CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

Project title: "Celtins and Cemat grid connection of isolated systems" (for simplicity hereafter referred to simply as the "Grupo Rede CDM Project").

PDD version number: 04

Date: March 7, 2007.

A.2. Description of the project activity:

The purpose of the project activity is the expansion of the Brazilian interconnected grid to isolated systems in the Brazilian states of Mato Grosso and Tocantins. The interconnection will result in the complete displacement of the previous fossil fuel power generation in the isolated systems by more efficient, less carbon intensive power generation from the interconnected grid.

Celtins and Cemat are aware about the biodiversity of the region's ecosystems. This is an important reason why the company is committed with sustainable development. Specifically for this project activity, project participant contributes to sustainable development through the following aspects:

- Reliable electricity supply for the communities that can be translated in, for example, longer conservation food and medicine, more economic opportunities for the communities, etc.
- Lowering the risk of diesel spills during fuel transportation from its origin and final use situated in distant locations.
- Reduction of local and global air pollution.
- Creation of new jobs as a consequence of increased economic development.

A.3. Project participants:

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)	CELTINS - Companhia de Energia Elétrica do Estado do Tocantins	No
	CEMAT - Centrais Elétricas Mato-Grossenses S. A.	
	Ecoinvest Carbon Brasil	
(*) 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.		

Table 1 – Party(ies) and private/public entities involved in the project activity

Detailed contact information on party(ies) and private/public entities involved in the project activity is listed in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Mato Grosso and Tocantins.

A.4.1.3. City/Town/Community etc:

City	Interconnected in	Reference for the interconnection	Geographical coordinates from http://pt.wikipedia.org/wiki/Mato_Grosso
Paranaita	January-2001	ANEEL-Despacho 145 22/3/2001	09º39'54" S - 56º28'37" W
Vila Bela	January-2001	ANEEL-Despacho 82 16/2/2001	15º00'28" S - 59º57'03" W
União do Sul	April-2001	ANEEL-Despacho 919 9/11/2001	11º31'58" S - 54º21'10" W
Tapurah	July-2001	Grupo Rede	12º46'19" S - 56º33'14" W
Castanheira	September-2001	ANEEL-Despacho 927 12/11/2001	11º07'58" S - 58º36'10" W
Marcelândia	September-2001	ANEEL-Despacho 919 9/11/2001	11º07'58" S - 54º35'49" W
Novo Horizonte do Norte	December-2001	Grupo Rede	11°24'46" S - 57°21'07" W
Porto dos Gaúchos	December-2001	Grupo Rede	11°32'06" S - 57°24'50" W
Canarana	May-2002	Grupo Rede	13º33'00" S - 52º09'57" W
Brasnorte	June-2003	ANEEL-Resolucao 267 15/6/2004	12º09'18" S - 57º58'44" W
Sapezal	December-2005	Grupo Rede	12º59'20" S - 58º45'50" W
Juina	January-2006	Grupo Rede	11°22'40" S - 58°44'27" W
Juara	January-2006	Grupo Rede	11°15'18" S - 57°31'12" W
Tabaporã	April-2006	ANEEL-Despacho 603 21/3/2006	10°48'25" S - 56°37'12" W

Table 2 – Cities/town/community interconnected in the CEMAT grid (Mato Grosso State)

City, town, community	Interconnected in	Reference for the interconnection	Geographical coordinates from http://pt.wikipedia.org/wiki/Tocantins
Porto Lemos (Santa Fé do Araguaia)	January-2001	ANEEL-Despacho 186, 16/4/2001	07°09'21" S - 48°42'10" W
Mansinha (Rio Sono)	January-2001	ANEEL-Despacho 186, 16/4/2001	09°20'37" S - 47°54'07" W
Serranópolis (Paranã)	January-2001	ANEEL-Despacho 186, 16/4/2001	12°36'55" S - 47°52'59" W
Mateiros	February-2001	ANEEL-Despacho 921, 9/11/2001	10°32'52" S - 46°25'15" W
Santa Maria do Tocantins	February-2001	ANEEL-Despacho 921, 9/11/2001	08°47'49" S - 47°47'42" W
Trevo da Praia (Gurupi)	February-2001	ANEEL-Despacho 921, 9/11/2001	11°43'45" S - 49°04'07" W
Lizarda	March-2001	ANEEL-Despacho 921, 9/11/2001	09°35'38" S - 46°40'22" W
São Félix do Tocantins	June-2001	ANEEL-Despacho 921, 9/11/2001	10°10'04" S - 46°39'32" W
Centenário	June-2001	ANEEL-Despacho 921, 9/11/2001	08°57'03" S - 47°20'09" W
Recursolândia	June-2001	ANEEL-Despacho 921, 9/11/2001	08°44'13"S - 47°14'49" W

Table 3 – Cities/town/community interconnected in the CELTINS grid (State of Tocantins)

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

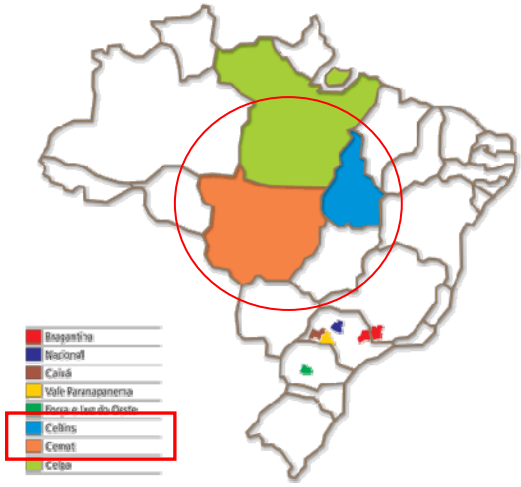

Figure 1 – Physical location of the project activity

See more details of physical locations in Table 2, and Table 3 above.

A.4.2. Category(ies) of project activity:

Sectoral scope: 1 – Energy industries (renewable -/ non-renewable sources)

A.4.3. Technology to be employed by the project activity:

Grupo Rede (Rede Group, i.e., *Rede Empresas de Energia Elétrica*) with over one hundred years of history is one of the Brazil's leading electric power groups engaged in the distribution, generation and trading of electric energy.

The Grupo Rede CDM Project uses straight grid expansion technologies: high voltage (13.8 kV to 138 kV), high-strength composite conductors, power transformers, etc. In the project activity Grupo Rede uses locally available technology, most of it also locally developed to the environmental, cultural and economic situation of the region.

For its efforts in improving the quality of the electricity supplied and the services provided to its customers, and for the development of outstanding social responsibility and environmental programs in Brazil, the REDE Group has won many awards over the years[1], for example:

- IASC Award by the Brazilian Electrical Energy Agency (ANEEL)
- Top Social Award by the Brazilian Association of Sales and Marketing Executives (ADVB)
- ABRADEE Award by the Brazilian Association of Electric Power Distributors (ABRADEE)

REDE Group's business activities are developed in biodiversity-rich areas containing ecosystems such as the cerrado savannas, the Pantanal wetlands and the Amazon Rainforest. These areas also have a great hydrographic potential and boast long and wide Brazilian rivers like the Amazon, Araguaia and Tocantins.

Aware of the value of this natural wealth and based on a philosophy of its own, which privileges sustainable development and complies with Brazilian environmental laws, the REDE Group exercises a strict environmental policy combining long-term growth and respect for nature.

The Group carries out several actions that contribute to the social and environmental education of both internal and external publics, and to the dissemination of scientific knowledge on the flora, fauna, water, soil, subsoil and other elements that sustain life on the Planet[2].

Highlights of such activities include:

- Ongoing studies for the elaboration and/or adjustment of norms and procedures, with the aim of ensuring respect for the environment.
- Strategic partnerships with educational, research and environmental institutions for the development of internal and external projects, programs and campaigns.
- Constant follow-up on issues related to environmental legislation for the Brazilian Electrical Sector as regards procedure adjustment and initiative suggestion.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

The estimate amount of emission reductions over crediting period is roughly 382,000 tCO_2 (Table 4).

[1] See http://www.gruporede.com.br/arquivos/english/ourhistory.pdf

[2] See http://www.gruporede.com.br/arquivos/english/evmtprotection.pdf

Years	Annual estimation of emission reductions in tonnes of CO_2e
Year 1 - (2001)	(28,143)
Year 2 - (2002)	34,185
Year 3 - (2003)	44,406
Year 4 - (2004)	49,931
Year 5 - (2005)	49,881
Year 6 - (2006)	116,544
Year 7 - (2007)	115,406
Total estimated reductions (tonnes of CO_2e)	382,211
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	54,602

Table 4 – Estimated emission reduction of the project activity

A.4.5. Public funding of the project activity:

No Official Development Assistance funding was or will be used in the Grupo Rede CDM Project.

