Eletrobras

Inventory of Greenhouse Gas Emissions

Base year 2009

november 2010

Eletrobras Companies

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Working Group on Greenhouse Gas Emissions – GT 3

Environmental Subcommittee – SCMA

Operation, Planning, Engineering and Environmental Committee – Copem

Superior Council of the Eletrobras System – Consise

SUPERIOR COUNCIL OF THE ELETROBRAS SYSTEM – CONSISE

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EXECUTIVE SUMMARY

The Inventory of Greenhouse Gas Emissions of the Eletrobras Companies (edition 2010) represents the fulfillment of the commitment to inventory their emissions annually, continuing the work that resulted in the *Inventory of Greenhouse Gas Emissions from Thermoelectric Power Plants (stationary sources) from 2003 to 2008,* the first historical series registering emissions from thermoelectric generation of the Eletrobras Companies.

In this document, the information corresponds to 2009 and covers the following gases that cause greenhouse gas emissions (GHG): carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and sulfur hexafluoride (SF_6). These emissions were calculated on the basis of the ten Eletrobras companies: CGTEE, Furnas, Chesf, Eletronorte, Eletronuclear, Eletrosul, Amazonas Energia, Itaipu, Cepel and Eletrobras (Holding Company).

The Inventory of GHG Emissions of the Eletrobras Companies follows IPCC methodology (2006) and GHG Protocol guidelines - a corporate accounting and reporting standard for greenhouse gas emissions, that is internationally recognized and the most widely used tool worldwide for its quantification.

GHG Emissions from Eletrobras Companies - base year 2009 (tCO2e)

COMPANY	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	Subtotal by Company	Percentage
CGTEE	1,455,780.37	341.91	N/A	27,651.11	58.54	1,483,831.93	20.14%
Chesf	14,442.19	1,685.46	49,010.88	N/A	129.72	65,268.25	0.89%
Furnas	1,945.35	2,189.84	110,511.60	N/A	714.44	114,736.71	1.57%
Eletronorte	1,616,283.47	N/av	51,300.00	N/A	88.21	1,667,671.68	22.63%
Eletronuclear	2,744.36	1,383.25	N/A	N/A	1,940.08	6,067.69	0.08%
Eletrosul	N/A	1,355.37	7,068.00	N/A	272.11	8,695.48	0.12%
Amazonas	3,997,292.46	1,441.57	3,971.76	N/A	N/av	4,002,705.79	54.33%
Itaipu	2.08	1,903.60	14,340.00	N/A	61.35	16,307.03	0.22%
Cepel	26.83	752.91	114.00	N/A	180.05	1,073.80	0.01%
Eletrobras *holding*	N/A	84.71	N/A	N/A	102.02	186.73	0.00%
SUBTOTAL	7,088,518.38	11,227.22	236,316.24	27,651.11	3,546.53	**TOTAL (tCO_2e)**	**7,367,259.48**
Percentage	96.22%	0.15%	3.21%	0.38%	0.05%		

Note: N/A = not applicable; N/av = not available

Total GHG emissions, corresponding to the sum total of all the companies, are 7,367,259.48 tCO_2e (tons of CO_2 equivalent). Of this total, the largest share comes from stationary sources[1] (large, medium and small-scale thermoelectric generation), namely 7,088,518.38 tCO_2e, which corresponds to 96% of total emissions. Fugitive SF_6 emissions from electrical equipment which use this gas total 236,316.24 tCO_2e (3%). The other sources

[1] Thermoelectric power plants attached to the National Interconnected System (SIN) are dispatched, or in other words, they generate energy according to stipulations from the National Electricity System Operator – ONS. Thus, their emissions are a consequence of the amount of energy generated through the operating rules established by the ONS. These *operating rules* are not discussed in this Inventory.

inventoried - vehicles (mobile sources) and electricity purchased by companies, which although not negligible emissions, together represent less than 1% of the total.

GHG Emissions from Eletrobras Companies - 2003 to 2009

GHG	2003	2004	2005	2006	2007	2008	2009
CO_2 (tCO_2)	4,564,580	4,806,020	5,744,560	4,667,800	4,900,920	5,080,970	7,103,858
CH_4 (tCO_2e)	2,650	2,670	2,800	2,650	2,810	3,370	6,069
N_2O (tCO_2e)	16,110	17,790	18,960	18,920	17,500	16,110	20,312
SF_6 (tCO_2e)	-	-	-	-	-	-	236,316
TOTAL (tCO_2e)	4,583,340	4,826,470	5,766,330	4,689,370	4,921,240	5,100,450	**7,366,545**

Note: Until 2008 only Stationary Sources were taken into account (Scope 1A of the GHG Protocol).

In the historical series of emissions of Eletrobras Companies, a considerable increase can be noted that occurred in the 2009 total. This is due to the fact that, until 2008, the information only covered part of the existing stationary sources. In 2009, data from a greater number of generating units was obtained, especially from the area of operation of Amazonas Energia. Another factor was increased electricity demand in the systems in the North region of the country, in the states of Acre, Rondônia and, especially, Amazonas, traditionally served by thermoelectric generation from petroleum derivatives.

