hydro Power Plants in Brazil through BNDES loan and repass through a local agent. The financing cost for loans from BNDES is usually indexed to the Long-Term Interest Rate (6.25% per year) + spread from BNDES + spread from the repassing bank. The entrepreneurs estimate a Total Spread of 4.0%, resulting in a total cost of 10.25% per year for the SHP Barra Escondida. For SHPs Bandeirante, Belmonte and Prata, project participants estimate a fall of 0.5% in the required spread by the financial agents that will result in a total cost of 9.75% of financing for these SHPs.

WACC (Weighted Average Capital Cost):

The table below presents the WACC for Estelar Project.

Table 10: Composition of Weighted Average Capital Cost of Estelar Project

Parameters	SHP Barra Escondidda	SHP Belmonte	SHP Bandeirante	SHP Prata
% of Equity	30%	25%	25%	30%
Cost of Equity	24.95%	27.06%	27.06%	24.95%
% of Debt	70%	75%	75%	70%
Cost of Debt	10.25%	9.75%	9.75%	9.75%
Income Tax + Social Contribution	34%	34%	34%	34%
WACC	**12.22%**	**11.59%**	**11.59%**	**11.99%**

This way, it is perceived that the Internal Rate of Return of Estelar Project is lower than WACC showing that the project is not financially attractive without the CDM incentives. Therefore, the revenues from selling Certified Emission Reduction are fundamental to the financial attractiveness of the project and for its development.

This way, a financially more viable alternative to the project activity which would be do not develop the project activity would have led to higher emissions through (i) the continuity of the current situation, with electricity being generated by the current composition of generation of the National Interconnected System, more specifically Subsystem South or (ii) the construction of new thermal power plant in the south region.

To confirm how solid the investment analysis is, project participants present below a sensitivity analysis which just the scenarios which contribute to increase the project financial and economic attractiveness, varying the most important parameters for the cash flow for each SHP: (i) the electricity price and (ii) the total amount of investment.

Table 11: Sensitivity Analysis of SHPs of Estelar Project

VARIATION ON ELECTRICITY PRICE								
Projected Situation	**MWh Price - SHP Barra Escondida (R$)**	**MWh Price - SHP Bandeirante (R$)**	**MWh Price - SHP Belmonte (R$)**	**MWh Price - SHP Prata (R$)**	**Project IRR SHP Barra Escondida**	**Project IRR SHP Bandeirante**	**Project IRR SHP Belmonte**	**Project IRR SHP Prata**
0%	**124.99**	**140.00**	**140.00**	**140.00**	**10.17%**	**8.56%**	**8.74%**	**8.10%**
5%	131.23	147.00	147.00	147.00	10.89%	9.25%	9.43%	8.76%
8%	134.98	151.20	151.2	151.2	11.32%	9.66%	9.84%	9.14%
10%	137.48	154.00	154.00	154.00	11.61%	9.93%	10.11%	9.4%

VARIATION ON TOTAL AMOUNT OF INVESTMENT								
Projected Situation	**Investment SHP Barra Escondida (R$ thousand)**	**Investment SHP Bandeirante (R$ thousand)**	**Investment SHP Belmonte (R$ thousand)**	**Investment SHP Prata (R$ thousand)**	**Project IRR SHP Barra Escondida**	**Project IRR SHP Bandeirante**	**Project IRR SHP Belmonte**	**Project IRR SHP Prata**
0%	**9,399**	**15,600**	**18,200**	**16,400**	**10.17%**	**8.56%**	**8.74%**	**8.10%**
-5%	8,929	14,820	17,290	15,580	10.86%	9.19%	9.37%	8.72%
-8%	8,647	14,352	16,744	15,088	11.30%	9.60%	9.78%	9.11%
-10%	8,459	14,040	16,380	14,760	11.61%	9.88%	10.07%	9.39%

The sensitivity analysis confirms that the SHPs of Estelar Project are not financially attractive once the project internal rates of return are lower than weighted average capital cost of them in all scenarios analyzed.

(C) *Barrier due to prevailing practice*

As seen in the description of the current Brazilian energetic matrix and its projection for the future established by the Brazilian Ministry of Mines and Energy, there is a clear predominance of big hydroelectric power plants and fossil fuels thermoelectric power plants in the national energetic matrix.

According to the Brazilian Atlas of Electric Energy[13], the hydroelectric generation in Brazil is essentially constituted of great entrepreneurships. According to this study, the 23 hydroelectric power plants in the country with generation capacity above 1,000 MW correspond to 71.4% of its installed capacity. Entrepreneurships of this scale present, for their capacity of generation and consequent capacity of revenue generation, a great economic viability.

Still according to ANEEL[14], in the study above mentioned, the utilization of hydraulic potentials in Brazil for the generation of electric energy has required the formation of great reservoirs and the inundation of great flooded areas. These constructions would use, in most cases, reservoirs of water accumulation in flows that would provoke alterations in the water regimens and the formation of microclimates, favoring, damaging or even extinguishing certain species.

It is also noticed that just one of the total of natural coal thermo electrical entrepreneurships in Brazil is located outside the Southern region of the country. Moreover, according to the Brazilian Atlas of Electric

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[13] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, page 32. (*Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica, Página 32. – Brasília: ANEEL, 2002.*)

[14] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, pages 45-46. (*Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica, Páginas 45-46. – Brasília: ANEEL, 2002.*)

Energy[15], more than 90% of the national mineral coal reserves of the country are concentrated in the Southern region where the SHPs of Estelar Project are located.

Another factor that must be highlighted is that, analyzing the history of the Brazilian electric sector, it is verified that the Brazilian legislation did not incorporate the environmental variables in the planning of the national electric sector. However, facing the undesirable social-environmental impacts resulting from the implantation of hydroelectric entrepreneurships, a series of legal demands that aim at avoiding and mitigating the environmental effects of this kind of project have become demands of the conceding power and of the legislative organs. With this, new investments, in the implantation of hydro electrical entrepreneurships in Brazil, are demanded from the investors.

The SHPs of Estelar Project are entrepreneurships with low installed capacity and low capacity of firm/assured energy generation, with no resemblance, therefore, to big national hydroelectric power plants, not having, thus, the great potential of income for this kind of entrepreneurship. Further, SHPs of Estelar Project are run-of-the-river power plants with low environmental impacts and that consider in its planning a series of investments in environmental programs and actions that did not exist in previous implantations of the greatest part of the hydroelectric power plants in the country's southern region.

This way, the implantation of this project does not rely on large incomes like the big hydroelectric entrepreneurships and has minimum environmental impacts that demand investment. For these characteristics, its cash flow presents return taxes below the referential ones in the market, and the revenue from the sales of emission reduction certificates becomes more important to make the project viable.

The fact that a project with this configuration, without additional income from the commercialization of certified emission reductions, are not attractive from the financial point of view and are not the common scenario in the country can be proved through the creation of the program PROINFA by the Federal Government through the Law 10,438, in April 26, 2002.

PROINFA is a governmental program that seeks to motivate, through the financial point of view, the development of entrepreneurships that make use of renewable technologies, due to the difficulties in financing, in offering guarantees to the finance suppliers and in the necessity of investments considered reasonable to small organizations. This way, the Federal Government tries to motivate projects through differentiated lines of finance, besides the guarantees of minimal revenues through the compromise of establishing Power Purchase Agreements (PPAs), to be firmed with a mixed economy society, Eletrobrás, which will secure to the entrepreneur a minimal revenue of 70% of the energy purchased during the financing period and complete protection to the risks of exposure in the short-term market. The contracts have duration of 20 years and involve selected projects that should start operating until December 2006. The projects of SHPs are one of the types eligible to participate in the PROINFA.

SHPs Bandeirante, Barra Escondida, Belmonte and Prata do not take part into PROINFA and consider the revenues from the commercialization of certified reductions of emission as an important factor to make the investment.

With that, the organization has to deal with the difficulties inherent to the small agents of the Brazilian electrical sector, as: (i) the little power of attraction to potential buyers in face of the small quantity of

[15] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, ANEEL, 2002

electric energy to be produced and commercialized; (ii) the excess of guarantees demanded by long-term financing banks that compromise the company's financial solvency; (iii) the bureaucracy inherent to the construction process of a small hydroelectric, from its beginning until their effective operation.

Moreover, the percentage of installed capacity in entrepreneurships similar to Estelar Project in the energetic matrix in Santa Catarina is very small, as suggests the table below:

Table 12: Generation Capacity in the Santa Catarina State[16]

Entrepreneurships in Operation		
Type	**Power (kW)**	**%**
CGH	22,393	0.40
EOL	14,400	0.26
SHP	191,973	3.45
HPP	4,329,352	77.74
UTE	1,011,136	18.16
Total	**5,569,254**	100

This way, through the information and data presented, it is perceived that the implantation of small hydroelectric power plants is not the predominant practice in the country, not being configured as the common scenario of the country's and the region's energetic matrix.