SECTION B. Application of a baseline and monitoring methodology

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

AM0045 - Grid connection of isolated electricity systems (version 1, 22 December 2006).

Tool for the demonstration and assessment of additionality (version 2, 28 November 2005).

For the calculation of the CO_2 emission coefficient of the grid "AM0045" remits to ACM0002 (Consolidated methodology for grid-connected electricity generation from renewable sources, version 6, 19 May 2006).

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The chosen methodology is applicable to grid connection of isolated systems, as is the case of the Grupo Rede CDM Project. In this case, several isolated "mini-grids" (off-grid power generation) operating in communities in the states of Mato Grosso and Tocantins (Midwest and North Brazil) are being connected to the national grid. All fossil fuel fired power plants in the isolated systems are displaced while renewable energy based electricity generation in the respective isolated systems is not significantly affected. Historical data of power generation and fuel consumption in the isolated systems is available to accurately estimate the most likely scenario in the absence of the project activity. The calculation of the project emissions, i.e., emissions for power generation in the grid that will displace off-grid power generation, is based on available official information.

For the case of the project activity there is no actively-enforced laws mandating the interconnection of the isolated systems.

B.3. Description of the sources and gases included in the project boundary

For the project activity, project participants shall account for CO_2 emissions from the increase (due to the project activity) of electricity generation in power plants connected to the grid and emissions related to SF_6 used in the new equipments of the project activity.

For the baseline determination, project participants shall only account CO_2 emissions from electricity generation in fossil fuel fired plants in the isolated system, which are displaced by the project activity, taking into account the increase of the demand and the remaining lifetime of the equipments.

The spatial extent of the project boundary includes all power plants physically connected to the previously isolated region (isolated grid or isolated individual plant) and all power plants physically connected to the electricity system, which the CDM project is being connected to.

	Source	Gas	Included?	Justification / Explanation
Baseline	Power generation	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	Power generation	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emission from the new equipments of the project activity	SF_6	Yes	Emissions related to SF_6 used in the new equipments of the project activity.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Procedure for the identification of the baseline scenario

The baseline scenario is determined though the following steps:

1. Identification of realistic and credible alternative scenarios that are consistent with applicable mandatory laws and regulations

The identified realistic and credible scenarios are:

- Project Activity Scenario: interconnection to the grid with CDM incentive.
- Interconnection Scenario: project activity without the CDM incentive (also implemented at a later point in time).
- Reference Scenario: current scenario of supplying energy to isolated communities through small and medium sized diesel fuelled power plants.
- Overhaul Scenario: revamping and replacing the existing thermal plants with the new ones utilizing best available diesel-fired

The most plausible baseline scenario will be identified though an investment comparison analysis (developed in sub-step 2b-Option II in item B.5 below).

2. Identification of barriers and assessment of alternative scenarios that are not prevented by the barriers.

The main barriers to the expansion of the grid to isolated areas are (Goldemberg *et al.*, 2004[3]; Brown, 2002[4]; Cunha *et al.*, 2005[5]):

[3] Goldemberg, J. *et al.* (2004). *Expanding the Access to Electricity in Brazil.* Global Network on Energy for Sustainable Development.

[4] Brown, A. C. (2002). *The Privatization of Brazil's Electricity Industry: Sector Reform or Restatement of the Government's Balance Sheet?* Inter-American Development Bank.

- Low income/isolated areas have relatively low densities of energy demand
  - Brazil has an area of 8,514,877 km^2, 22 inhabitants per km^2 (in 2005), per capita GDP[6] of around BRL 9,729 (in 2004) and per capita electricity consumption[7] of 1.62 MWh.
  - The State of São Paulo has an area of 248,209 km^2, 160 inhabitants per km^2 (in 2005), per capita GDP of around BRL 13,725 (in 2004) and per capita electricity consumption of 2.23 MWh.
  - The State of Mato Grosso has an area of 906,807 km^2, 3.1 inhabitants per km^2 (in 2005), per capita GDP of around BRL 10,162 (in 2002) and per capita electricity consumption of 1.35 MWh.
  - The State of Tocantins has an area of 278,421 km^2, 4.6 inhabitants per km^2 (in 2005), per capita GDP of around BRL 3,776 (in 2004) and per capita electricity consumption of 0.63 MWh.
- Expanding networks to these areas is not feasible without substantial subsidies.
  - Not a single transmission line or power generation plant were in the isolated systems was implemented without government subsidies. Even today, around 20 years after the initiation of the utilities privatization process in the electricity industry there are still utilities in the isolated system 100% publicly financed (for example, Centrais Elétricas de Rondônia S. A. – CERON).
- Difficulties in properly operating and maintaining power equipment in isolated areas.
  - Due to the great distances and sparse distribution operation is made mainly remotely. Physical verification and maintenance of the equipments is expensive and not so frequent.
- Lack of uniformity prevents standardized solutions.
  - Both states have economies mainly based in the agriculture with processing industry sparsely distributed. Isolated systems are also sparsely distributed and depend strongly on local factors (extractive industries, mining activities, arable land, river-ways availability, etc.).
- Regulatory
  - The regulatory framework of the electricity sector in Brazil establishes that distribution companies are compensated for the economic value of the assets they carry in their balance sheets. In that regard, Grupo Rede is the only private Brazilian electricity company which has replaced diesel oil plants with the interconnected grid thus reducing their asset base.

The first four presented barriers affect the Project Activity Scenario as well as all alternative scenarios similarly. Therefore, in order to determine which of the presented alternative are credible and plausible it is necessary to carry out an investment analysis. The regulatory barrier affects only the interconnection scenarios.

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[5] Cunha, K. B. et al. (2005). *CDM implementation in rural and isolated regions: the Amazonia case.* "Climate or Development Conference." Hamburg, Germany, October 28-29.

[6] IBGE (2005). *Contas Regionais do Brasil 2004.* Instituto Brasileiro de Geografia e Estatística. Rio de Janeiro, Brasil.

[7] ANEEL (2005). *Atlas da Energia elétrica do Brasil (2. ed.).* Agência Nacional de Energia Elétrica. Brasília, Brasil.

3. Investment analysis

The investment analysis is carried out in sub-step 2b-Option II in item B.5 below.

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 CDM project activity (assessment and demonstration of additionality):

The "additionality tool" shall be applied conjunction with the proposed baseline methodology to describe how the anthropogenic emissions of GHG are reduced below those that would have occurred in the absence of the Grupo Rede CDM Project. The additionality tool provides a general step-wise framework for demonstrating and assessing additionality. These steps, numbered from 0 to 5, include:

0. Preliminary screening
1. Identification of alternatives to the project activity
2. Investment analysis AND/OR
3. Barrier analysis
4. Common practice analysis
5. Impact of CDM registration

The application of the additionality tool to the Grupo Rede CDM Project follows.

Step 0. Preliminary screening based on the project start date.

1. (a) Provide evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of registration of a first CDM project activity.

The project activity has been extending the grid and phasing out Diesel generators in these communities from June 2000 onwards. The evidence of deactivation schedule can be found in various available official documents from ANEEL (National Electricity Agency), MME (Ministry of Mines and Energy), Eletrobras (federally-owned Brazilian Power Utility) and Grupo Rede. Table 2**Error! Reference source not found.** and Table 3 have a column named "reference for the interconnection" where the document presented to the DOE is listed. The majority of the presented documents are also publicly available at the internet.

Regarding claims for a crediting period before the date of registration, Grupo Rede first submitted a new methodology proposal in mid 2005 but the version finally accepted for assessment at the MethPanel is the one from 28 December 2005 submitted though SGS.

1. (b) Provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

Grupo Rede assesses the possibility to obtain CDM incentives since mid 1999. The oldest available document is a presentation prepared in 28 September 1999 (Figure 2) about the risks and opportunities for Grupo Rede in the "CO_2 emission reduction market". A meeting was held On 9 February 9 2000 to evaluate the impacts of possible CDM incentives for different projects at Grupo Rede (it shall be noted that the core business of the Group is distribution of electricity). The meeting is mentioned in a presentation, prepared in 2 March 2000 (Figure 2), which indicates steps forward to develop the ideas discussed in the February 2000 meeting (including human resources available, and presentation of the

consolidated results to the group's board). Another result of the February 9th 2000 meeting is a work plan prepared in February 23rd 2000 (Figure 2) indicating financial and human resources allocated for the effort. All electronic files mentioned above were supplied to the validation team.