In addition, this Inventory does not only include those companies whose core business is thermoelectric generation. With the expansion of scope 1 (to include information on fugitive emissions from sulfur hexafluoride - SF_6) and scope 2 (emissions proportional to energy purchased in the national interconnected system - SIN), the number of companies included in the Inventory went up from six to ten.

GHG Emissions from Eletrobras Companies - Annual Estimates in Gg CO2e

company	2003	2004	2005	2006	2007	2008	2009
CGTEE	1,984.63	2,298.34	2,525.61	2,631.52	2,196.73	1,497.57	1,483.83
Chesf	224.73	54.28	35.46	3.56	45.09	594.07	652.68
Furnas	394.78	170.55	149.88	4.11	24.94	144.44	114.73
Eletronorte	1,187.35	2,298.34	1,882.75	1,116.70	1,584.51	1,630.15	1,667.67
Eletronuclear	2.61	1,484.25	2.28	3.19	3.14	2.65	6.07
Eletrosul	N/A	N/A	N/A	N/A	N/A	N/A	8.69
Amazonas Energia	789.23	816.73	1,170.35	930.30	1,066.83	1,231.56	4,002.70
Itaipu	N/av	N/av	N/av	N/av	N/av	N/av	16.31
Cepel	N/av	N/av	N/av	N/av	N/av	N/av	1.07
Eletrobras *holding*	N/A	N/A	N/A	N/A	N/A	N/A	0.18
ELETROBRAS Companies	**4,583.34**	**4,826.47**	**5,766.33**	**4,689.37**	**4,921.24**	**5,100.45**	**7,366.54**

Note: 1) N/A = not applicable; N/av = not available
2) 1 Gg = 1,000 tons

GHG Emissions from Eletrobras Companies - Percentage Contributions

	% 2003	% 2004	% 2005	% 2006	% 2007	% 2008	% 2009
CGTEE	43.30	47.62	43.80	56.12	44.64	29.36	20.14
Chesf	4.90	1.12	0.61	0.08	0.92	11.65	0.89
Furnas	8.61	3.53	2.60	0.09	0.51	2.83	1.57
Eletronorte	25.91	47.62	32.65	23.81	32.20	31.96	22.63
Eletronuclear	0.06	30.75	0.04	0.07	0.06	0.05	0.08
Eletrosul	-	-	-	-	-	-	0.12
Amazonas Energia	17.22	16.92	20.30	19.84	21.68	24.15	54.33
Itaipu	-	-	-	-	-	-	0.22
Cepel	-	-	-	-	-	-	0.01
Eletrobras *holding*	-	-	-	-	-	-	0.00
ELETROBRAS Companies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Except for companies that have a greater weight of thermoelectric generation, the amount of GHG emission for energy generated is very small. This index is extremely positive for all of the Eletrobras Companies, showing an overall clean energy production.

GHG Emissions by Net Generation - base year 2009

COMPANY	EMISSIONS (tCO2e)	TOTAL NET GENERATION (MWh)	EMISSIONS / TOTAL NET GENERATION	
			(tCO2e / MWh)	(tCO2e / kWh)
CGTEE	1,483,831.93	723,581.61	2.05068	2050.68
Chesf	65,268.25	49,954,605.00	0.00131	1.31
Furnas	114,736.71	37,137,333.00	0.00309	3.09
Eletronorte	1,667,671.68	43,310,431.91	0.03851	38.51
Eletronuclear	6,067.69	11,876,916.91	0.00051	0.51
Eletrosul	8,695.48	N/A	-	-
Amazonas Energia	4,002,705.79	4,361,860.00	0.91766	917.66
Itaipu	16,307.03	41,945,520.00	0.00039	0.39
Cepel	1,073.80	N/A	-	-
Eletrobras *Holding*	186.73	N/A	-	-
TOTAL	**7,366,545.09**	**189,310,248.43**	**0.03891**	**38.91**

OBJECTIVE

Doing an inventory of greenhouse gas emissions is, primarily, to identify its origin, the effect this emission has on the earth's atmosphere and, then, to register its quantity over a given period of time.

Therefore, the purpose of this document is to identify and account for greenhouse gas emissions that Eletrobras Companies were responsible for in 2009, utilizing the methodology that has been adopted by most companies in the world that seek to improve their environmental management systems and sustainability.

Once this set of data is known and its quality is enhanced, it then becomes easier to propose effective measures to manage these emissions.

INTRODUCTION

This document presents information in regards to the Inventory of Greenhouse Gas Emissions of the Eletrobras Companies, base year 2009, and includes the following greenhouse gas emissions (GHG): carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and sulfur hexafluoride (SF_6), as well as emissions proportional to energy purchased from the national interconnected system (SIN).