Do not implement Estelar Project would result on (i) the continuation of the present situation, with electricity being generated by the current composition of the National Interconnected System, more specifically the South Sub-system (with the great presence of thermo electric power plants) or (ii) the construction of new thermoelectric power plants. Thus, the implantation of SHPs of Estelar Project propitiates emissions reductions, which would occur in the absence of the project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the methodology I.D, version 13, if the energy generation equipment is transferred from another activity or if the equipment is transferred to another activity, leakage must be considered. In case of Estelar Project, new equipments will be used, manufactured for the activity, so, there will be no leakage

Therefore, Estelar Project emissions reductions correspond to the baseline emissions of the project.

Baseline emissions

BEy = EGy* EFgrid,CM,y **Equation 1**

Where:

BEy = Baseline Emission in year y (t CO_2e/year)

[16] Source: Aneel - http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

EGy = Electricity supplied by the project activity to the grid (MWh)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"

As mentioned previously, Estelar Project's SHPs are new energy plants to be connected to the grid, therefore no modification or retrofit of generators through the project activity will happen.

The EGy variable will be continuously monitored by the project participants and corresponds to its main product: the electricity generation. The Assured energy of each PCH was considered for the ex-ante estimate of the baseline emissions of the project.

To calculate $EF_{grid,CM,y}$, it will be used the data supplied by the Brazilian DNA which makes available the data of Dispatch data analysis operating margin emission factor and the build margin emission factor through using the tool to calculate the emission factor for an electricity system (version 01.1) which suggests the following steps:

***Step 1**. Identify the relevant electric power system*

According to the "Tool to calculate the emission factor for an electricity system", if the DNA of the Host Country has published a delineation of the project electricity system and connected electricity system, these delineations should be used.

This way, the Brazilian DNA defined that the National Interconnected System must be considered as a unique System and that this configuration will be valid for calculating the emission factor of CO_2 used to calculate the emission reduction of greenhouse gases in CDM Projects of electricity generation connected to the grid. This definition will be applied to the Estelar Project.

***Step 2**. Select an operating margin (OM) method*

The operating margin aims to assess the contribution of the power plants that would be dispatched in the absence of the project activity's generation. The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or
(b) Simple Adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

The method chosen to calculate the emission factor of SHPs Bandeirante, Barra Escondida, Belmonte and Prata Project was the operation margin by dispatch data analysis. This method was chosen because it is, according to Brazilian DNA, the most accurate and the most recommended if information is available.

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

The calculation of the operation margin emission factor follows the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) and it is calculated and defined by the Brazilian Designated National Authority in accordance with the dispatch data of the ONS - National System Operator.

The CO_2 emission factors resulting from the power generation in the Brazilian National Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by ONS. The procedures for calculation were elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

Following that procedures, from July of 2008, the operating margin emission factor started to be calculated for the National Interconnected System, , considering the System as unique, and it became available to be consulted by the interested public and investors.

The dispatch data OM emission factor are defined as the weighted average of the emission factors of the set of power plants in the top 10% of the grid system dispatch order and is calculated for each hour.

The emission factor for each plant in the system is calculated annually based on values for generation and fuel consumption of the plant in the previous year. For the new thermal plants that come into operation each year, the value for a similar plant in the previous year must be adopted.

Until the preparation of this PDD, it is available information about dispatch data OM emission factor, related to the year of 2007 and related to the period from January 2008 to May 2008.

The dispatch data OM emission factor for period from the year 2007 will be used for an ex-ante estimation of CERs generation, because they are the latest data available. All data used to calculate the ex-ante operating margin emission factor are available in the Annex 3 of this PDD.

***Step 4**. Identify the cohort of power units to be included in the building margin*

The sample group of power units ***m*** used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid.

Power plants registered as CDM project activities should be excluded from the sample group ***m***. However, if group of power units, not registered as CDM project activities, identified for estimating the build margin emission factor includes power unit(s) that is(are) built more than 10 years ago then:

(i) Exclude power unit(s) that is(are) built more than 10 years ago from the group;
(ii) To include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.

Capacity additions from retrofits of power plants should not be included on the calculation of the build margin emission factor.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated *ex-ante*, as described in option 1 above. For the third crediting period, the built margin emission factor calculated for the second crediting period should be used.

The option that was chosen by project participants was Option 2.

Step 5*. Calculate the build margin emission factor*

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available.

The CO_2 emission factors resulted from the electricity generation in the National Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by ONS. The procedure for calculation was elaborated in cooperation between ONS, MME and MCT and follows "Tool to calculate the emission factor for an electricity system"

Following that procedures, from July of 2008, the build margin emission factor started to be calculated for the National Interconnected System, considering the System as unique, and it became available to be consulted by the interested public and investors.

The build margin emission factor for the year 2007 was used for an ex-ante estimation of CERs generation, since they are the latest data available. The data used to calculate the ex-ante build margin emission factor are available in the Annex 3 of this PDD.

Step6*. Calculate the combined margin emission factor*

The combined margin emission factor is calculated as follows:

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

Equation 2

Where:
$EF_{grid,\ BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2e/ MWh)
$EF_{grid,\ OM,y}$ = Operating Margin CO_2 emission in year *y* (tCO_2e/ MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

As previously mentioned, the following weighting were adopted to the Estelar Project: W_{OM} = 0.50 and W_{BM} = 0.50.

Project Emissions Reductions

In summary, the emission reduction of the project will be calculated based on the equation 1 of this PDD, where the quantity of electricity supplied to the grid by the project will be multiplied by the combined margin emission factor, being the operating margin emission factor being calculated according to dispatch data analysis OM and the build margin emission factor will be calculated through the option 2 which considers that this emission factor must be updated ex-post. Besides it will be considered 50% for the weights that forms the Combined Margin Emission Factor.

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

Data / Parameter:	**Installed Capacity**
Data unit:	MWh
Description:	Electricity Generation Capacity by project activity connected to grid.
Source of data used:	Engineering Basic Project
Value applied	It was used the value of the installed capacity according to the Engineering Basic Projects of the SHPs Bandeirante, Barra Escondida, Belmonte e Prata, with the values of 3.0 MW; 2.25 MW; 3.6 MW e 3.0 MW, respectively.
Justification of the choice of data or description of measurement methods and procedures actually applied	As the SHPs of the project are all new plants, the reference data used to calculate the generation is the installed capacity pointed in the Engineering Basic Project, approved by ANEEL.
Procedimentos GQ/CQ aplicados:	The uncertainty level of these data is low. They will be indirectly used to calculate the emission reduction, once the SHP assured energy is based on the installed capacity of each entrepreneurship.
Comments:	

Data / Parameter:	**Assured Energy**
Data unit:	MWh
Description:	Assured Energy
Source of data used:	An estimate was made based on the installed capacity presented in the Engineering Basic Project.
Value applied	The Assured energy was estimated according to the installed capacity, as described on the Engineering Basic Projects of the SHPs Bandeirante, Barra Escondida, Belmonte e Prata, at a value of 1.76 MW, 1.25 MW, 2.02 MW e 1.68 MW, respectively.
Justification of the choice of data or description of	As the SHPs of the project are all new plants, the reference data used to calculate the generation is the installed capacity pointed in the Engineering Basic Project, approved by ANEEL.

measurement methods and procedures actually applied	
Procedimentos GQ/CQ aplicados:	
Comments:	

B.6.3 Ex-ante calculation of emission reductions:

It follows below the description about emissions reduction provided by Estelar Project.

<u>BEy Calculation</u>

For BEy Calculation it was applied the equation as follows:

$$BEy = EGy * EF_{grid,CM,y}$$ **Equation 1**

Tables below shows step by step the components of equation applied for BEy Calculation.

<u>EGy Calculation</u>

Table 13: EGy Calculation

Period	SHP Bandeirante	SHP Barra Escondida	SHP Belmonte	SHP Prata	Total
	EGy	EGy	EGy	EGy	EGy
2010*	2.534	9.000	-	12.096	23.630
2011	15.206	10.800	15.998	14.515	56.520
2012	15.206	10.800	17.453	14.515	57.974
2013	15.206	10.800	17.453	14.515	57.974
2014	15.206	10.800	17.453	14.515	57.974
2015	15.206	10.800	17.453	14.515	57.974
2016	15.206	10.800	17.453	14.515	57.974
2017	2.534	1.800	2.909	2.419	9.662
Total	96.307	75.600	106.171	101.606	379.685

Assumptions:

- EGy projection was made assuming power plant operation during 24 hours per day, 30 days per month and 12 months per year;
- *Beginning of crediting period: March of 2010
- *Prevision of Beginning Operation: SHP Barra Escondida – December of 2008; SHP Prata – March of 2010; SHP Bandeirante – November of 2010 and SHP Belmonte – February of 2011
- The generation of electricity of Estelar Project is projected according to the Assured energy of SHPs Bandeirante, Barra Escondida, Belmonte e Prata, according to table 2 of this PDD.