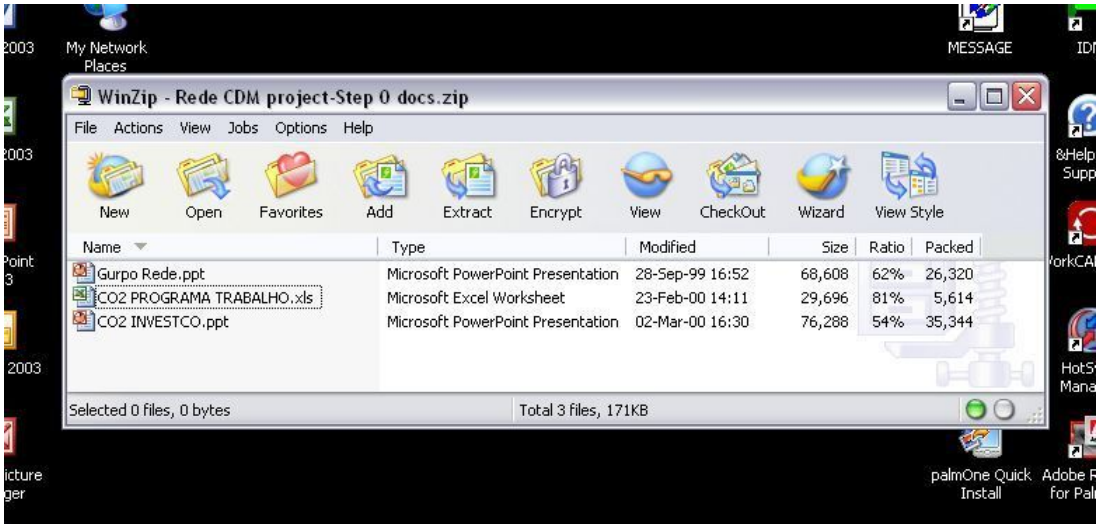


Figure 2 – Printscreen showing properties of the files used as evidence in "step 0"

Step 1. Identification of alternatives to the project activity consistent with current laws and Regulation.

Sub-step 1a. Define alternatives to the project activity.

1. The Grupo Rede interconnection project is an alternative to thermal electricity generated within the isolated sub-systems of northern and central west Brazil. By displacing small to medium sized oil fuelled power plants, the interconnection project will increase reliability of the company services in the region, improve energy supply to small communities served by Grupo Rede, and reduce GHG emissions. In order to asses the project's additionality, Grupo Rede identified in February 2000 the following alternatives to supply the demand in the isolated systems:

Project Activity Scenario: interconnection to the grid with CDM incentive.

Interconnection Scenario: project activity without the CDM incentive (also implemented at a later point in time).

Reference Scenario: Grupo Rede could continue operating under the current scenario of supplying energy to isolated communities through small and medium sized diesel fuelled power plants.

Overhaul Scenario: Grupo Rede could upgrade its operation in the region by revamping and replacing the existing thermal plants with the new ones utilizing best available diesel-fired technology.

Sub-step 1b. Enforcement of applicable laws and regulations.

2. All the alternatives and the project activity (with and without the CDM incentive) are in compliance with all applicable and regulatory requirements.

3. Not applicable.

4. Not applicable. Both the project activity (with and without the CDM incentive) and the alternative scenario are in compliance with all applicable legal and regulatory requirements.

Step 2. Investment Analysis

Follows a brief description of the financing and institutional arrangements in place in the country to facilitate the expansion of the interconnected grid to isolated systems[8].

- "***CCC"***[9]

Electricity generation in the isolated areas of Brazil is largely based on diesel oil, making use of internal combustion engines of small capacity.

CCC was originally created and regulated, respectively, by Law 5,899/73 and Decree 73,102/73. It is defined as a *"financial reserve to cover fossil fuel costs, working as a compensation account through which an apportionment will be made of the benefits and costs of consuming such fuels in thermal plants belonging to concessionaires with their electric systems partially or totally connected to the South-Southeast interconnected system".*

Through the CCC part of the financial resources collected from the energy supply in the grid system is used to reduce the cost differences in the energy production in isolated systems. Initially the CCC was used to subsidize the cost of fossil-fuel-based power generation in isolated systems but today it can be used, under special conditions, for other power supply options (for example, renewable energy based power generation, interconnection of isolated systems to the national grid, etc). Nevertheless, power generation using fossil fuels are eligible under the CCC to remain receiving the incentives. The scheme was originally applicable until May 2013 but it in 2002 was extended to 2022 (see ANEEL Resolution 784/2002).

- ***"Luz no Campo"***

In 1999, *Eletrobrás* (a state-owned holding of other Federal companies), under the coordination of the Ministry of Mines and Energy, launched an ambitious program, "*Luz no Campo"* ("Light in the Countryside"), to finance the electrification of one million rural consumers over a three-year period exclusively through grid extension.

In April 2002, the Brazilian Congress passed Law 10438, which provided for the reduction of tariffs to low-income consumers, the establishment of targets for concessionaires, and the granting of permission to permit holders to provide full coverage. The law also created a national fund, the Energy Development Account (*CDE - Conta de Desenvolvimento Energético*), to promote universal access and use of innovative sources of energy.

Despite the help of the *CDE*, huge investments are required from the distributors. The income loss from defaults on energy bills is one the main concerns of distributors, as this loss reduces the distributor's capacity to invest. Consequently, the universal access targets defined by *ANEEL* may become increasingly difficult to achieve.

- ***"PRODEEM"***

The "*Programa de Desenvolvimento Energético de Estados e Municípios" (PRODEEM,* "Energy Development of States and Municipalities Program") is the main government-sponsored program that aims to promote off-grid electrification of villages. Established by a Presidential Decree in 1994, *PRODEEM* is sponsored by international donors and is implemented mainly through Brazilian utilities. It

[8] Goldemberg, J. *et al.* (2004). *Expanding the Access to Electricity in Brazil.* Global Network on Energy for Sustainable Development.

[9] CCC stands for "*Conta Consumo de Combustível*". The account was established by the Brazilian government to promote efficient use of fuel oil in isolated systems.

consists of several pilot off-grid electrification initiatives using photovoltaic (PV), wind or hybrid systems, and also conventional fossil fuels in remote villages.

- ***"Luz Para Todos"***

In November 2003 the Brazilian Government announced the "*Luz para Todos"* ("Light for All") Program to supply electricity throughout Brazil to 12 million people as yet unconnected to any transmission grid. The main objective of *Luz para Todos* is social inclusion through access to electricity supply. The program will be implemented through partnerships between the Federal Government, the state governments and the concessionaires.

The participation of the project activity scenario as well as the alternatives scenarios in any of the above schemes is reflected in the investment analysis carried out in sub-step 2b-Option II.

Sub-step 2a. Determine the appropriate analysis method

The CDM project activity generates in comparison with the all other alternatives no financial or economic benefits other than the CDM related income. For that reason investment comparison analysis will be applied.

Sub-step 2b. – Option II – Investment comparison analysis

A study to compare all four scenarios was carried out.

Financial variables used were EBITDA (Earning before interest taxes depreciation and amortization), earnings, and NPV.

EBITDA – please, refer to Sub-step 2c. (Figure 4).

Earnings – please, refer to Sub-step 2c. (Figure 3).

NPV - please, refer to Sub-step 2d. (**Error! Reference source not found.**Table 5 and Table 6).

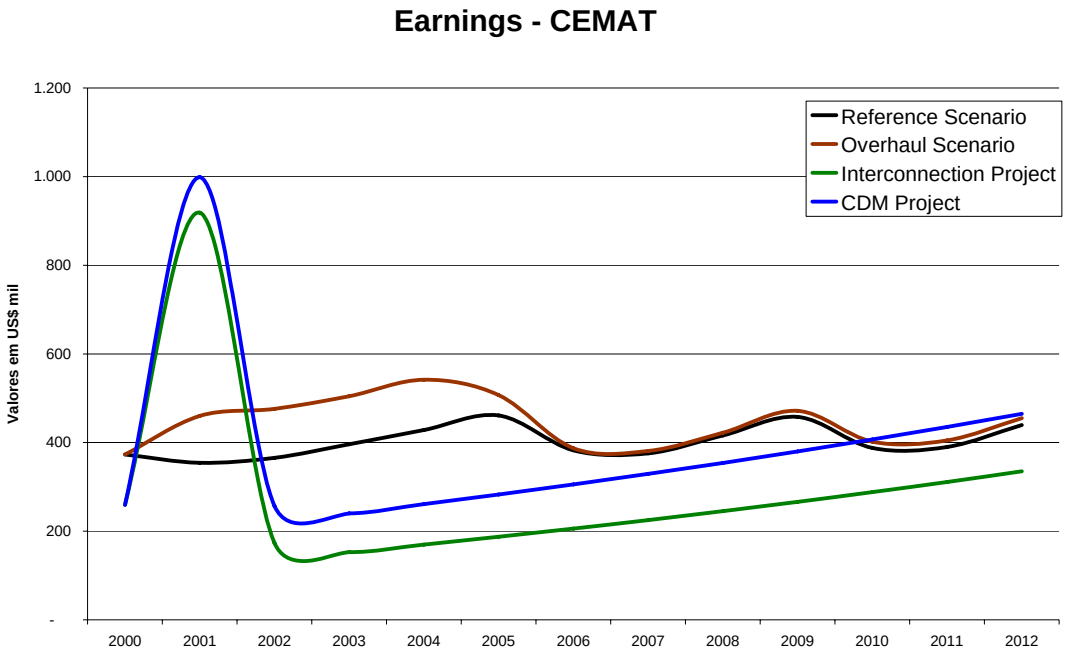
Sub-step 2c. Calculation and comparison of financial indicators

All scenarios will deliver the same energy output necessary for Grupo Rede to fulfill its current contractual obligations in regards to energy supply to the region. In the next sections we will show that in the short run, regardless of the efficiency and reliability gains afforded by the Interconnection project, the Reference and the Overhaul scenarios are financially more attractive when compared with the Grupo Rede CDM Interconnection project. However, by 2007 the Grupo Rede Interconnection CDM project will marginally improve the company's earnings (Figure 3) when compared with the Reference and Overhaul Scenarios (except for the CELTINS case study if considered individually).