It was prepared by Working Group No. 3 - Greenhouse Gases, from the Environmental Subcommittee of the Eletrobras Companies. This group consists of experts from the environmental areas of the following companies: Eletrobras, Cepel, CGTEE, Chesf, Furnas, Eletronorte, Eletronuclear, Eletrosul, Amazonas Energia and Itaipu Binacional.

The results presented and their disclosure meet with Eletrobras strategic planning guidelines in regards to commitments with corporate sustainability principles. More specifically, they contribute to the definition of concrete actions related to managing greenhouse gas emissions within the sphere of Eletrobras Companies, actions that will bolster efforts currently underway to minimize the effects of expected changes in the earth's climate.

The work is organized in four chapters and appendices. The first chapter presents the methodology, premises and procedures used for the inventory. In the second and third chapters, the individualized results for each company and the consolidated results for the entire set of companies are respectively presented. In conclusion, the fourth chapter presents the final considerations with a focus on the "pro-climate change" set of actions to be implemented, in line with the national and global position taken by Eletrobras in relation to this theme.

The appendices present: the calculation log (Appendix 1); the contextualization of the theme of Climate Change in terms of the country and the world (Appendix 2); the structure, organization and positioning of Eletrobras Companies in regards to issues involving the Environment, Corporate Sustainability and Climate Change (Appendix 3); and the structure, organization and activities developed by the Environmental Subcommittee of the Eletrobras Companies and by the Working Group on Greenhouse Gas Emissions (Appendix 4).

All participants and contributors who worked on developing this document are listed in the credits.

1. INVENTORY METHODOLOGY

1.1 GHG Protocol Guidelines

Any initiative in terms of inventorying or reporting greenhouse gas emissions (GHG) for which a corporation is responsible should be based on a recognized and well-defined methodology, and present, as clearly as possible, all the considerations and premises adopted for defining the boundaries of responsibility and the content of the emissions presented.

The Inventory of GHG Emissions of the Eletrobras Companies follows IPCC methodology (2006) and Greenhouse Gas Protocol guidelines (WRI, 2004), or simply GHG Protocol - a corporate accounting and reporting standard for greenhouse gas emissions, launched in 1998 and revised in 2004, recognized internationally and today the most widely used tool by companies and governments worldwide for understanding, quantifying and managing their emissions.

In order to contextualize the premises made in this inventory, it is important to present an overview of the Brazilian GHG Protocol Program (FGV, 2010), in terms of its boundaries and scopes.

Organizational Boundaries

There are two approaches for consolidating organizational boundaries: *operational control* and *equity share.*

In the *operational control* approach, an organization is responsible for 100% of the GHG emissions from the units over which it has operational control and is not accountable for those coming from operations in which it only has an equity share. Having operational control over a unit/operation lies in the fact that the organization – or one of its subsidiaries – has absolute authority to introduce and implement policies regarding the operation in question.

However, with *equity share,* the organization accounts for GHG emissions from its operational activities, according to its share of capital in a particular company or operation.

In terms of organizational boundaries, there are two options for preparing an inventory:

- Option 1: the information containing GHG emissions is in two formats – one based on *operational control* and the other on *equity share*;
- Option 2: the information containing GHG emissions is based solely on *operational control.*

Operational Boundaries

After determining its organizational boundaries, the operational boundaries need to be established, which involves identifying the emissions associated with the organization's operations, classifying them as *direct or indirect emissions* and selecting the scope for the accounting and preparation of the emissions inventory.

Direct GHG emissions are emissions from sources that are owned or controlled by the organization. On the other hand, *indirect emissions* are those resulting from activities of the organization whose emissions are being inventoried, but that occur from sources that are owned or controlled by another organization. The classification of an emission as direct or indirect depends on the consolidation approach (equity share or operational control) selected for establishing the organizational boundaries.

It is necessary to clearly define how to classify the sets of activities that generate emissions in order to facilitate the presentation of the results and to avoid possible double counting in the process. The GHG Protocol classifies emissions into three different scopes:

Scope 1 – Direct GHG Emissions

These are from sources that are owned or controlled by the organization. Examples: combustion emissions from boilers, furnaces, company-owned or controlled vehicles, emissions from air conditioning and refrigeration systems, among others.

Scope 2 – Indirect GHG Emissions

Scope 2 accounts for GHG emissions that come from the purchase of electricity that is consumed by the company. Purchased energy is defined as that which is purchased or brought into the company's organizational boundaries. Companies working in the field of electric power transmission and distribution (T&D) must include in their inventories the indirect emissions related to losses (T&D loss) during transmission and distribution to final consumers.

Scope 3 – Other Indirect Emissions

Scope 3 is an optional reporting category that allows for taking into account all other indirect emissions. Scope 3 emissions are a consequence of company activities, but that occur from sources that do not belong to or are not controlled by the company. Examples: employee business trips; extraction, production and transport of raw materials and other materials by another company; transportation of employees back and forth to work in ways not under the company's control; transport and disposal of waste, and others.