Table 14: EFgrid,CM, 2007 Calculation

Emission Factor	January-07	February-07	March-07	April-07	May-07	June-07	July-07	August-07	September-07	October-07	November-07	December-07
$EF_{grid,OM'}$	0.2291	0.1954	0.1947	0.1965	0.1605	0.2559	0.3095	0.3240	0.3550	0.3774	0.4058	0.4864
$EF_{grid,BM'}$	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775	0.0775
W_{OM}	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
W_{BM}	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
$EF_{grid,CM'}$	0.1533	0.1365	0.1361	0.137	0.119	0.1667	0.1935	0.2008	0.2163	0.2275	0.2417	0.2820

The emission factor which will be used for ex-ante estimation of emission reduction of Estelar Project is 0.1842 which was obtained from simple arithmetic average of National Interconnected System monthly EFgrid,CM,2007.

Observations:

- The most recent information available by Brazilian Designated National Authority for complete years refers to the year 2007;
- The daily data for Operating Margin Emission Factor is available on Annex 3;
- The hourly data for Operating Margin Emission Factor are available on the links: http://www.mct.gov.br/index.php/content/view/74691.html;

As described on item B.6.1, there is no leakage for Estelar Project and, therefore, PEy is 0 (zero).

With that, the ex-ante estimation of certified emission reduction can be view through the table below:

Table 15: Ex-ante estimation of Emissions Reduction (tCO_2 e) of Estelar Project

Year	Estimation of overall emission reductions (tonnes of CO2 e)
2010	4.353
2011	10.411
2012	10.679
2013	10.679
2014	10.679
2015	10.679
2016	10.679
2017	1.780
Total (tCO2 e)	69.939

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

Table 16: Summary of the ex-ante estimation of emission reduction

Year	Estimation of project activity emissions (tonnes of CO2 e)	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of Leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
2010	-	4.353	0	4.353
2011	-	10.411	0	10.411
2012	-	10.679	0	10.679
2013	-	10.679	0	10.679
2014	-	10.679	0	10.679
2015	-	10.679	0	10.679
2016	-	10.679	0	10.679
2017	-	1.780	0	1.780
Total (tCO2 e)	**-**	**69.939**	**0**	**69.939**

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

B.7.1 Data and parameters monitored:

Based on the methodology AMS – I.D the parameter to be monitored is the electricity supplied by the project activity to the grid.

The energy measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, the use of meter equipment to register and check the electricity generated by the unit.

All data collected as part of monitoring will be archived and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards.

The following data and parameters will be monitored:

Data / Parameter:	**Electricity Generated (EG_y)**
Data unit:	MWh
Description:	Electricity supplied by the project activity to the grid
Source of data to be used:	Project Activity Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The value of data will be periodically monitored. To *ex-ante* estimation of emission reduction, it was used the **Assured energy** of SHPs Bandeirante, Barra Escondida, Belmonte and Prata, with a value of 1.76 MW, 1.25 MW, 2.02 MW and 1.68 MW, respectively.
Description of measurement methods and procedures to be applied (if any)	Spreadsheets will be used, obtained directly from the meters with information generated hourly or within every 15 minutes. Monthly, the information will be checked with the generation spreadsheets available at the website of CCEE. Besides, information of generation can be checked by receipt of sales, if it is necessary to do so.

QA/QC procedures to be applied:	The uncertainty level for these data is low. They will be used to calculate the emission reductions. The electricity generated will be monitored by the project participants and it will be checked by spreadsheets available at the Website of CCEE.
Any comment:	*CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

Data / Parameter:	**($EF_{grid,CM,y}$) Combined Margin CO_2 Emission Factor**
Data unit:	tCO_2/MWh
Description:	The combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”. The combined margin CO_2 emission factor used in Estelar Project will be calculated based on data supplied by Brazilian DNA for the National Interconnected System.
Source of data to be used:	Ex-post emission factor will be calculated by Enerbio Consultoria through ONS data supplied by Brazilian DNA. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, necessary for $EF_{grid,CM,y}$ calculation, will be also monitored and calculated through the Dispatch Data of the National Interconnected System.
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The values of ($EF_{grid,CM,y}$) Combined Margin CO_2 Emission Factor which were used for ex-ante estimation of emission reduction of Estelar Project is 0.1842 which was obtained from simple arithmetic average of National Interconnected System monthly EFgrid,CM, 2007 as described on table 14 on the item B.6.3 and as described on the Annex 3.
Description of measurement methods and procedures to be applied (if any)	As described in the most recent version of the “Tool to calculate the emission factor for an electricity system”.
QA/QC procedures to be applied:	As described in the most recent version of the “Tool to calculate the emission factor for an electricity system”. The uncertainty level for these data is low.
Any comment:	

B.7.2 Description of the monitoring plan:

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The SHPs Bandeirante, Barra Escondida, Belmonte e Prata follow the same monitoring plan.

Responsibilities

- Operation and Maintenance Director: responsible for activities related to the plant’s operation and maintenance.

- Corporate Management Director: responsible for management activities;

- Technical Director: responsible for technical activities related to the construction of the SHPs;
- Measurement Area, linked to Operation and Maintenance Board: responsible for collecting information directly from the meters of SHPs. The Measurement Area is also responsible for the consolidation and analysis of monthly generation spreadsheets and for System of Energy Data Collection (SCDE), through the collected data consistence analysis and software operation monitoring.
- Measurement Outsourced Agent: Part of the responsibility of the Measurement Area can be outsourced hiring a Measurement Agent. In this case, Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent.
- Electric Power Commercialization Chamber (CCEE): it is responsible for implantation, operation and maintenance of SCDE, to enable the collection of the data of electric energy for the use of Accounting and Settlement System (SCL), aiming at assuring the accuracy of the amounts measured, as well as the meeting of the required deadlines.

Process Description

I – Procedure of Generation Data Collection

There are two data collection channels in each measurement points. A channel is used by the company for direct collection in the Powerhouse and the other one is used by CCEE in the Connection Point, compound by the System of Measurement and Billing.

Each SHP has one meter located in its Powerhouse that registers the Gross Electricity produced by the Plants. SHPs Bandeirante, Belmonte and Prata will have one unique meter located on São Miguel do Oeste Substation that registers the net electricity to be supplied by these Plants to the grid and SHP Barra Escondida has another meter located in a physical structure located between 4 and 5 km to the plant which is responsible for registration of net electricity supplied to the grid.

In the company, Measurement Area is responsible for obtaining data directly from the meters and make available in files on xml format. Data obtained by the company are sent continuously to CCEE through SCDE system which makes the collection and treatment of the generation and consumption data of the National Interconnected System measurement points.

The Measurement Area is also responsible for generating, at each month in the first working day, based on consultation from a meters database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month.

The procedure quoted above might be outsourced through hiring a Measurement Agent. In this case, the Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent. In both cases, information related to electricity produced are also followed directly by representatives of a Market Electricity Trading Company, which is a company hired by Measurement Area to follow and to manage the relationship with CCEE. This company must be accredited by CCEE.
In CCEE, the collected data, through SCDE, are transferred to the software SCL to accounting and financial clearance based on the Rules and Procedures for Commercialization of CCEE.

II – Data Consolidation Procedure:

Project Participants compares data available and if an inconsistency occurs, it will be generated a non-conformity report that will verify with CCEE the cause for the disagreement between the information

In case of unavailability of any measurement point, due to maintenances, commissioning or for any other reason, the methodology of data estimation will be used according to the item 14.3 of the Commercialization Procedure PdC ME.01.

III – Data Storage:

The generation information, both the internally generated and the spreadsheets generated through the CCEE website, are electronically stored by the Operation and Maintenance Board.

Periodically, the Information Technology Area accomplishes an insurance backup for all company's data through a Data Server *backup.*

IV – Confronting of the internal generation data with the third part reports

The internal information might be confronted with data available on CCEE website.

V – Calibration of Meters (measuring tools):

The calibration of meters will follow what was described on the document elaborated by ONS – Sub module 12.3 - Maintenance of the measurement system for billing, which establishes that:

(a) The periodicity for the responsible agent's preventive maintenance for Measurement System for Billing (SMF) is of 2 (two) years at the most. That periodicity can be altered in function of the occurrence history observed for all facilities.

(b) The preventive maintenance can be postponed by the period of up to 2 (two) years, in the case of happening inspection in the measurement point. The postponement of that maintenance starts to apply from the inspection date.

Emission Factors

The emission factors will be calculated each year as described on the item B.6.1. To calculate the emission factors will be used data supplied by Ministry of the Science and Technology (MCT) (www.mct.gov.br), institution which chairs the Brazilian DNA.

Project Emission Calculation

Project Emissions will be monitored monthly by Enerbio Consultoria and the team of Energética Saudade and of Energética Rio das Flores, linked to Operation and Maintenance Director, together. Project Emission Reduction will be calculated according of this PDD.

Period of Archiving

All data collected as part of the monitoring will be archived and be kept for at least 2 years after the end of the last crediting period.