Grupo Rede has at least two alternatives to the interconnection project (with or without the CDM incentives) as described above: the Reference Scenario and the Overhaul Scenario. Both alternatives are financially more attractive to the company in the short run albeit riskier for the following reasons:

1. Market Expansion: Increasing market penetration in isolated communities with transmission lines is more efficient than building thermal power plants. Moreover, transmission lines are built at once whereas thermal plants require dedicated managerial effort for each project. In sum, transmission lines increase the company's efficiency to expand into new markets.
2. Operation and Maintenance: Transmission lines are operated remotely and require standardized maintenance whereas thermal plants are of different sizes and thus require specific operation and maintenance practices. Also, fuel supply to isolated communities is burdensome in the

rainy season that typically lasts an average of six months. Therefore, grid connected transmission lines increase reliability of Rede's electricity supply services.



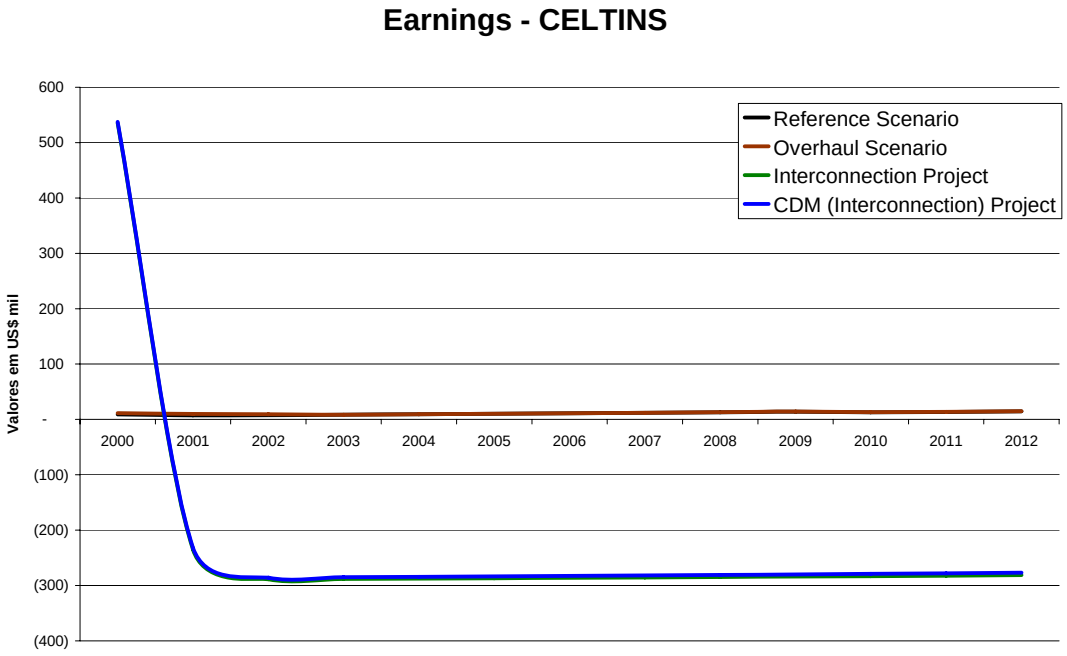
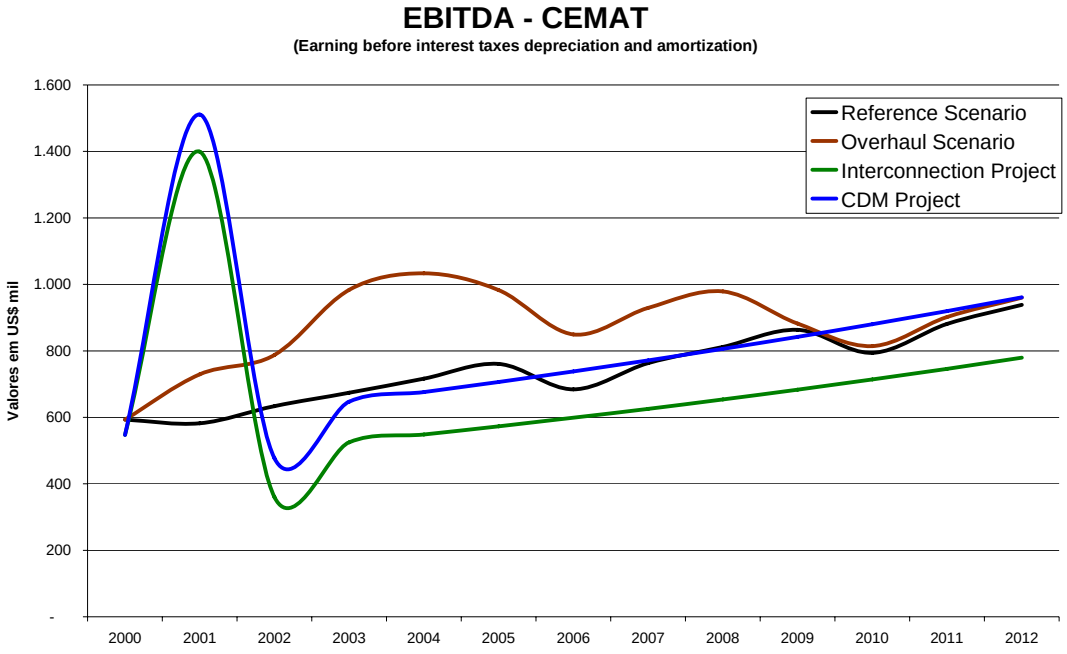


Figure 3 – Earnings for each utility case study

However, at the time, of project inception and in spite of the efficiency and reliability aspects of utilizing transmission lines, an Investment Comparison Analysis of the available alternatives to Grupo Rede showed that in the short run, the company is better off choosing either the Reference Scenario or the Overhaul Scenario. This happens basically due to the following reasons:

1. Revenues from the CDM Interconnection Project are marginally higher than to the revenues from the Reference Scenario and from the Overhaul Scenario, the latter being compensated by payments made by the federal government from the CCC account.
2. Operational and Maintenance Expenses are much higher for the Interconnection Project. The major reason for the difference between the Overhaul Scenario and the Interconnection Project deriving from the depreciation of the Transmission Lines, the cost of electricity purchased from the national grid and insurance payments.

Within this context, EBITDA for the CDM Interconnection Project is marginally lower than EBITDA for both the Reference and the Overhaul Scenarios until 2012 (Figure 4). The graph shows that in 20122006, EBITDA for the CDM project will exceed those of the current project alternatives considered by Grupo Rede. Furthermore, in the absence of CDM, Grupo Rede would have no incentive to support the Interconnection project as shown in the same graph since the Reference and the Overhaul scenarios will be financially more attractive when compared with the Grupo Rede Interconnection Project in the long run (again, except for the CELTINS case study if considered individually). It is important to observe again that the CELTINS CDM Interconnection project is not financially more attractive compared with the Reference and the Overhaul scenarios; however CELTINS CDM project represents less than 10% of the Grupo Rede CDM Interconnection project.