1.2 Premises and Procedures Adopted

- With regards to organizational boundaries, this Inventory was prepared using Option 2: based on **operational control.** In the future, Option 1 could be used, depending on the relevance and volume of corporate partnerships of the Eletrobras Companies.

- In this 2010 edition of the Inventory, information was collected only from 2009 (base year) and the scope was expanded, in accordance with recommendations from the *Inventory of Greenhouse Gas Emissions from Thermoelectric Power Plants (stationary sources) from 2003 to 2008* (published in 2009). Therefore, the following were recorded:

  - Direct emissions from fuel combustion in stationary sources (scope 1A)
  - Direct emissions from fuel combustion in one's own or subcontracted fleet of vehicles (scope 1B)
  - Fugitive GHG emissions associated with sulfur hexafluoride (SF_6) (scope 1C)
  - Indirect emissions related to electricity consumption from the SIN (scope 2)

Evolution of the content and coverage of Eletrobras GHG Inventories

	GHG Inventory **2008 edition**	GHG Inventory **2009 edition**	GHG Inventory **2010 edition**
Unit	**Gg CO_2e**	**Gg CO_2e**	**tCO_2e**
Coverage	**only 2005**	**2003 to 2008**	**2009**
Approach	Operational Control (GHG Protocol)	Operational Control (GHG Protocol)	Operational Control (GHG Protocol)
Methodology	2006 IPCC	2006 IPCC	2006 IPCC
Content	Only **part** of Scope 1: direct emissions from stationary sources (TPPs)	Only **part** of Scope 1: direct emissions from stationary sources (TPPs)	Scope 1: direct emissions from stationary sources (TPPs) + **mobile sources** **+ fugitive SF_6 emissions** **Scope 2: emissions for the amount of energy purchased from the power grid**
GHGs	CO_2 CH_4 N_2O	CO_2 CH_4 N_2O	CO_2 CH_4 N_2O **SF_6**

a. Thermoelectric power plants (TPPs) attached to the National Interconnected System (SIN), are dispatched according to stipulations from the National Electricity System Operator – ONS. Thus, their emissions are a consequence of the amount of energy generated through operating rules established by the ONS. These *operating rules* are not discussed in this Inventory.

- The methodology of the Intergovernmental Panel on Climate Change - IPCC 2006 was adopted.

- The information collected **does not cover** all the units of the Eletrobras Companies.

- The *emission factors* for petroleum-based fuels in Brazil are different from those used internationally due to the requirement to add a fraction of sugarcane ethanol to these fuels, which reduces its pollution potential and modifies its carbon emission when burned.

- The *emission factors* used were taken from the Initial National Communication of Brazil to the United Nations Framework Convention on Climate Change.

- The value of the *energy content of fuel consumed* was calculated on the basis of conversion factors listed in the National Energy Balance - BEN 2008 (base year 2007).

- Indirect scope 3 emissions were not registered: for traveling back and forth to work, the transport of administrative waste, for providers, and others.

- Emissions from land use or the balance of emissions (taking into account sources and sinks) in the areas where Eletrobras companies have business ventures were not taken into account.

- Likewise, emissions from hydroelectric reservoirs where Eletrobras companies have business ventures were not included, since so far no scientific consensus exists regarding methodology upon which estimates for GHG emissions for these reservoirs can be made or for calculating the balance of emissions (or net emissions) from water bodies.

- The information needed to prepare the Inventory was gathered in each of the companies by their respective representatives from the GT 3 - Working Group on Greenhouse Gas Emissions created within the SCMA – Environmental Subcommittee of the Eletrobras Companies (see **Appendix 4**).

- In order to obtain the data, each company was asked to fill out spreadsheets specially prepared for this purpose, based on GHG Protocol specifications.

- The designing of the spreadsheets, the data consistency evaluation and the results analysis were carried out by the Cepel GT 3 representative.

- The preparation of texts and consolidation of additional information were done by the GT 3 coordination and the Eletrobras Environment Department – EGA.

- This Inventory has not been verified by an independent third party, nevertheless all the information and calculation logs, in addition to the identification of data sources, were archived for possible later verification.

1.3 Calculation Methodology

The details of the calculation methodology are presented in **Appendix 1** of this document.

2. RESULTS BY COMPANY

The Eletrobras Companies are quite different from each other, either by the nature of their activities, by their area of operation, or by their size and number of units. Furnas, Chesf and Eletronorte engage in generation (hydroelectric and thermoelectric) and transmission activities in a large number of units; the thermoelectric operations of Eletronuclear and CGTEE are on one single site, but they use different fuels; Eletrosul is more focused on transmission and is resuming its generation operations, with wind and hydroelectric units; Itaipu is one huge power generation plant; and Amazonas Energia operates in the realm of hydro and thermal generation in isolated systems and also with electricity distribution. Eletrobras *holding* engages in administrative and corporate activities, while Cepel works in research and development.