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

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The baseline study and monitoring methodology for the project activity were elaborated by Enerbio Consultoria and they were completed on 07/08/2008. Enerbio Consultoria is also a project participant.

Responsible for the project and participant listed on Annex I with the contact information

Eduardo Baltar de Souza Leão
Enerbio Consultoria Ltda
Porto Alegre, Brazil
Tel: 55 51 3392-1505
Email: eduardo@enerbio-rs.com.br
www.enerbio-rs.com.br

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:

15/02/2008

The starting date of the project activity is the starting date of the SHP Barra Escondida construction. The evidence to prove this date is the contract with the construction company.

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

30 years to each SHP.

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

C.2.1. Renewable crediting period

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

01/03/2010.

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The Brazilian legislation requires the development of environmental licensing for entrepreneurships that involve pollutant activities or potentially pollutant ones. In the state of Santa Catarina, the Environment Foundation – FATMA - is the legal responsible for the licensing process, which starts with the study of the environmental impact realized by the entrepreneur and follows with a prior analysis (preliminary studies) carried out by the local environmental organ.

In case the entrepreneurship is considered a project of low environmental impact, the studies on impact may be simplified, being called Reports of Simplified Analysis – RAS, or follow the normal procedures, when it is required the elaboration of the so-called Study on Environmental Impact (EIA). If the project is considered environmentally feasible, the investors must prepare the environmental assessment. This being elaborated, the entrepreneurship should pass through three phases to obtain all necessary licenses for its functioning.

In the first phase, the current state and federal environmental legislation are consulted, in order to verify the viability of the project and impose legal conditions. In case FATMA has a positive view on the environmental concepts of the project, the Prior Environmental License (LAP – From the Portuguese: Licença Ambiental Prévia) is issued.

Having obtained the LAP, a physical and operational project of the entrepreneurship and of the construction must be presented, if necessary, showing how the conditions and restrictions imposed by LAP will be met.

To obtain the Environmental Installation License (LAI - From the Portuguese: Licença Ambiental de Instalação), it is necessary to present (a) additional information on the prior environmental assessment; (b) a new simplified evaluation (RDPA - Report Detailing Environmental Programs); or (c) Basic Environmental Project (PBA), according to the resolution from the environmental agency informed in the LAP.

Having the project completely met the conditions expressed in LAP, the entrepreneurship obtains the authorization to initiate its implantation through the issuance of the Environmental Installation License (LAI).

The third and last phase provides the authorization for the start of the entrepreneurship's operation by the issuance of the Environmental License for Operation (LAO - From the Portuguese: Licença Ambiental de Operação). This is the confirmation that the construction of the entrepreneurship was executed according to the project presented and licensed, verifying the adequacy to the environmental conditions and restrictions.

Below, it is presented the list of most recent environmental licenses (until the moment of elaboration of this PDD) for the SHPs of Estelar Project. The environmental licenses will be sent to the DOE which will carry out the validation of the project.

SHP Bandeirante:
LAP nº 84/2006, issued in December, 2006.

SHP Belmonte
LAP nº 18/2007, issued on May 29th, 2007.
LAI nº 92/2008, issued on May 20th, 2008.

SHP Prata
LAP nº 83/2006, issued on December 8th, 2006.

SHP Barra Escondida
LAI nº 37/2008, issued on March 13th, 2008.

The issuance of licenses for the study and implantation of the SHPs in Estelar Project is the proof that the SHPs meet the various demands of the national environmental legislation, having the necessary licenses for their implantation.

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 four SHPs need a restricted flooded area, deriving from the shape of the reservoir, located in a well fit valley. This way, the areas of direct influence of the entrepreneurship are reduced and the impacts resulting from the environmental alterations are small. Even so, several programs for monitoring, control or possible negative impacts reparation are predicted, as well as programs for the management of the numerous positive impacts, such as the generation of new jobs and the increase of the local economy.

Aiming at the identification of possible environmental impacts caused by the SHPs, it was carried out a study for the development of a Simplified Environmental Report (RAS). The same way, it was elaborated a Detailed Report on the Environmental Projects (RDPA), aiming at developing and explaining all the environmental and social projects to be developed.

A description of some programs to be developed in the implantation of Estelar Project is shown below:

The **Program for control and increase of water quality** was elaborated with the objective of minimizing possible alterations in water quality, resulting of the carrying of sediments caused by soil movement and by the civil works, as well as the water eutrophization in reservoirs at the beginning of its filling. The program comprises the Project of control and increase of water quality, Program for monitoring limnologic conditions, Project of attendance and control of aquatic macrophytes, Project of attendance and control of the ictiofauna, Project of observation of hydrosedimentological conditions and Project of flooded areas' cleanliness. Thus, the Program anticipated measures to detect and solve possible alterations in the aquatic fauna and proliferations of macrophytes. Due to the low useful volume of the reservoirs, the alterations on hydric regimens will not affect the area downstream the reservoir.

The **Program for Controlling Alterations in the Terrestrial Ecosystems** is designed to minimize the impacts produced with the loss of ambiences due to the fillings of reservoirs. Considering the shapes of the reservoirs allow the flooded areas to be relatively small, the loss of habitats is limited to riparian margins, susceptible of replacement through mitigation measures. The program is formed by Project of Handling and Conservation of Flora and by Directive Plan for the Reservoir's Surroundings. The Directive Plan refers to disciplining the soil use surrounding the reservoir, indicating the sensitive areas that should be preserved and the appropriate locals for balnearies, ship entrance, etc.

The **Program for the Recuperation of Degraded Areas** foresees measures for the recuperation of the impacts caused by the removal of vegetable cover in the working areas and support areas and in the areas occupied by the reservoirs. In the places where the alterations are provisional, there will be the reconstitution of the former situations, and in the areas where the alterations are permanent, specific projects of arborisation will be carried out. The new margins will be reintegrated through flora recomposition projects, by replanting species of the native flora. The program also aims at attending the development of fortuitous erosive processes and at promoting the landscape reintegration.

The new jobs directly generated from the construction may promote a movement of migration of workers, attracted by new opportunities. This way, it is necessary the creation of educational activities to the upkeep of the good relationship with the community, as well as leisure programs with cultural and sport-related activities. To aid in this action, the **Program of Workers Behaviour** will be executed, establishing norms and guidelines to the workers of the entrepreneurships in relation to the community and the environment.

The **Program of Social Communication** aims at informing the population of the possible impacts that may occur in the region due to the implantation of the SHPs and the changes that may alter the dynamics of local life. The program has the objective of discussing with the community their expectations and desires in relation to the works. Concomitantly to this program, the **Program of Environmental Education** will be developed, whose actions should highlight the importance of environmental and socio-economical aspects, of the maintenance of biodiversity and the quality of life, and promote the awareness of workers and population.

The **Program of Environmental Management** has the main objective of ensuring, in an integrated way, that the environmental actions proposed in RAS and detailed in the RDPA will be implanted adequately and in the time predicted in the entrepreneurship's timetable, in its many phases and throughout the Area of Direct Influence.

In the social sphere, we can highlight as positive impacts the increase in job offers, mainly to little qualified workforce present in the region, resulting in an incitement to growth in a scenario of little options for investment. Alterations in the market of goods and services will also occur, as well as in the regional revenue and in the city's collections, once new workers will represent an increase in the mass salaries of the region, which may be spent in the consumption of local goods and services. There will also occur alterations in the local community, once the reservoirs will provide new leisure activities, such as fishing, camping and the its use as a balneary, which may stimulate the tourism in the region.

SECTION E. Stakeholders' comments

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

According to Resolution published by the Brazilian DNA and consolidated in the Handbook for Submission of CDM Project Activities, local stakeholder must be invited to comment the CDM Project Activity.

Therefore, it was sent invite-letters to the following stakeholders:

SHPs Bandeirante and Prata

- City Hall of Bandeirante;
- Municipal Assembly of Bandeirante;
- Secretary of Agriculture of Bandeirante (responsible for issues related to the Environment in the municipality of Bandeirante);
- Association of Small Agriculturists of Linha Riqueza do Oeste – municipality of Bandeirante;
- Cooperative of Small Agriculturists of Biofuel - municipality of Bandeirante.

SHP Belmonte

- City Hall of Belmonte;
- Municipal Assembly of Belmonte;
- Secretary of Agriculture of Belmonte (responsible for issues related to the Environment in the municipality of Belmonte);
- Union of Rural Workers of Belmonte.

SHP Barra Escondida

- City Hall of Saudades;
- Municipal Assembly of Saudades;
- Secretary of Agriculture of Saudades (responsible for issues related to the Environment in the municipality of Saudades);
- Union of Rural Workers of Saudades.

Common Stakeholders

- Foundation of Environment of the State of Santa Catarina (FATMA);
- State Secretary of Sustainable Development (responsible for issues related to the Environment in the state of Santa Catarina)
- State of Santa Catarina Attorney of Public Interest;
- Federal Attorney of Public Interest;

- Brazilian Forum of NGO's and Social Movements for Environment and Development;

E.2. Summary of the comments received:

It was received just one comment, sent by the State Secretary of Sustainable Development sent a comment.