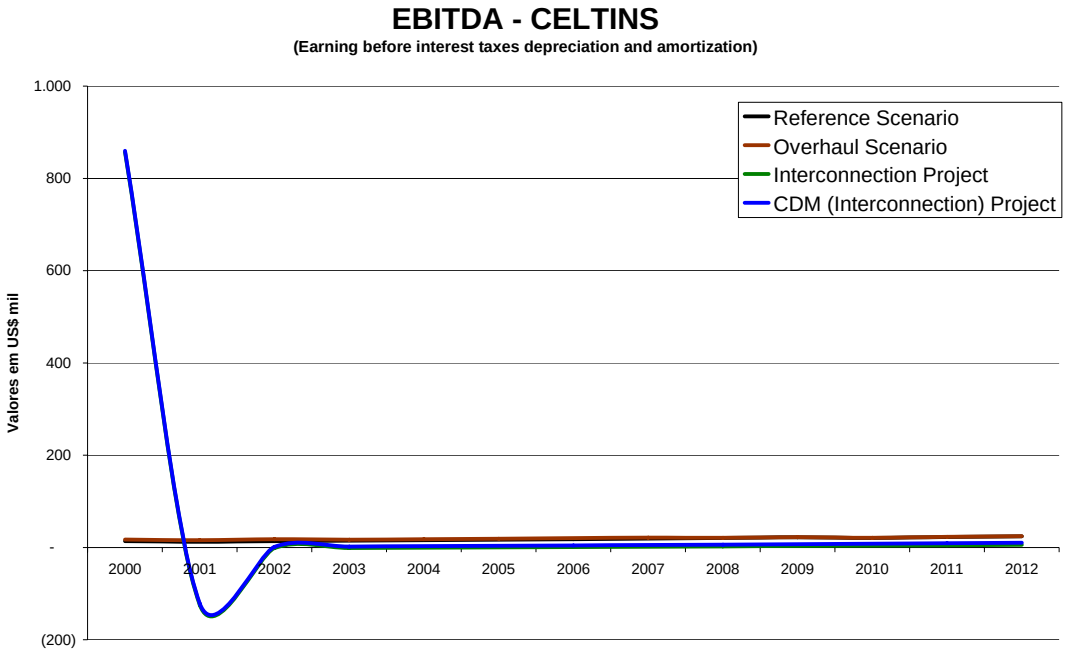


Figure 4 – EBITDA for each utility case study

It is interesting to note that in spite of financial incentives from federal government - i.e. long term loans covering 100% of investment necessary to build the transmission lines, consolidated financial results for the Interconnection project are worse than those of the Reference and Overhaul Scenarios. This situation arises from the contractual aspects pertaining to the concession contract which regulates Grupo Rede's services. In simple terms, the Return on Equity of any electricity utility in Brazil is capped according to its Weighted Average Cost of Capital applied to a global Capital Asset Pricing Model using Brazil's crediting rating. In other words, electricity tariffs are set at a level to compensate for the company's cost of capital and industry risk. This inventive mechanism to compensate for the utility's services guarantees that efficiency gains are passed on to the consumer by means of limiting tariff increases above inflation. For further information on the tariff adjustment mechanism please check, for example the technical report "*Nota Tecnica: Conceitos Econômicos para Reajuste e Revisão Tarifária*" published in 2000 by ANEEL, the federal agency in charge of the electricity industry in Brazil. Under the current regulatory framework granting the transmission lines to Grupo Rede for free actually reduces the company's total earnings as shown in Figure 3. In the long run however, as per the same graph, total earnings from the CDM project will exceed those of the current alternatives to Grupo Rede.

The Grupo Rede CDM Interconnection project is additional because at the time of project inception and in spite of the efficiency and reliability aspects of utilizing transmission lines, an Investment Comparison Analysis of the available alternatives to Grupo Rede showed that in the short run, the company is better off choosing either the Reference Scenario or the Overhaul Scenario. An Investment Comparison Analysis shows that by mid 2006 the Grupo Rede CDM project will marginally improve the company's Earnings when compared with the Reference and Overhaul Scenarios. By 2012, EBITDA for the CDM project will exceed those of the current project alternatives considered by Grupo Rede. Likewise, under the current regulatory framework total earnings from the CDM project will exceed those of the current alternatives to Grupo Rede after 2012. In sum, in the absence of CDM, the Grupo Rede Interconnection

project would be a riskier and less attractive investment for the company when compared with the alternative Reference and Overhaul scenarios.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

- Rising electricity and fuel costs
- Reducing electricity and fuel costs

Those parameters were selected as being the most likely to fluctuate over time. Fuel costs influence Reference and Overhaul Scenarios. Electricity costs have an effect on Interconnection and CDM Projects. Financial analyses were performed altering each of these parameters by 15%, and assessing what the impact on the project' earnings NPV would be (see all calculations in the spreadsheets appended to the PDD). As it can be seen, the CDM project NPV remains lower than the Reference and Overhaul Scenario.

Scenarios	**%**	**NPV (in thousand)**	**% compared to original**
Reference Scenario			
Original		2,197	
Rising electricity costs and **fuel costs**	15	2,056	-6,42
Reducing electricity costs and **fuel costs**	15	2,338	6,42
Overhaul Scenario			
Original		2,505	
Rising electricity costs and **fuel costs**	15	2,372	-5,31
Reducing electricity costs and **fuel costs**	15	2,637	5,27
Interconnection Project			
Original		1,748	
Rising **electricity costs** and fuel costs	15	1,366	-21,85
Reducing **electricity costs** and fuel costs	15	2,129	21,80
CDM (Interconnection) Project			
Original		2,200	
Rising **electricity costs** and fuel costs	15	1,819	-17,32
Reducing **electricity costs** and fuel costs	15	2,582	17,36

Table 5 – Sensitivity analysis CEMAT

Scenarios	**%**	**NPV (in thousand)**	**% compared to original**
Reference Scenario			
Original		55	
Rising electricity costs and **fuel costs**	15	53	-3,64
Reducing electricity costs and **fuel costs**	15	58	5,45
Overhaul Scenario			
Original		61	
Rising electricity costs and **fuel costs**	15	58	-4,92

Reducing electricity costs and **fuel costs**	15	63	3,28
Interconnection Project			
Original		-845	
Rising **electricity costs** and fuel costs	15	-857	1,42
Reducing **electricity costs** and fuel costs	15	-832	-1,54
CDM (Interconnection) Project			
Original		-827	
Rising **electricity costs** and fuel costs	15	-840	1,57
Reducing **electricity costs** and fuel costs	15	-815	-1,45

Table 6 – Sensitivity analysis CELTINS

Even though the CER revenue increases the NPV of the CDM Project compared to Interconnection Project, it brings the additional benefit of revenue in hard currencies (US dollars). That revenue allows the investors to hedge against currency devaluation risk. Moreover, the CER revenue in hard currency could be discounted at applicable lower interest rate, thus increasing the project leverage.

Finally, it is important to note that fuel costs have a lower effect on reference and overhaul scenarios when compared to the impacts electricity costs have on interconnection and CDM projects (see results in the Columns "% compared to original" in the previous Tables). This shows how CDM benefits are important for the Project since they contribute to make the project less unstable than the interconnection project without CDM benefits.

Step 3. Barrier analysis

For the reasons explained above (item 2., section B.4) the step is not used.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project:

Electricity generation in Brazil remained stated-owned until the '90s under a centralized and long-term planned management model.

At the beginning of the 1990-decade state companies were facing financial difficulties due to high debt levels, as a result of the rising interest rates and the high leverage structure. The government however could not bring forth new investments so it started to seek alternatives to expand the system. The solution found was the gradual opening of the market to private investors, as well as the privatization of the stated-owned companies.

The first T&D Company privatized in Brazil was CELTINS in 1989 and the privatization contract included the expansion of the supply to various cities, which would not be carried out under economic constraints. The main driver was social, i.e., to increase the electric power supply in the recently created state (the state of Tocantins was created in 1988). The other project participant was privatized in 1997 (CEMAT) under similar circumstances.

Strictly speaking there are no 100% similar activities to the proposed project, i.e., extension of the interconnected grid to sparse and distant isolated systems[10] in a privatized environment (market rational).

The only relatively similar situation can be found in the state of Rondonia but with one fundamental difference, the local T&D (CERON) Company is still publicly owned and, as previous similar examples in the area of the project activity from 1989 to 2000, are 100% financed with government funds does not necessarily pursue financial returns.

Sub-step 4b. Discuss any similar options that are occurring

The regulatory framework of the electricity sector in Brazil establishes that distribution companies are compensated for the economic value of the assets they carry in their balance sheets. In that regard, Grupo Rede is the only private Brazilian electricity company which has replaced diesel oil plants with the interconnected grid thus reducing their asset base. Therefore, the common practice analysis does not apply to Rede operations from the standpoint of the company's financial returns.

Step 5 – Impact of CDM Registration

Diesel oil consumed for electricity generation in isolated areas is subsidized through the Fuel Consumption Account (CCC). Without absolutely any change in the previous configuration of the isolated systems under evaluation, the existing diesel-fired power generation is eligible to remain receiving the incentives from CCC without any risk up to 2020 (the incentives are calculated to make the generation with diesel feasible).