	Company	Characteristics
1	CGTEE	thermoelectric generation using coal
2	Chesf	hydroelectric and thermoelectric generation (gas and diesel oil) + transmission
3	Furnas	hydroelectric and thermoelectric generation (gas and diesel oil) + transmission
4	Eletronorte	hydroelectric and thermoelectric generation (diesel oil) + transmission
5	Eletronuclear	thermonuclear generation
6	Eletrosul	transmission + hydroelectric generation
7	Amazonas Energia	hydroelectric and thermoelectric generation (fuel oil and diesel) + distribution
8	Itaipu	hydroelectric generation
9	Cepel	research and development (R&D)
10	Eletrobras *Holding*	corporate management and administration

This diversity is reflected in the results of this Inventory in terms of the volumes of greenhouse gases from each of the companies.

In companies with a large numbers of units, many in remote locations that are difficult to access, it was not possible to collect information from all of their units (see Section 1.2 of the chapter above). However, it is expected that as the practice of inventorying the different sources of GHG emissions spreads, it will be easier to fill in the gaps of the information mosaic of the Eletrobras Companies through actions that improve environmental management activities.

This chapter presents the results, by company, of the emissions estimates for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) by stationary and mobile sources of the Eletrobras Companies, as well as emissions of sulfur hexafluoride (SF_6) from electrical equipment and those proportional to the energy purchased from the national interconnected system (SIN).

Emissions are measured according to "tons of CO_2 equivalent" (tCO_2e).

2.1 CGTEE

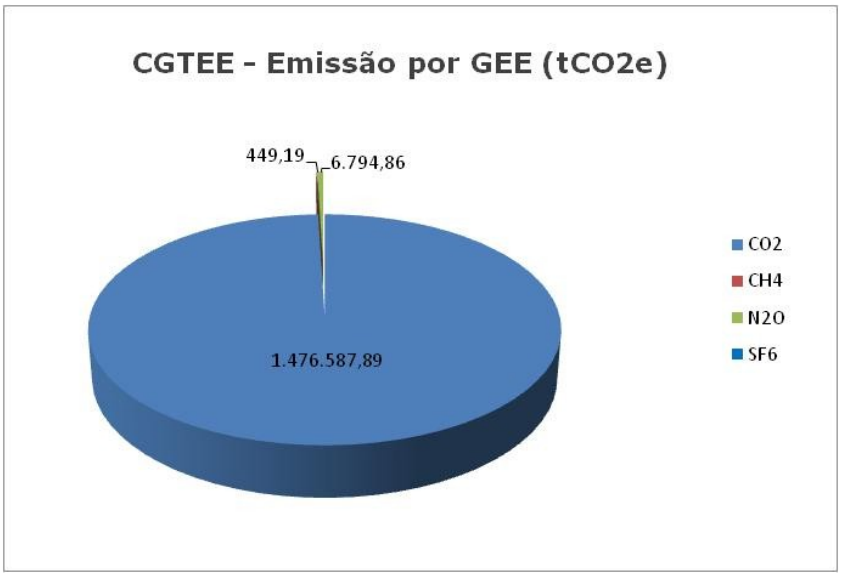
CGTEE owns the rights to exploit and produce electricity through its thermoelectric power plants set up in the state of Rio Grande do Sul. These include the: President Medici Thermoelectric Power Plant (Candiota II) - 446 MW; São Jerônimo Thermoelectric Power Plant - 20 MW; and Porto Alegre New Thermoelectric Power Plant- NUTEPA - 24 MW.

The predominant primary source for generating electricity in Eletrobras CGTEE is mineral coal. However, diesel oil and fuel oil are also used on a smaller scale.

CGTEE 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	1,448,546.88	331.35	N/A	27,651.11	58.54	1,476,587.89
CH_4 (tCO_2e)	447.04	2.15	N/A	N/A	N/A	449.19
N_2O (tCO_2e)	6,786.45	8.41	N/A	N/A	N/A	6,794.86
SF6 (tCO_2e)	N/A	N/A	N/A	N/A	N/A	0.00
OTAL (tCO_2e)	1,455,780.37	341.91	N/A	27,651.11	58.54	**1.483,831.93**

Emissions in 2009 were lower compared to previous years, due to a gradual decrease in total generation starting from 2007, an occurrence associated with the increased unavailability of Generating Units and, consequently, a reduction in fuel consumption.