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

The State Secretary of Sustainable Development made a positive comment, saying that it does not oppose to the Estelar Project and also compliments to the project participants for the initiative and for the contribution for the emission reduction of greenhouse gases.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	ENERGÉTICA SAUDADES S.A.
Street/P.O.Box:	Linha São Carlos, s/nº
Building:	
City:	Saudades
State/Region:	Santa Catarina
Postfix/ZIP:	89868-000
Country:	Brasil
Telephone:	(49) 3334-0946
FAX:	(49) 3334-0946
E-Mail:	luciano@estelarengenharia.com.br
URL:	
Represented by:	Luciano Quadros
Title:	
Salutation:	Sr.
Last Name:	Quadros
First Name:	Luciano
Department:	Engenharia
Mobile:	(48)9981-1458
Direct FAX:	(48)3203-7655
Direct tel:	(48)3203-7669
Personal E-Mail:	luciano@estelarengenharia.com.br

Organization:	COMPANHIA ENERGÉTICA RIO DAS FLORES
Street/P.O.Box:	Avenida Prefeito Osmar Cunha, nº183
Building:	Ceisa Center – Bloco C – Sala 1001
City:	Florianópolis
State/Region:	Santa Catarina
Postfix/ZIP:	8815-100
Country:	Brasil
Telephone:	(48) 3203-7669
FAX:	(48) 3203-7655
E-Mail:	luciano@estelarengenharia.com.br
URL:	
Represented by:	Luciano Quadros
Title:	
Salutation:	Sr.
Last Name:	Quadros
First Name:	Luciano
Department:	Engenharia
Mobile:	(48)9981-1458
Direct FAX:	(48)3203-7655
Direct tel:	(48)3203-7669

Personal E-Mail:	luciano@estelarengenharia.com.br

Organization:	ENERBIO CONSULTORIA LTDA
Street/P.O.Box:	Av. Carlos Gomes, 281, 202, Auxiliadora.
Building:	Centro Empresarial Eugenio Gudin
City:	Porto Alegre
State/Region:	Rio Grande do Sul
Postfix/ZIP:	90480-003
Country:	Brasil
Telephone:	55 51 3392-1500
FAX:	55 513392-1504
E-Mail:	contato@enerbio-rs.com.br
URL:	www.enerbio-rs.com.br
Represented by:	Eduardo Baltar
Title:	
Salutation:	Sr.
Last Name:	Baltar
First Name:	Eduardo
Department:	Diretoria
Mobile:	
Direct FAX:	55 51 3392-1504
Direct tel:	55 51 3392-1505
Personal E-Mail:	eduardo@enerbio-rs.com.br

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding coming from Annex I countries was used in this project.

Annex 3

BASELINE INFORMATION

From 2006, the MCT in cooperation with the MME and ONS, started to make available the calculation methodology for CO_2 emission factor for grid-connected electricity generation in the Brazilian National Interconnected System using dispatch data analysis. The emission factor started to be widespread for each Subsystem of Brazilian Interconnected System.

In May 2008, the Designated National Authority of CDM in Brazil defined that the National Interconnected System must be considered as a unique System and, this way, this configuration started to be valid for calculating the emission factor of CO_2 used to calculate the emission reduction of greenhouse gases for CDM Projects of electricity generation connected to the grid.

The calculation of emission factor of $CO_{2,}$ published by CIMGC, follows the methodological tool "Tool to calculate the emission factor for an electricity system" approved by the CDM Executive Board and published in the Annex 12 of EB 35 Report.

The tables below present the values considered to calculate the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) which were used for Estelar Project *ex-ante* estimation of emission reduction. All these data were provided by the Brazilian DNA.

Table 17 – Monthly Medium Operating Margin Emission Factor of the year of 2007– Brazilian Interconnected System

Medium Emission Factor (tCO2/MWh) - **MONTHLY**													
2007		Month											
		January	February	March	April	May	June	July	August	September	October	November	December
		0,2292	0,1954	0,1948	0,1965	0,1606	0,2559	0,3096	0,3240	0,3550	0,3774	0,4059	0,4865

Table 18 – Daily Medium Operating Margin Emission Factor of the year of 2007– Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) - **DAILY**												
2007	Month											
Day	January	February	March	April	May	June	July	August	September	October	November	December
1	0,1989	0,1965	0,2466	0,2204	0,2620	0,1409	0,3254	0,2625	0,3402	0,3753	0,3359	0,3831
2	0,2314	0,2260	0,2102	0,1929	0,1999	0,1634	0,2933	0,2989	0,3854	0,3700	0,4556	0,4286
3	0,2270	0,2059	0,1878	0,1957	0,1497	0,1975	0,2692	0,3305	0,2882	0,3753	0,4557	0,3761
4	0,2322	0,2195	0,2205	0,1960	0,1618	0,1898	0,2790	0,3591	0,3042	0,3731	0,5588	0,3791
5	0,2146	0,1496	0,2252	0,1982	0,1703	0,2706	0,2833	0,3619	0,3491	0,3296	0,4773	0,3884
6	0,2758	0,1458	0,2346	0,1951	0,1820	0,2478	0,2928	0,2978	0,3467	0,3683	0,3686	0,3935
7	0,2812	0,1845	0,2334	0,2124	0,1394	0,2747	0,3280	0,2553	0,4455	0,4927	0,3534	0,4359
8	0,2579	0,1471	0,1923	0,2353	0,1259	0,2484	0,3944	0,2603	0,4297	0,3922	0,3520	0,4885
9	0,2592	0,1640	0,2040	0,2223	0,1342	0,2983	0,3491	0,2944	0,4108	0,3679	0,3798	0,5143
10	0,2179	0,1749	0,1860	0,1958	0,1713	0,3292	0,3201	0,3215	0,2859	0,3799	0,4743	0,3831
11	0,2232	0,2131	0,2033	0,1861	0,1717	0,2817	0,2915	0,3471	0,2579	0,3793	0,5057	0,3245
12	0,2254	0,1746	0,1804	0,1600	0,1950	0,2592	0,2809	0,3805	0,2480	0,4448	0,3967	0,3439
13	0,2627	0,1726	0,1767	0,1614	0,2243	0,2613	0,3009	0,3255	0,2836	0,4945	0,3995	0,4192
14	0,3102	0,1705	0,2027	0,2150	0,1676	0,2616	0,3263	0,3382	0,2845	0,5172	0,3629	0,4146
15	0,2554	0,1832	0,2215	0,2264	0,1633	0,3048	0,3395	0,3516	0,3674	0,4061	0,4286	0,4129
16	0,1978	0,1736	0,2156	0,1922	0,1557	0,2904	0,3307	0,3148	0,4407	0,3679	0,4486	0,4935
17	0,1988	0,1934	0,2324	0,2236	0,1515	0,3182	0,3214	0,3025	0,3677	0,3552	0,4881	0,4501
18	0,2114	0,2292	0,2553	0,2256	0,1455	0,2640	0,3245	0,3867	0,3491	0,3640	0,5123	0,4570
19	0,2213	0,2073	0,2199	0,2072	0,1391	0,2324	0,3133	0,4149	0,3758	0,3606	0,4010	0,4710
20	0,2253	0,2465	0,1924	0,1767	0,1274	0,2380	0,3050	0,3512	0,3577	0,4013	0,3839	0,5208
21	0,2478	0,2514	0,1809	0,1849	0,1113	0,2341	0,3359	0,3438	0,3395	0,4714	0,3763	0,5127
22	0,2107	0,2267	0,1727	0,1905	0,1155	0,2434	0,3229	0,3478	0,4127	0,3727	0,3752	0,6000
23	0,1816	0,2098	0,1450	0,1789	0,1510	0,2615	0,3005	0,3396	0,4503	0,3465	0,3437	0,6587
24	0,1727	0,1935	0,1415	0,1931	0,1551	0,3127	0,2856	0,3030	0,3525	0,3353	0,4072	0,6614
25	0,2158	0,2000	0,1167	0,1789	0,1424	0,2790	0,2958	0,3649	0,3931	0,3273	0,4748	0,6913
26	0,2155	0,1720	0,1466	0,1649	0,1795	0,2413	0,3037	0,3844	0,3710	0,3159	0,3936	0,5878
27	0,2411	0,2080	0,1703	0,1643	0,2215	0,2454	0,2951	0,3154	0,2954	0,3433	0,3756	0,5647
28	0,2521	0,2555	0,1530	0,1552	0,1781	0,2622	0,3188	0,2828	0,3486	0,3641	0,3470	0,5873
29	0,2273		0,1806	0,2464	0,1442	0,2659	0,3472	0,2889	0,4057	0,3375	0,3140	0,6143
30	0,2360		0,1844	0,2295	0,1416	0,2840	0,2814	0,2785	0,4581	0,3435	0,3407	0,6485
31	0,2113		0,2113		0,1453		0,2778	0,2934		0,3136		0,6693

The hourly average emission factors are also available on the links: http://www.mct.gov.br/index.php/content/view/74691.html (accessed in October/2008), respectively. The operating margin emission factor is calculated for Brazilian National Interconnected System for each hour based on the value of energy dispatched by each plant, generation cost of each plant (dispatch priority), hourly exchange with neighboring subsystem and emission factors for thermoelectric plants.