The assessment of additionality carried out above demonstrates that the investment in the project activity without the incentive of the CDM is a risky entrepreneurship. With the incentive of the CDM it still is. In other words, without the incentives from the CDM the most likely scenario is to keep the diesel power plants in operation and the system isolated.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions are calculated based on the isolated system at the time of the interconnection to the grid. The lifetime decrease of the existing equipments and potential demand increase must be taken into account.

The methodology considers for the calculation of the project emissions the determination of the emission factor for the relevant grid to which the project activity is connected as the core data to be determined according to the concept of combined margin emission factor from ACM0002.

Emission related to SF_6 use and potentially higher transmissions losses are taken into account.

Leakage related to deforestation in the construction of interconnection lines is estimated and, if higher than 1% of the estimated emission reduction of the project activity in the first crediting period must be taken into account.

[10] As a matter of comparison the areas of the State of Mato Grosso and Tocantins are 906,807 km^2 (population: 2,803,274 in 2005) and 278,421 km^2 (population: 1,305,728 in 2005) respectively, while, for example, Germany's area is 357,050 km^2 (population: 82,336,000 in 2006).

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

Data / Parameter:	1 - $COEF_{i,j}$
Data unit:	tCO_2/mass or volume unit
Description:	CO_2 emission coefficient of each fuel type *i* consumed by the power plants *j* of the isolated system in the baseline scenario. This is estimated as product of carbon content of the fossil fuel per unit energy, NCV, and oxidation factor.
Source of data used:	Latest local statistics
Value applied:	2.686 kgCO2/liter of diesel oil
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data. Default data and literature statistics are used to check the local data.
Any comment:	

Data / Parameter:	2 - $COEF_{i,IMPORTS}$
Data unit:	tCO_2/mass or volume unit
Description:	CO_2 emission coefficient of each fuel type *i* (if imports occur)
Source of data used:	Latest local statistics
Value applied:	0 (zero)
Justification of the choice of data or description of measurement methods and procedures actually applied :	For conservative reasons.
Any comment:	

Data / Parameter:	3 - $COEF_{i,}$
Data unit:	tCO_2/mass or volume unit
Description:	CO_2 emission coefficient of each fuel type *i*
Source of data used:	Latest local statistics
Value applied:	Massive amount of data, individual values for each plant of the grid, raw data available for validation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data. Default data and literature statistics are used to check the local data.
Any comment:	

Data / Parameter:	4 – $GEN_{j, bl}$
Data unit:	MWh
Description:	Electricity supplied to the isolated system in the baseline scenario by power generation source *'j'* during the last three years before the beginning of the project activity.
Source of data used:	Historic records based on electricity meters recording.
Value applied:	Data used in the calculations are presented in the spreadsheets appended to the PDD.

Justification of the choice of data or description of measurement methods and procedures actually applied :	Directly measured and publicly available official data.
Any comment:	

Data / Parameter:	5 - $F_{i,j,bl}$
Data unit:	Mass of volume
Description:	Amount of fossil fuel consumed by each power plant of the isolated system in the baseline scenario during the last three years before the beginning of the project activity.
Source of data used:	Historic records of the isolated system
Value applied:	Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Directly measured and publicly available official data.
Any comment:	

Data / Parameter:	6 - LT_{avg}
Data unit:	years
Description:	Average remaining lifetime of the equipments estimated using formula 4 defined in the baseline emission section.
Source of data used:	Project activity
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Estimation made using the historic of similar equipments and the experience of the project activity.
Any comment:	

Data / Parameter:	7 - EF_{BAT}
Data unit:	tCO_2/MWh
Description:	Baseline emission factor (in tCO_2e/MWh) for the most efficient kind of technology displaced in the isolated system.
Source of data used:	Project activity
Value applied:	0.6 tCO_2/MWh
Justification of the choice of data or description of	The best available operating machine in the areas operated by Grupo Rede has an emission factor of around 0.7 tCO_2/MWh. In theory and at optimal conditions the

measurement methods and procedures actually applied :	emission could be reduced up to 0.6 tCO_2/MWh. In real circumstances such number is not achievable at the existing conditions of the isolated subsystems interconnected (0.763 tCO_2/MWh is the smallest emission factor found in the equipments substituted) but for conservative reasons the theoretical number is used.
Any comment:	

Data / Parameter:	8 - $EF_{bl,ini}$
Data unit:	tCO_2/MWh
Description:	Baseline emission factor (in tCO_2e/MWh) of the isolated electricity system at the time of the interconnection to the grid.
Source of data used:	Project activity
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculation made using directly measured and publicly available official data.
Any comment:	

Data / Parameter:	9 - $A_{,def}$
Data unit:	hectares
Description:	Area of land deforested in the construction of the interconnection lines.
Source of data used:	Project activity
Value applied:	Large amount of data (individual data/parameter for each transmission line). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Not all transmission lines demanded deforestation for its construction. When applicable, documented evidence of the deforested area (environmental impact assessment reports) is presented.
Any comment:	

Data / Parameter:	10 - *TL*
Data unit:	%
Description:	Additional transmission losses
Source of data used:	Project activity
Value applied:	1.40% for CEMAT and 1.00% for CELTINS
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured data and simulation were used to determine weighted average additional transmission losses in each subsystem.
Any comment:	

Data / Parameter:	11 - S_{ini}
Data unit:	MW
Description:	Equipments power supply capacity in the isolated system at the time of the interconnection to the grid.
Source of data used:	Project activity
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	12 – $LT_{i\ ini}$
Data unit:	Years
Description:	Lifetime of equipment '*i*' at the time it is replaced
Source of data used:	Project activity
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Estimation made using the historic of similar equipments and the experience of the project participants.
Any comment:	

Data / Parameter:	13 - L_c
Data unit:	tCO_2/hectare
Description:	Carbon stock per area (above ground, below ground, soil carbon, litter and dead biomass)
Source of data used:	Primeiro Inventário Brasileiro de Emissões Antrópicas de Gases de Efeito Estufa. Emissões e Remoções de Dióxido de Carbono Por Conversão de Florestas e Abandono de Terras Cultivadas. Ministério da Ciência e Tecnologia, Brasília (2006).
Value applied:	15.39 tC/ha = 56.43 tCO_2/ha ("savana arbórea aberta")
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	14 - EF_p (from ACM0002)
Description:	CO_2 emission factor of the grid (ex-ante vintage selected)
Source of data used:	Project activity (calculated based on information from producers, dispatch centers, electricity agencies or literature).
Value applied:	S-SE-MW grid: EF_p = 0.261 tCO_2/MWh N-NE grid: EF_p = 0.077 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	15 - $EF_{OM,y}$ (from ACM0002)
Data unit:	tCO_2/MWh
Description:	CO_2 operating margin emission factor of the grid
Source of data used:	Project activity (calculated based on information from producers, dispatch centers, electricity agencies or literature).
Value applied:	S-SE-MW grid: $EF_{OM,p}$ = 0.435 tCO_2/MWh N-NE grid: $EF_{OM,p}$ = 0.104 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	16 - $EF_{BM,y}$ (from ACM0002)
Data unit:	tCO_2/MWh
Description:	CO_2 build margin emission factor of the grid
Source of data used:	Project activity (calculated based on information from producers, dispatch centers, electricity agencies or literature).
Value applied:	S-SE-MW grid: $EF_{BM,p}$ = 0.087 tCO_2/MWh N-NE grid: $EF_{BM,p}$ = 0.049 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	17 - $F_{i,j}$ (from ACM0002)
Data unit:	Mass of volume
Description:	Amount of fossil fuel consumed by each power plant
Source of data used:	Latest local statistics
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of	Publicly available official data.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	18 - $GEN_{i/j/k,y}$ (from ACM0002)
Data unit:	MWh/a
Description:	Electricity generation of each power plant
Source of data used:	Latest local statistics
Value applied:	Large amount of data (individual data/parameter for each power plant). Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

Data / Parameter:	19 - $GEN_{i/j/k,y\ IMPORTS}$ (from ACM0002)
Data unit:	MWh
Description:	Electricity imports quantity to the project electricity system
Source of data used:	Latest local statistics
Value applied:	Large amount of data. Data used in the calculations are presented in the spreadsheets appended to the PDD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Publicly available official data.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The baseline emission factor ($EF_{bl,\ ini}$) of the isolated system at the time of the interconnection to the grid is calculated as the generation weighted average emissions per electricity unit (tCO_2/MWh) in the most recent three years before the connection to the grid of all generating units displaced in the isolated system using Equation 1:

$$EF_{bl,ini} = \frac{\sum_{i,j} F_{i,j,bl} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,bl}} \qquad \textbf{Equation 1}$$

Where:

- $\sum_{i,j} F_{i,j,bl}$ is the amount of fuel i (in mass or volume unit) consumed by relevant power sources j in year(s) y in the baseline scenario,

- $COEF_{i,j}$ is the CO_{2e} coefficient of fuel *i* (tCO_2e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y* in the baseline scenario and,
- $\sum_j GEN_{j,bl}$ is the electricity (MWh) delivered to the isolated system by source *j* in the baseline scenario.