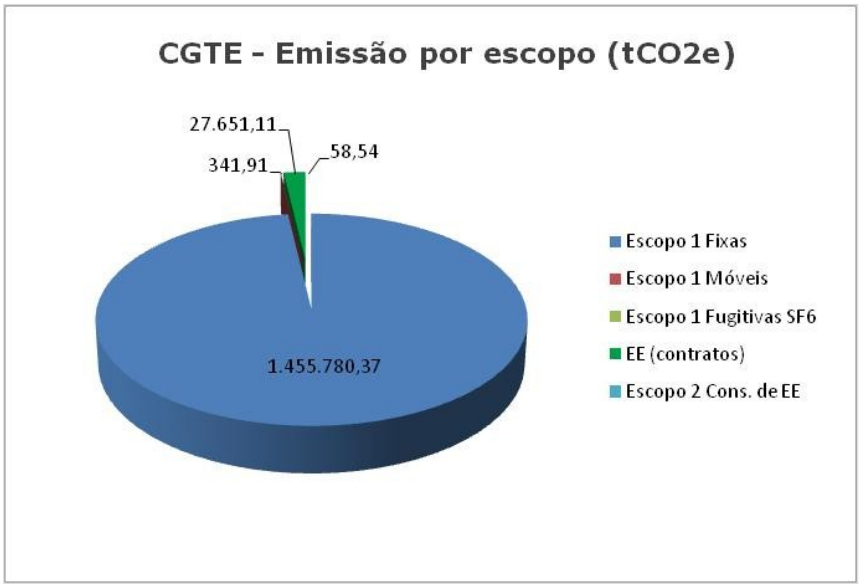
CGTEE - GHG Emissions (tCO2e)

The reduction in total power generation by CGTEE Units made it impossible to meet the contracted energy demand, and it was therefore necessary to purchase this amount of energy in the domestic market in order for the contracts be honored and for sales stability to be restored.

According to GHG Protocol, emissions from the generation of energy purchased for resale to non end-users (for example, energy distributors) can be reported under "optional information". [2]

CGTEE 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	1,455,780.37
	Mobile Sources	341.91
	Fugitive Emissions (SF6)	N/A
Scope 2	Electricity Consumption	58.54
Optional Information		27,651.11
TOTAL		**1,483,831.93**



CGTEE - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Electricity (contracts)
Scope 2 Electricity Cons.

2 For more details about these indirect emissions, see Appendix II of the PB GHG Protocol, p. 64.

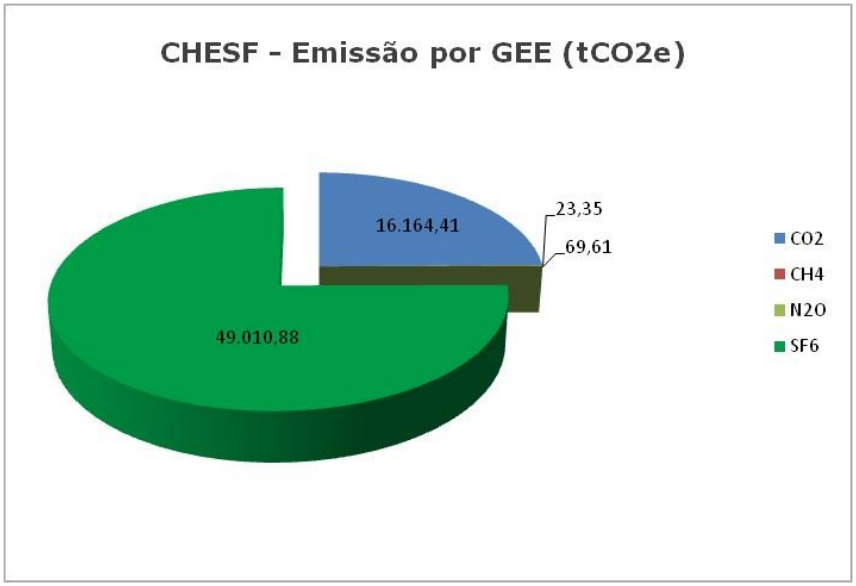
2.2 CHESF

Eletrobras Chesf, which has a generating capacity of nearly 10,000 MW, mostly by water sources, has one plant, the Camaçari Thermoelectric Power Plant in Bahia, with 350 MW of installed power, and which operates on natural gas and diesel oil. Due to the fact that the operation of this plant is subject to the dispatch of the National Interconnected System, generation in 2009 was quite low (168 GWh) compared to 2008 (569 GWh), which resulted in a significant reduction of GHG emissions.

Chesf 2009 - Results by scope and type of gas

CHESF 2009	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	14,383.18	1,651.51	N/A	N/A	129.72	16,164.41
CH_4 (tCO_2e)	17.44	5.91	N/A	N/A	N/A	23.35
N_2O (tCO_2e)	41.57	28.04	N/A	N/A	N/A	69.61
SF6 (tCO_2e)	N/A	N/A	49,010.88	N/A	N/A	49,010.88
TOTAL (tCO_2e)	14,442.19	1,685.46	49,010.88	N/A	129.72	**65,268.25**

In June 2009, Chesf implemented a fuel consumption management system. Under this new system, the company instituted that the flex fuel vehicles in its fleet could only use sugarcane ethanol, a cleaner fuel than gasoline because it has a lower emission factor for local effect pollutants and comes from a renewable source. This initiative, taking into account the complete carbon cycle, results in zero net GHG emissions.