The dispatch order for Brazilian Interconnected System is: hydroelectric power plants, wind, nuclear, imports from other systems in ascending order of cost, thermoelectric power plants in ascending order of generation cost.

The tables below present the data concerned to the build margin emission factor ($EF_{grid,BM,y}$) used for project ex-ante emission reduction estimation.

Table 19 – Build Margin Emission Factor of the year 2007 – National Interconnected System

Medium Emission Factor (tCO_2/MWh) - **ANNUAL**	
2007	
	0,0775

*Source: Designated National Authority (*http://www.mct.gov.br/index.php/content/view/74691.html (accessed in October/2008)

The build emission factor is the average emission factor of the most recent plants of the subsystem. This set should comprise at least 5 plants and its installed capacity should be greater than 20% of installed capacity of the subsystem.

Others information about the baseline scenario and baseline emissions is presented on item B.

Annex 4

MONITORING INFORMATION

All procedures which will be used to monitor the project are described on item B.7.1 and B.7.2. Some additional information is presented below.

Some details about the CCEE (Chamber of Commercialization of Electrical Energy) Energy Measurement Process are described below:

The Commercialization Process

The Electric Power Commercialization Process takes place in accordance to the parameters that have been established by Law 10848/2004, by Decrees 5163/2004 and 5.177/2004 (which instituted CCEE) and by ANEEL Normative Resolution 109/2004, which instituted the Electric Power Commercialization Convention.

The business relationships between the Agents members of the CCEE are predominately regulated by electric power purchase and sale agreements, and all the agreements executed between the Agents within the context of the National Interconnected System must be recorded at CCEE. Such recording includes only the parties involved, the amounts of energy and the period of effectiveness; the prices for the electric power on the agreements are not recorded at CCEE, and they are used specifically by the parties involved during their bilateral settlements.

CCEE posts the differences between what has been produced or consumed and what has been contracted. The positive or negative differences are settled on the Short Term Market and are valued according to the PLD (Price for the Settlement of Differences, from Portuguese: Preço de Liquidação das Diferenças), set weekly for each load level, and for each Subsystem, having as basis the marginal cost to operate the system, which is limited by a minimum and by a maximum price.

Measurement

As set forth by the Commercialization Convention, homologated by ANEEL Resolution 109, dated October 26, 2004, CCEE is responsible for providing the specifications, orientation and determination of aspects pertaining to the adaptation of the Billing Measurement System (SMF), and for the implementation, operation and maintenance of the SCDE system (Electric Power Data Collection System), so as to render viable the garnering of data pertaining to electric power to be used in the Accounting and Settlement System (SCL), aiming at assuring the accuracy of the amounts measured, as well as the meeting of the required time frames.

Accounting Measurement

The National Interconnected System is represented at the CCEE through a structure made-up of the measurement of consumption and generation points, which are defined through the Electric System Modeling, and whose purpose is to obtain the measured net amounts of electric power for each Agent, thus allowing the Posting and Financial Settlement of short term market operations.

In order to obtain such amounts, the Commercialization Rules have established a process for the determination and the treatment of the electric power consumption and generation amounts commercialized by the Agents. The processing of the data is called Accounting Measurement Aggregation (from Portuguese: Agregação Contábil da Medição). There is need for adjustments because losses of electricity occur in the transmission system while the consumption through generation is being accomplished.

At CCEE these losses are apportioned among the Agents which own the consumption and generation measurement points. Through the apportionment of these losses an assurance is given that the total effective generation of the system will be consonant with the total effective load of the system. The virtual point where the losses of the generation and consumption points become even is called the Gravity Point, and at this point all the purchases and sales of electric power at the CCEE are computed. The existence of this virtual point makes it possible to establish a comparison between the measurements taken at different actual points of the SIN.

The points of the SIN that become part of the apportionment process mentioned are those defined by ANEEL as being participants in the apportionment of the losses which occurred within the basic network. The losses of electric power are shared equally between the points of generation and consumption, where half the losses are deducted from the total amount generated and the other half is added to the total amount consumed. The generation and consumption totals of each Agent at the Gravity Point are computed from the measurement values informed by the Agents to CCEE, so as to be used in the process of posting the energy that has been commercialized on the Short-Term Market.

Electric Power Data Collection System – SCDE (from Portuguese: Sistema de Coleta de Dados de Energia Elétrica)

The SCDE is responsible for the daily collection and treatment of measurement data, whereby the acquisition of these data is accomplished automatically, directly from the measuring device or through the Agent's database (UCM).This system allows the carrying out of logical inspections, providing direct access to the measuring devices, and allowing greater reliability and accuracy to the data obtained.

Through the SCDE, market agents achieve greater ease in sending the measurement data to CCEE, as well as they are able to monitor the information sent on a daily basis.

Technical specifications

When is needed the installation/adaptation of the measurement System for Billing (SMF), the constant technical requirements should be observed in the Annex 1 - technical specification of the measurements for billing of the sub module 12.2 - Installation of Measurement for Billing of the Module 12 of the Procedures of Net of ONS.

The use was authorized temporarily by ANEEL Authoritative Resolution 787, of 23/01/2007.

Aiming at establishing the periodicity which the measuring tools of Estelar Project should be calibrated, it follows below the orientation presented in Grid Procedures Sub-Module 12.3, established by ONS.

Preventive maintenance – Meters Calibration

Source: ONS – Sub-Module 12.3 – Maintenance of the measurement system for billing

In order to make the System of Measurement for Billing - SMF effective in its operation, it is necessary periodically accomplished preventive maintenances and, when necessary, corrective maintenances in the involved agents' facilities. Inspections in SMF are also accomplished with the intention of verifying the correct operation of the devices.

The activities to be accomplished by the agents involved in the National Interconnected System - SIN in the maintenances and in the inspections are described in the Annexes 1 and 2 of this sub module.

Annex 1 of ONS Sub-Module 12.3

Activities to be accomplished in the maintenance of the System of Measurement for Billing - SMF

(a) The periodicity for the preventive maintenance of responsible agent for SMF is 2 (two) years at the most. That periodicity can be altered in function of the occurrence report observed for all facilities.

(b) The preventive maintenance can be postponed by the period of up to 2 (two) years, in case an inspection happens in the measurement point. The postponement of that maintenance starts to be applied from the inspection date.

(c) The minimum tests to which the transformers should be submitted for instruments (TI) are the following ones: imposed load and diphase with periodicity of 8 (eight) years at most.

(d) In all maintenance or meters calibration, these should be substituted by another properly programmed and calibrated, when there is not an extra device, in order to minimize the interruption in the registration load

(e) Any changing in the relation of transformation of TI to assist the protection or any operational condition that affects the measurement circuit for billing should be previously communicated to the responsible agent. That agent should make the data registered change in the Electric Power Data Collection System - SCDE and submit it to the approval of the CCEE. After the alterations in the measurement system, the involved agents should program an inspection to restore the sealing waxes.

(f) The verification of the perfect operation of the several functions of the meters should be accomplished, as programming, mass memory, schedule, registrations, aside reading, etc. The mass memory conformity configuration should be verified (Data Record) with the one declared by the supplier and constant on the CCEE website.

(g) The general inspection of the SMF connections should be accomplished to verify the existence of eventual irregularity to affect the measurement.

(h) The calibration of the meter should be made by comparative method of consumption of Wh, with artificial load, single-phase or three-phase tests, in laboratories or in the field, with patterns tracked to the National Institute of Metrology, Normalization and Industrial Quality - INMETRO.

(i) The applied tension for calibration should be equal to the nominal tension of meter.

(j) The pattern used in the calibration should be owned by the responsible agent for SMF or by a hired laboratory for the responsible agent, but, just for comparison, it can be adopted the agent's pattern that accompanies the maintenance. The standard(s) must be accomplished by their calibration certificates valid in the event period.

(k) The standard(s), the artificial load and the meter must, when necessary, be energized before the tests with tension and nominal current, during the necessary time - at least 30 (thirty) minutes or in agreement with the orientations of the manufacturers of the meters and pattern - for the thermal stabilization.

(l) The minimum tests to which each meter should be submitted are the following ones: calibration with nominal load, activates, reactivates inductive and reactivates capacitive, and with small load activates, according to the ABNT 14520 or IEC 687 norms.

(m) The meter in calibration that presents mistakes out of the limits specified by the used norm should be substituted.

(n) The meter identification code supplied by CCEE should be programmed and/or verified.

(o) The currents phasorial, the tensions and the studies of the sequence of phases should be accomplished before and after the maintenance.