The $EF_{bl,\,ini}$ is a fixed *EF* per MWh and remains constant for every year in the crediting period. The *EF* should be calculated using a 3-year average, based on the most recent statistics available at the time of CDM-PDD submission.

$$S_{yp} = S_{ini} - S_{ini} \div \left(2 \cdot LT_{avg}\right) \cdot yp \text{ , if } yp < 2 \cdot LT_{avg} \quad \textbf{Equation 2}$$

$$S_{yp} = 0 \text{ , if } yp \geq 2 \cdot LT_{avg} \quad \textbf{Equation 3}$$

$$LT_{avg} = \left(\sum S_{ini} \cdot LT_{i,ini}\right) \Big/ \sum S_{ini} \quad \textbf{Equation 4}$$

Where:

- S_{yp} is the electricity supplied to previously isolated system (in MW_{med}) if its equipments were not replaced at the end of their lifetime in project year *yp*,
- S_{ini} *i*s the supply capacity of the isolated system (in MW_{med}) at the time of the interconnection to the grid,
- *yp* is the number of years since the interconnection to the grid (project year),
- LT_{avg} is the average remaining lifetime of the equipments used in the isolated system at the time of the interconnection,
- LT_{ini} is the lifetime of equipment '*i*' (in years) used in the isolated grid, estimated at the time of isolated system being connected to the grid.

The technology used in all the displaced isolated systems is internal combustion engines using diesel as fuel. The equipments displaced had a wide range of emissions factors (from 0.763 to 0.991 tCO_2/MWh). For the project activity the best available technology in the region[11]:

- $EF_{bl,BAT} = 0.6\ tCO_2/MWh$

For the calculation of the baseline emission factor, the following equations have to be used.

$$EF_{bl,yp} = EF_{bl} \text{ , if } S_{yp} > 0 \text{ and } S_{yp} > D_{yp} \quad \textbf{Equation 5}$$

$$EF_{bl,yp} = [EF_{bl} \times S_{yp} + EF_{BAT} \times (D_{yp} - S_{yp})] \div D_{yp} \text{ , if } S_{yp} > 0 \text{ and } S_{yp} < D_{yp} \quad \textbf{Equation 6}$$

$$EF_{bl,yp} = EF_{BAT} \text{ , if } S_{yp} = 0 \quad \textbf{Equation 7}$$

Where:

[11] As reference, the Brazilian CCC program used in 2005 (see ANEEL Resolution 146 – 14.02.2005), 4 years after the project start date, the standard desired parameter 0.3 liters of diesel per kWh (equivalent to an emission factor of 0.792 tCO_2/MWh).

- $EF_{bl,yp}$ is the baseline emission factor (in tCO_{2e}/mass or volume unit of the fuel) of the project (previously isolated system at year *yp*),
- D_{yp} is the electricity demand of the project (previously isolated system at year yp)
- EF_{BAT} is the baseline emission factor (in tCO_{2e}/mass or volume unit of the fuel) for the kind of technology displaced in the isolated system

The baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{bl,yp}$ in tCO_2/MWh), times the electricity supplied by the grid to the project activity (EG_y in MWh).

$$BE_y = EG_y \cdot EF_{bl,yp} \qquad \textbf{Equation 8}$$

Where:

- EG_y is electricity supplied to the isolated area in the year *yp* (MWh).

The emissions from the project activity are those resulting from electricity generated due to the project activity by the operation of existing grid-connected power plants and by the addition of new generation sources. Additionally, emissions related to SF_6 use and potentially higher transmission losses than the grid average is taken into account.

For the calculation of the project emissions, the combined margin emission factor of the interconnected grid is to be used as in ACM0002 with a default value of 0.5 for the weights.

$$EF_p = \omega_{OM} \cdot EF_{OM,y} + \omega_{BM} \cdot EF_{BM,y} \qquad \textbf{Equation 9}$$

Emissions related to SF6 used in the new equipments of the project activity during the year y ($PE_{SF6,y}$), in tonnes of CO2e, are calculated as follows:

$$PE_{SF6,y} = M_{SF6,y} \cdot GWP_{SF6} \qquad \textbf{Equation 10}$$

Where:

- $M_{SF6,y}$ is the average quantity of SF_6 leaks in the equipments during year y in tonnes of SF_6. The value shall be determined using the equipment manufacturer's information and/or amount of SF_6 injected in the equipments during maintenance to maintain their operation standards.
- GWP_{SF6} is the global warming potential of sulphur hexafluoride (23,900 is the value for the first commitment period).

With the above, the project emissions are calculated as follows:

$$PE_y = (EG_y \cdot EF_p) \cdot (TL+1) + PE_{SF6,y} \qquad \textbf{Equation 11}$$

Where:

- *TL* is the incremental transmission losses of the project activity over and above those in the isolated area.

Possible emissions potentially giving rise to leakage in the context of electrification projects are emissions arising due to transmission lines construction.

Regarding deforestation, the net change in aboveground biomass is the difference between the density (t dm/ha) of aboveground biomass on the forest prior to the conversion, and the density of aboveground living biomass (t dm/ha) remaining as living vegetation, after clearing. The climatic zone of

most of the project area is mostly classified as "savana arbórea aberta" according to Brazilian National Communication[12] In this case, $L_C = 15.39\ tC/ha = 15.39 \cdot (44/12) = 56.43\ \ tCO_2e/ha$.

$$LE_1 = A_{def} \cdot L_C \qquad \textbf{Equation 12}$$

Where:

- L_{E1} is the leakage emissions to be accounted in the first year of project crediting period.
- A_{def} is the area of land deforested in hectares
- L_C is the carbon stock per unit area in tonnes of CO_2 per hectare.

The project activity mainly reduces carbon dioxide through substitution of isolated systems electricity generation with fossil fuel fired power plants by electricity supplied by an interconnected grid. The emission reduction (ER_y, in tCO_2) by the project activity during a given year *y* is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \qquad \textbf{Equation 13}$$

All data used in the calculations are presented in the 6 spreadsheets accompanying the PDD (one for the consolidated emission reductions calculations, three for the emissions reductions calculations at each, CELTINS and CEMAT, and two for the electricity emission factor calculations of the Brazilian grid).

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

Years	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)
Year 1 - (2001)	5,283	16,291	39,150	(28,143)
Year 2 - (2002)	16,803	50,988	0	34,185
Year 3 - (2003)	21,873	66,279	0	44,406
Year 4 - (2004)	25,044	74,975	0	49,931
Year 5 - (2005)	25,417	75,298	0	49,881
Year 6 - (2006)	56,810	173,354	0	116,544
Year 7 - (2007)	56,810	172,216	0	115,406
Total (tonnes of CO_2e)	208,040	629,401	39,150	382,211

Table 7 – Estimation of GHG emission by sources

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

B.7.1 Data and parameters monitored:

Data / Parameter:	1 - EG_y
Data unit:	MWh
Description:	Electricity supplied by the grid to the project activity
Source of data to be used:	Project activity

[12] *Primeiro Inventário Brasileiro de Emissões Antrópicas de Gases de Efeito Estufa. Emissões e Remoções de Dióxido de Carbono Por Conversão de Florestas e Abandono de Terras Cultivadas.* Ministério da Ciência e Tecnologia, Brasília (2006).

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Large amount of data. Data used in the calculations are presented in the spreadsheets appended to the PDD.
Description of measurement methods and procedures to be applied:	Directly measured and publicly available official data. Distribution of electricity in Brazil is a government concession and is regulated by the Brazilian Electricity Agency (ANEEL acronym from the Portuguese "*Agência Nacional de Energial Elétrica"*). Measurement methods and procedures carried out at Grupo Rede CDM Project are in accordance with legal and regulatory requirements determined by ANEEL (see ANEEL, Resolução Normativa Nº 163, de 1º de Agosto de 2005).
QA/QC procedures to be applied:	The electricity delivered to the previous isolated systems is cross-checked in the general balance of all meters at each distributor.
Any comment:	

Data / Parameter:	2 - $M_{SF6,\,y}$
Data unit:	tonnes of SF_6
Description:	SF_6 leaks in the equipments during year y in
Source of data to be used:	Project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.008 tonnes of SF_6 yearly.
Description of measurement methods and procedures to be applied:	Directly measured data while recharging equipments.
QA/QC procedures to be applied:	The project's inventory indicates a total amount of around 113 kg of SF_6. The operating pressure of all equipments using SF_6 is checked annually and if necessary, i.e., if the operating pressure is below the minimum required, the equipment is recharged. The procedure is documented and archived in the companies' software management tool. During verification the documented charges will be used to determine $M_{SF6,\,y}$. In the PDD $PE_{SF6,\,y}$ is estimated assuming 10% leakage of the total amount of SF_6 yearly (8 kg or 0.008 tonnes of SF_6).
Any comment:	

Data / Parameter:	3 - Public policies
Data unit:	
Description:	Verification and evaluation of financial and institutional arrangements that could help the implementation of the project.
Source of data to be used:	Project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See item B.5 above.
Description of measurement methods and procedures to be applied:	Literature research.
QA/QC procedures to be applied:	Publicly available official data.