CHESF- GHG Emissions (tCO2e)

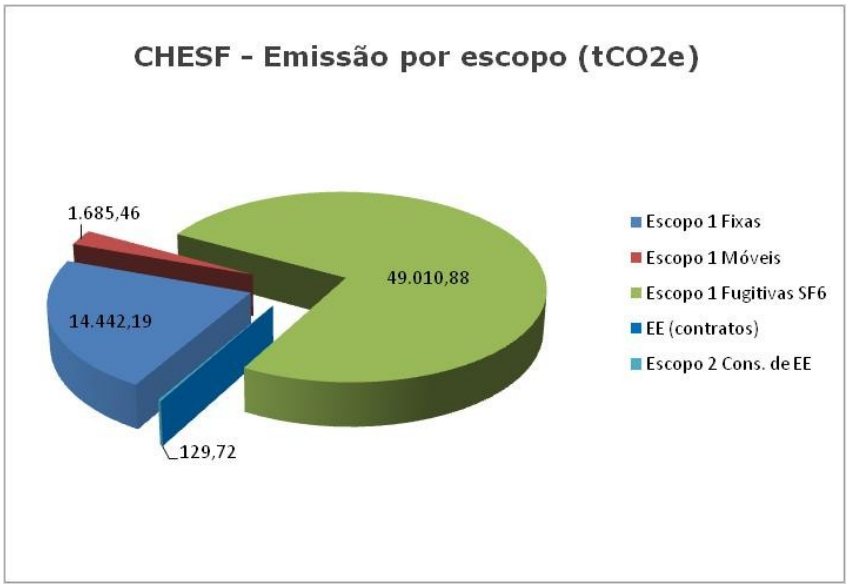
Normally, Chesf had been entering all fuel expenses in one single budgetary account, without separating them by type. A new process, regulated via supply card, was implemented at the end of August 2009. Since then, Chesf has been building a detailed historical series of the fuel consumption of its fleet that has a high level of reliability and is easy to refer to for filling in reports.

With regards to fugitive emissions associated with SF_6, Chesf, in compliance with Official Circular No. 0805/2009-SFG-SFE/ANEEL, of 08/27/2009, has been contributing to the elaboration of the *Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases – SF_6 Emissions in Electrical Systems,* coordinated by the Ministry of Science and Technology - MCT. This contribution is made through the inventory of all equipment containing SF_6, including the content and number of units at the end of each year since 1990, as well as the information flow and yearly stocks.

As for indirect emissions resulting from energy purchased from the National Interconnected System (SIN) from local utility companies, the amounts correspond to the amount of energy consumed by the company in each area. In upcoming periods, it will be necessary to refine the data collected.

Chesf 2009 - Results by scope

Scope		**tCO2e**
Scope 1	Stationary Sources	14,442.19
	Mobile Sources	1,685.46
	Fugitive Emissions (SF6)	49,010.88
Scope 2	Electricity Consumption	129.72
TOTAL		**65,268.25**



CHESF - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Electricity (contracts)
Scope 2 Electricity Cons.

2.3 FURNAS

Eletrobras Furnas has a system of 13 hydroelectric power plants, two thermoelectric power plants, more than 19,000 kilometers of transmission lines and 49 substations.

The Furnas thermoelectric base consists of two plants, the Santa Cruz Thermoelectric Power Plant (766 MW) and the Campos Thermoelectric Power Plant (30 MW), both located in the state of Rio de Janeiro, and subject to the dispatch of the National Interconnected System.

Currently, the Santa Cruz Thermoelectric Power Plant is ready to generate using natural gas. However, during the period that was inventoried, this plant generated with fuel oil and diesel oil. The Campos Thermoelectric Power Plant, which uses natural gas, was shut down for almost the entire period, operating only in 2008. The highest power generation of the FURNAS thermal plants occurred in 2003 and, consequently, accounts for the highest amount of GHG emissions.

In 2008, Furnas was the first company of the Eletrobras System to join the Brazil GHG Protocol Program and undertook various commitments, such as to:

a) Develop an annual inventory of Greenhouse Gases (GHG), in accordance with the GHG Protocol Corporate Accounting and Reporting Standard;
b) Submit the inventory for publication, via the Brazilian GHG Protocol Program;
c) Develop an appropriate management plan for Greenhouse Gas Emissions;
d) Review and implement suggestions for accounting and rules for the report;
e) Contribute towards the structural construction and review of the Brazilian GHG Protocol Program, at the end of the pilot phase.

This initiative greatly enhanced the value of the work of the GT 3, with respect to multiplying knowledge of the procedures to be adopted by companies for collecting their data.