(p) In case the connected agent or responsible agent for SMF is late in the arrival to the place, the involved agents should wait 2 (two) hours, when, then, they should cancel the service, except for agreement among the parts regarding the awaiting period.

Annex 5

FINANCIAL INFORMATION

Table 20: Assumptions and Cash Flow of SHP Barra Escondida

Shareholders - Presum Profit																	
R$ thousand			year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
SHP Barra Escondida																	
Gross Revenue			**0**	**684**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**
Taxes			**0**	**42**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**
PIS/PASEP	0,65%		0	4	9	9	9	9	9	9	9	9	9	9	9	9	9
COFINS	3,0%		0	21	41	41	41	41	41	41	41	41	41	41	41	41	41
COMERCIALIZATION	1,50%		0	10	21	21	21	21	21	21	21	21	21	21	21	21	21
ANEEL	0,50%		0	3	7	7	7	7	7	7	7	7	7	7	7	7	7
MAE/ONS	0,50%		0	3	7	7	7	7	7	7	7	7	7	7	7	7	7
Operational Expenses			**0**	**279**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**
Depreciation	3,33%		0	156	313	313	313	313	313	313	313	313	313	313	313	313	313
Transm.(0,5*price*Efirm)	6,50		0	18	36	36	36	36	36	36	36	36	36	36	36	36	36
Insurance	1,0%		0	47	94	94	94	94	94	94	94	94	94	94	94	94	94
Management	2,0%		0	14	27	27	27	27	27	27	27	27	27	27	27	27	27
Op.&Mnt. (R$/MWh)	8,0		0	44	88	88	88	88	88	88	88	88	88	88	88	88	88
Financial Expenses			**0**	**47**	**924**	**849**	**773**	**698**	**623**	**547**	**472**	**397**	**321**	**208**	**94**	**94**	**94**
interest + amortization JDC			0	0	830	755	679	604	529	454	378	303	228	114	0	0	0
Deferred of Equity			0	47	94	94	94	94	94	94	94	94	94	94	94	94	94
LAIR			**0**	**317**	**-197**	**-122**	**-46**	**29**	**104**	**180**	**255**	**330**	**405**	**519**	**633**	**633**	**633**
Income Tax			**0**	**219**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**
Income Tax (Presumed Profit)				31	85	85	85	85	85	85	85	85	85	85	85	85	85
Social Contribution(L.Pres.)	9,0%		0	20	39	39	39	39	39	39	39	39	39	39	39	39	39
Net Profit			**0**	**266**	**-322**	**-247**	**-171**	**-96**	**-21**	**55**	**130**	**205**	**281**	**394**	**508**	**508**	**508**
Depreciation			0	156	313	313	313	313	313	313	313	313	313	313	313	313	313
Deferred of Equity			0	47	94	94	94	94	94	94	94	94	94	94	94	94	94
Principal Amortization		total	0	0	658	658	658	658	658	658	658	658	658	658	0	0	0
Loans	70%	6.579	4.606	1.974	-	-	-	-	-	-	-	-	-	-	-	-	-
Investiments -Thousand R$	9.399		6.579	2.820	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	***4.272***																
Project IRR			year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Investiments			-6.579	-2.820	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit			0	520	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040
Project Cash Flow			**-6.579**	**-2.300**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**

Project IRR
10,17%

Table 20: Assumptions and Cash Flow of SHP Barra Escondida (Continuation)

Shareholders - Presum Profit R$ thousand SHP Barra Escondida			year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Gross Revenue			**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**	**1.369**
Taxes			**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**
PIS/PASEP	0,65%		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
COFINS	3,0%		41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
COMERCIALIZATION	1,50%		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
ANEEL	0,50%		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
MAE/ONS	0,50%		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Operational Expenses			**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**	**558**
Depreciation	3,33%		313	313	313	313	313	313	313	313	313	313	313	313	313	313	313
Transm.(0,5*price*Efirm)	6,50		36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Insurance	1,0%		94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Management	2,0%		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Op.&Mnt. (R$/MWh)	8,0		88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
Financial Expenses			**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**	**94**
interest + amortization JDC			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred of Equity			94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
LAIR			**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**	**633**
Income Tax			**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**	**438**
Income Tax (Presumed Profit)			85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Social Contribution(L.Pres.)	9,0%		39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Net Profit			**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**	**508**
Depreciation			313	313	313	313	313	313	313	313	313	313	313	313	313	313	313
Deferred of Equity			94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Principal Amortization		total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans	70%	6.579	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Investiments -Thousand R$	9.399		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	*4.272*																

Project IRR	year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Investiments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040	1.040
Project Cash Flow	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**	**1.040**

Project IRR
10,17%

Table 21: Assumptions and Cash Flow of SHP Prata

Shareholders - Presum Profit R$ thousand SHP Prata			year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Gross Revenue			**0**	**1.030**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**
Taxes			**0**	**69**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**
PIS/PASEP	0,65%		0	7	13	13	13	13	13	13	13	13	13	13	13	13	13
COFINS	3,0%		0	31	62	62	62	62	62	62	62	62	62	62	62	62	62
COMERCIALIZATION	2,00%		0	21	41	41	41	41	41	41	41	41	41	41	41	41	41
ANEEL	0,50%		0	5	10	10	10	10	10	10	10	10	10	10	10	10	10
MAE/ONS	0,50%		0	5	10	10	10	10	10	10	10	10	10	10	10	10	10
Operational Expenses			**0**	**475**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**
Depreciation	3,33%		0	273	546	546	546	546	546	546	546	546	546	546	546	546	546
Transm.(0,5*price*Efirm)	7,00		0	26	52	52	52	52	52	52	52	52	52	52	52	52	52
Insurance	1,0%		0	82	164	164	164	164	164	164	164	164	164	164	164	164	164
Management	2,0%		0	21	41	41	41	41	41	41	41	41	41	41	41	41	41
Op.&Mnt. (R$/MWh)	10,0		0	74	147	147	147	147	147	147	147	147	147	147	147	147	147
Financial Expenses			**0**	**82**	**1.424**	**1.311**	**1.198**	**1.084**	**971**	**858**	**745**	**631**	**518**	**347**	**164**	**164**	**164**
interest + amortization JDC			0	0	1.260	1.147	1.034	920	807	694	581	468	354	183	0	0	0
Deferred of Equity			0	82	164	164	164	164	164	164	164	164	164	164	164	164	164
LAIR			**0**	**405**	**-451**	**-337**	**-224**	**-111**	**2**	**115**	**229**	**342**	**455**	**626**	**809**	**809**	**809**
Income Tax (Presumed Profit)			0	12	25	25	25	25	25	25	25	25	25	25	25	25	25
Social Contribution(L.Pres.)	9,0%		0	11	0	0	0	0	22	22	22	22	22	22	22	22	22
Net Profit			**0**	**381**	**-475**	**-362**	**-249**	**-136**	**-45**	**68**	**182**	**295**	**408**	**579**	**763**	**763**	**763**
Depreciation			0	273	546	546	546	546	546	546	546	546	546	546	546	546	546
Deferred of Equity			0	82	164	164	164	164	164	164	164	164	164	164	164	164	164
Principal Amortization		total	0	0	1.033	1.033	1.033	1.033	1.033	1.033	1.033	1.033	1.033	1.033	0	0	0
Loans	70%	11.480	8.610	2.870	-	-	-	-	-	-	-	-	-	-	-	-	-
Investiments -Thousand R$	16.400		12.300	4.100	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	*5.467*																

Project IRR	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Investiments	-12.300	-4100	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	0	760	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519
Project Cash Flow	**-12.300**	**-3.340**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**

Project IRR
8,10%

Table 21: Assumptions and Cash Flow of SHP Prata (Continuation)

Shareholders - Presum Profit R$ thousand SHP Prata			year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Gross Revenue			**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**	**2.060**
Taxes			**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**	**137**
PIS/PASEP	0,65%		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
COFINS	3,0%		62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
COMERCIALIZATION	2,00%		41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
ANEEL	0,50%		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
MAE/ONS	0,50%		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Operational Expenses			**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**
Depreciation	3,33%		546	546	546	546	546	546	546	546	546	546	546	546	546	546	546
Transm.(0,5*price*Efirm)	7,00		52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Insurance	1,0%		164	164	164	164	164	164	164	164	164	164	164	164	164	164	164
Management	2,0%		41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Op.&Mnt. (R$/MWh)	10,0		147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
Financial Expenses			**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**	**164**
interest + amortization JDC			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred of Equity			164	164	164	164	164	164	164	164	164	164	164	164	164	164	164
LAIR			**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**	**809**
Income Tax (Presumed Profit)			25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Social Contribution(L.Pres.)	9,0%		22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Net Profit			**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**
Depreciation			546	546	546	546	546	546	546	546	546	546	546	546	546	546	546
Deferred of Equity			164	164	164	164	164	164	164	164	164	164	164	164	164	164	164
Principal Amortization		total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans	70%	11.480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Investiments -Thousand R$	16.400		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	***5.467***																

Project IRR	year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519
Project Cash Flow	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**	**1.519**