Any comment:	

Data / Parameter:	4 - D_{yp}
Data unit:	MW
Description:	Power demand of the project activity scenario
Source of data to be used:	Project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Large amount of data. Data used in the calculations are presented in the spreadsheets.
Description of measurement methods and procedures to be applied:	Directly measured or publicly available official data. Distribution of electricity in Brazil is a government concession and is regulated by the Brazilian Electricity Agency (ANEEL acronym from the Portuguese "*Agência Nacional de Energial Elétrica"*). Measurement methods and procedures carried out at Grupo Rede CDM Project are in accordance with legal and regulatory requirements determined by ANEEL (see ANEEL, Resolução Normativa N^{o} 163, de 1^{o} de Agosto de 2005).
QA/QC procedures to be applied:	The electricity delivered to the previous isolated systems is cross-checked in the general balance of all meters at each distributor.
Any comment:	Based o the most recent statistics available at the time of CDM-PDD submission. Obtained from the project participants (cross-check with official data possible).

Data / Parameter:	5 - S_{yp}
Data unit:	MW
Description:	Power supply of the displaced power plants in isolated area in the baseline scenario
Source of data to be used:	Project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Large amount of data. Data used in the calculations are presented in the spreadsheets appended to the PDD.
Description of measurement methods and procedures to be applied:	Calculated using equation 2 and 3 o the approved methodology.
QA/QC procedures to be applied:	Not applicable.
Any comment:	Based on the average lifetime of the equipments.

B.7.2 Description of the monitoring plan:

In order to adequately calculate project and baseline emissions, the methodology requires from the project participants monitoring of the following data:

- From the project activity: electricity generation, SF_6 use (injected in the equipments to maintain their operation standards).
- Financing and/or institutional arrangements that could help the project to overcome identified barriers during the crediting period.

All necessary operational and management structures necessary to monitor emissions reductions and any leakage effects generated by the project activity are common practice in the operation of the Grupo Rede CDM Project.

Furthermore, distribution of electricity in Brazil is a government concession and is regulated by the Brazilian Electricity Agency (ANEEL acronym from the Portuguese "Agência Nacional de Energial Elétrica"). Measurement methods and procedures carried out at Grupo Rede CDM Project are in accordance with legal and regulatory requirements determined by ANEEL (see ANEEL, Resolução Normativa No 163, de 1o de Agosto de 2005).

Data will be collected and consolidated by the special projects department of Grupo Rede (at the headquarter of the company in São Paulo), with the support of Ecoinvest Carbon, for the preparation of the monitoring reports

All data will be electronically archived at least during the whole crediting lifetime of the project plus two years after that.

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

Date of completion: 03/02/2007

Responsible person(s)/entity(ies)

Company:	Ecoinvest Carbon
Address:	Rua Padre João Manoel, 222
Zip code + city address:	01411-000 São Paulo, SP
Country:	Brazil
Contact person:	A. Ricardo J. Esparta
Job title:	Director
Telephone number:	+55 (11) 3063-9068
Fax number:	+55 (11) 3063-9069
E-mail:	esparta@ecoinvestcarbon.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/01/2001

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

30y-0m

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

C.2.1. Renewable crediting period

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

01/01/2001

C.2.1.2. Length of the first crediting period:

7y-0m

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

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The main environmental impacts of grid extension are related to clearing-road activities and transmission line construction. In the Grupo Rede CDM Project transmission lines are being preferably built using existing roadways to minimize environmental impacts (some of the lines, mainly the 34.5 kV lines, demanded no deforestation at all).

Grupo Rede CDM Project participants are aware about all applicable environmental laws and regulations and they have been fulfilling all environmental demands. All necessary environmental and operation licenses are already issued and are available upon request. Copies of all licences were supplied to the DOE during the validation process.

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

Brazil, the host Party of this project, is fully aware about the importance of environmental impact studies as well as Grupo Rede CDM Project that actually states social corporate responsibility is part of its activities. It is also committed to the environment, which has a huge biodiversity in their areas of actuation, and to the people of these communities through social programs.

Mitigation plans were/are/will be developed in order to deal with any environmental impact which was/is/will be expected in environmental impact studies for this project activity (copies of all environmental licenses/permits demanded for the implementation of the lines were supplied for the validation).

Actually, some benefits were observed after mitigation measures were implemented. Transmission lines used to be built without any protection/signalization. After the lines installation bird's deaths were reported. After some changes in the line, such as better protection/signalization, there are no registered bird deaths. Additional documents and statistics related to CEMAT and CELTINS environmental programs are available under request.

SECTION E. Stakeholders' comments

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

The Brazilian Designated National Authority for the CDM (CIMGC, acronym from the Portuguese "*Comissão Interministerial de Mudança Global do Clima*"), under other requirements, demands the translation of the PDD into Portuguese, the compulsory invitation of selected local stakeholders, the validation report issued by an authorized DOE (CIMGC resolution number 1, September 11, 2003), under other requirements, in order to provide the letter of approval.

The project participants sent the invitation letters to the selected local stakeholders in December 2006 and January 2007 order to invite their comments while the PDD of the project is open for comments in the validation stage in the United Nations Framework Convention on Climate Change.

E.2. Summary of the comments received:

CIMGC requests from the project activities the start the local stakeholders' consultation process before validation. Thus, in addition to UNFCCC global stakeholders' comments process the project were be open for inputs from local stakeholders at the same time.

Local stakeholders defined in the CIMGC Resolution # 1 were directly invited by letters sent from 28 December 2006 to 1 February 2007.

Until 7 March 2007 (35 days after the last letter was sent) the project participants received no input to the local stakeholders' consultation process.

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

All demands received in the context of the environmental licensing and operation permits process were carefully evaluated and finally incorporated to the implementation of the project.

The project participants did not receive any input neither from to the (UNFCCC) global nor from the (CIMGC) local stakeholders' consultation process.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CELTINS - Companhia de Energia Elétrica do Estado do Tocantins
Street/P.O.Box:	Avenida Paulista, 2439 - 4º andar
City:	São Paulo
State/Region:	SP
Postfix/ZIP:	01311-936
Country:	Brazil
URL:	http://www.gruporede.com.br/celtins/
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Hirota
Middle Name:	
First Name:	Mituo
Mobile:	
Direct FAX:	+55 (11) 3060-9624
Direct tel:	+55 (11) 3066-2081
Personal E-Mail:	mituo.hirota@gruporede.com.br

Organization:	CEMAT - Centrais Elétricas Mato-Grossenses S. A.
Street/P.O.Box:	Avenida Paulista, 2439 - 4º andar
City:	São Paulo
State/Region:	SP
Postfix/ZIP:	01311-936
Country:	Brazil
URL:	http://www.gruporede.com.br/cemat/
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Hirota
Middle Name:	
First Name:	Mituo
Mobile:	
Direct FAX:	+55 (11) 3060-9624
Direct tel:	+55 (11) 3066-2081
Personal E-Mail:	mituo.hirota@gruporede.com.br

Organization:	Ecoinvest Carbon Brasil
Street/P.O.Box:	Rua Padre João Manoel, 222
City:	São Paulo
State/Region:	SP

Postfix/ZIP:	01411-000
Country:	Brazil
URL:	http://www.ecoinvestcarbon.com/
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Martins Jr
Middle Name:	de Mathias
First Name:	Carlos
Mobile:	
Direct FAX:	+55 (11) 3063-9068
Direct tel:	+55 (11) 3063-9069
Personal E-Mail:	cmm@ecoinvestcarbon.com

Annex 2 - INFORMATION REGARDING PUBLIC FUNDING

No public funding, including official development assistance, was or will be used in the Grupo Rede CDM Project.

Annex 3

BASELINE INFORMATION

All data used in the calculations are presented in the 6 spreadsheets accompanying the PDD (one for the consolidated emission reductions calculations, three for the emissions reductions calculations at each, CELTINS and CEMAT, and two for the electricity emission factor calculations of the Brazilian grid).

Annex 4

MONITORING INFORMATION

As of the procedures set by the “Baseline and monitoring methodology AM0045 – Grid connection of isolated electricity systems”.

The project will proceed with the necessary measures for the required monitoring. Together with the information produced by both ANEEL and ONS, it will be possible to monitor the power generation of the project and the grid power mix.