Project IRR
8,10%

Table 22: Assumptions and Cash Flow of SHP Belmonte

Shareholders - Presum Profit R$ thousand SHP Belmonte			year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Gross Revenue			**0**	**1.239**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**	**2.477**
Taxes			**0**	**82**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**	**165**
PIS/PASEP	0,65%		0	8	16	16	16	16	16	16	16	16	16	16	16	16	16
COFINS	3,0%		0	37	74	74	74	74	74	74	74	74	74	74	74	74	74
COMERCIALIZATION	2,00%		0	25	50	50	50	50	50	50	50	50	50	50	50	50	50
ANEEL	0,50%		0	6	12	12	12	12	12	12	12	12	12	12	12	12	12
MAE/ONS	0,50%		0	6	12	12	12	12	12	12	12	12	12	12	12	12	12
Operational Expenses			**0**	**566**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**	**1.131**
Depreciation	3,33%		0	303	606	606	606	606	606	606	606	606	606	606	606	606	606
Transm.(0,5*price*Efirm)	7,00		0	58	117	117	117	117	117	117	117	117	117	117	117	117	117
Insurance	1,0%		0	91	182	182	182	182	182	182	182	182	182	182	182	182	182
Management	2,0%		0	25	50	50	50	50	50	50	50	50	50	50	50	50	50
Op.&Mnt. (R$/MWh)	10,0		0	88	177	177	177	177	177	177	177	177	177	177	177	177	177
Financial Expenses			**0**	**76**	**1.650**	**1.515**	**1.381**	**1.246**	**1.111**	**977**	**842**	**708**	**573**	**369**	**152**	**152**	**152**
interest + amortization JDC			0	0	1.498	1.364	1.229	1.094	960	825	691	556	421	218	0	0	0
Deferred of Equity			0	76	152	152	152	152	152	152	152	152	152	152	152	152	152
LAIR			**0**	**515**	**-469**	**-334**	**-199**	**-65**	**70**	**204**	**339**	**474**	**608**	**812**	**1.030**	**1.030**	**1.030**
Income Tax (Presumed Profit)			0	15	30	30	30	30	30	30	30	30	30	30	30	30	30
Social Contribution(L.Pres.)	9,0%		0	13	0	0	0	0	27	27	27	27	27	27	27	27	27
Net Profit			**0**	**487**	**-498**	**-364**	**-229**	**-94**	**13**	**148**	**283**	**417**	**552**	**755**	**973**	**973**	**973**
Depreciation			0	303	606	606	606	606	606	606	606	606	606	606	606	606	606
Deferred of Equity			0	76	152	152	152	152	152	152	152	152	152	152	152	152	152
Principal Amortization		total	0	0	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	0	0	0
Loans	75%	13.650	10.238	3.413	-	-	-	-	-	-	-	-	-	-	-	-	-
Investiments -Thousand R$	18.200		13.650	4.550	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	***5.056***																

Project IRR	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Investments	-13.650	-4.550	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	0	894	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787
Project Cash Flow	**-13.650**	**-3.656**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**

Project IRR
8,74%

Table 22: Assumptions and Cash Flow of SHP Belmonte (continuation)

Shareholders - Presum Profit R$ thousand SHP Belmonte			year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Gross Revenue			2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477	2.477
Taxes			165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
PIS/PASEP	0,65%		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
COFINS	3,0%		74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
COMERCIALIZATION	2,00%		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
ANEEL	0,50%		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
MAE/ONS	0,50%		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Operational Expenses			1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131
Depreciation	3,33%		606	606	606	606	606	606	606	606	606	606	606	606	606	606	606
Transm.(0,5*price*Efirm)	7,00		117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
Insurance	1,0%		182	182	182	182	182	182	182	182	182	182	182	182	182	182	182
Management	2,0%		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Op.&Mnt. (R$/MWh)	10,0		177	177	177	177	177	177	177	177	177	177	177	177	177	177	177
Financial Expenses			152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
interest + amortization JDC			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred of Equity			152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
LAIR			1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030
Income Tax (Presumed Profit)			30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Social Contribution(L.Pres.)	9,0%		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Net Profit			973	973	973	973	973	973	973	973	973	973	973	973	973	973	973
Depreciation			606	606	606	606	606	606	606	606	606	606	606	606	606	606	606
Deferred of Equity			152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
Principal Amortization		total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans	75%	13.650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Investments -Thousand R$	18.200		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	*5.056*																

Project IRR	year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787	1.787
Project Cash Flow	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**	**1.787**

Project IRR
8,74%

Table 23: Assumptions and Cash Flow of SHP Bandeirante

Shareholders - Presum Profit R$ thousand SHP Bandeirante			year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Gross Revenue			0	1.079	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158
Taxes			0	99	197	197	197	197	197	197	197	197	197	197	197	197	197
PIS/PASEP	0,65%		0	7	14	14	14	14	14	14	14	14	14	14	14	14	14
COFINS	3,0%		0	32	65	65	65	65	65	65	65	65	65	65	65	65	65
COMERCIALIZATION	2,00%		0	22	43	43	43	43	43	43	43	43	43	43	43	43	43
ANEEL	0,50%		0	5	11	11	11	11	11	11	11	11	11	11	11	11	11
MAE/ONS	3,00%		0	32	65	65	65	65	65	65	65	65	65	65	65	65	65
Operational Expenses			0	486	973	973	973	973	973	973	973	973	973	973	973	973	973
Depreciation	3,33%		0	260	519	519	519	519	519	519	519	519	519	519	519	519	519
Transm.(0,5*price*Efirm)	7,00		0	50	100	100	100	100	100	100	100	100	100	100	100	100	100
Insurance	1,0%		0	78	156	156	156	156	156	156	156	156	156	156	156	156	156
Management	2,0%		0	22	43	43	43	43	43	43	43	43	43	43	43	43	43
Op.&Mnt. (R$/MWh)	10,0		0	77	154	154	154	154	154	154	154	154	154	154	154	154	154
Financial Expenses			0	65	1.414	1.299	1.183	1.068	953	837	722	606	491	317	130	130	130
interest + amortization JDC			0	0	1.284	1.169	1.054	938	823	707	592	477	361	187	0	0	0
Deferred of Equity			0	65	130	130	130	130	130	130	130	130	130	130	130	130	130
LAIR			0	429	-426	-310	-195	-80	36	151	267	382	497	672	859	859	859
Income Tax (Presumed Profit)			0	13	26	26	26	26	26	26	26	26	26	26	26	26	26
Social Contribution(L.Pres.)	9,0%		0	12	0	0	0	0	23	23	23	23	23	23	23	23	23
Net Profit			0	405	-452	-336	-221	-105	-13	102	217	333	448	623	809	809	809
Depreciation			0	260	519	519	519	519	519	519	519	519	519	519	519	519	519
Deferred of Equity			0	65	130	130	130	130	130	130	130	130	130	130	130	130	130
Principal Amortization		total	0	0	1.053	1.053	1.053	1.053	1.053	1.053	1.053	1.053	1.053	1.053	0	0	0
Loans	75%	11.700	8.775	2.925	-	-	-	-	-	-	-	-	-	-	-	-	-
Investments -Thousand R$	15.600		11.700	3.900	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	*5.200*																

Project IRR	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
Investments	-11.700	-3.900	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	0	754	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508
Project Cash Flow	**-11.700**	**-3.146**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**

Project IRR
8,56%

Table 23: Assumptions and Cash Flow of SHP Bandeirante (Continuation)

Shareholders - Presum Profit

R$ thousand SHP Bandeirante		year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Gross Revenue		2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158	2.158
Taxes		197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
PIS/PASEP	0,65%	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
COFINS	3,0%	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
COMERCIALIZATION	2,00%	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
ANEEL	0,50%	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
MAE/ONS	3,00%	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Operational Expenses		973	973	973	973	973	973	973	973	973	973	973	973	973	973	973
Depreciation	3,33%	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519
Transm.(0,5*price*Efirm)	7,00	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Insurance	1,0%	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156
Management	2,0%	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Op.&Mnt. (R$/MWh)	10,0	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154
Financial Expenses		130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
interest + amortization JDC		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred of Equity		130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
LAIR		859	859	859	859	859	859	859	859	859	859	859	859	859	859	859
Income Tax (Presumed Profit)		26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Social Contribution(L.Pres.)	9,0%	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Net Profit		809	809	809	809	809	809	809	809	809	809	809	809	809	809	809
Depreciation		519	519	519	519	519	519	519	519	519	519	519	519	519	519	519
Deferred of Equity		130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Principal Amortization		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Investments -Thousand R$	15.600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost Instal Capacity (R$/KW)	*5.200*															

Project IRR	year 16	year 17	year 18	year 19	year 20	year 21	year 22	year 23	year 24	year 25	year 26	year 27	year 28	year 29	year 30
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operational Profit	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508	1.508
Project Cash Flow	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**	**1.508**

Project IRR
8,56%

Annex 6

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