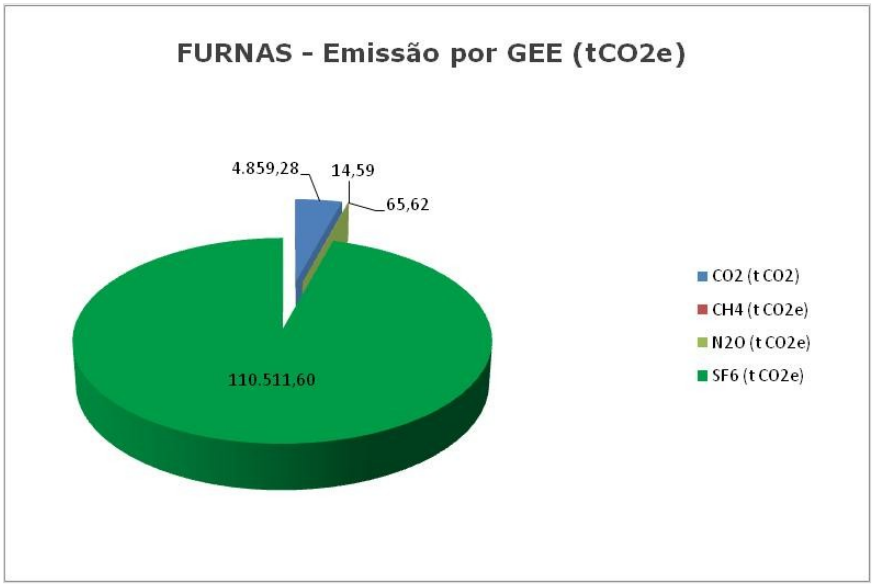
In 2009, Furnas once again prepared the Inventory of Greenhouse Gases, classified as a "bronze inventory" in the Brazil GHG Protocol Program, achieving the following results:

Furnas 2009 - Results by scope and type of gas

FURNAS 2009	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	1,945.35	2,189.84	N/A	N/A	714.44	4,148.21
CH_4 (tCO_2e)	0.37	16.77	N/A	N/A	N/A	16.50
N_2O (tCO_2e)	0.89	71.83	N/A	N/A	N/A	60.4
SF6 (tCO_2e)	N/A	N/A	110,511.60	N/A	N/A	110,511.60
TOTAL (tCO_2e)	1,946.61	2,278.44	110,511.60	N/A	714.44	**114,736.71**

After two cycles of preparing Inventories, the following relevant facts can be noted:

a. The large share of Sulfur Hexafluoride Gas (SF_6) in the company's breakdown of GHG emissions.
b. In 2009, SF_6 emissions surpassed those of Stationary Sources, mainly due to the fact that the Santa Cruz Thermoelectric Plant had not been dispatched.
c. The need to obtain the appropriate level of disaggregation (by operational unit);



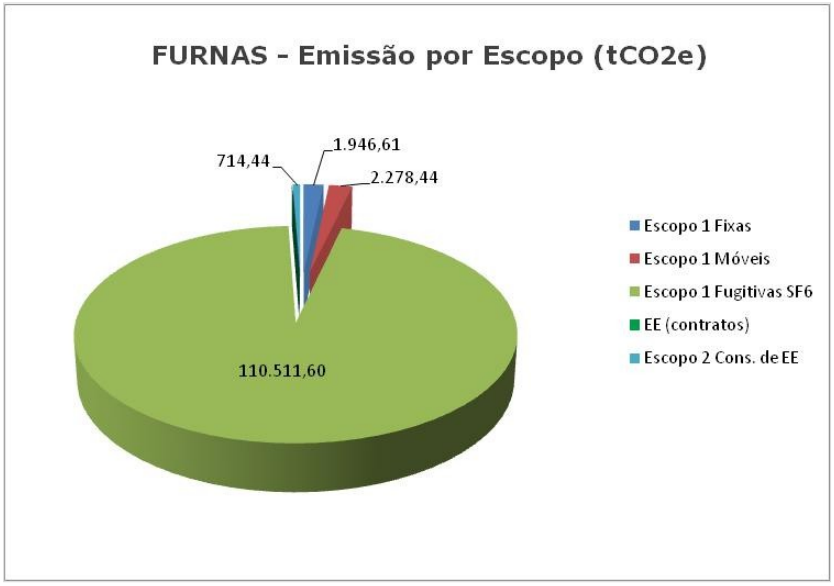
FURNAS - GHG Emissions (tCO2e)

Currently, Furnas is in the third cycle of preparing their GHG Inventory (base year 2010) through the Brazilian GHG Protocol Program and has been working to meet the following needs:

d. Automating the sending of basic data;
e. Systematizing the data collection process;
f. Developing the report (external and internal) for the GHG Inventory (besides the GHG Protocol template);
g. Developing the GHG Inventory protocol;
h. Training;
i. Third Party Certification.
j.

Furnas 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	1,946.61
	Mobile Sources	2,278.44
	Fugitive Emissions (SF6)	110,511.60
Scope 2	Electricity Consumption	714.44
TOTAL		**114,736.71**



FURNAS - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Electricity (contracts)
Scope 2 Electricity Cons.

2.4 ELETRONORTE

Of the approximately 24 million inhabitants living in the Amazon region, more than 15 million benefit from electricity generated by Eletrobras Eletronorte in their hydroelectric power plants: Tucuruí (Pará), the largest truly Brazilian power plant and fourth largest in the world, Coaracy Nunes (Amapá), Samuel (Rondônia) and Curuá-Una (Pará) – and in its thermoelectric complexes. The total installed power of the company's ventures is 9,787 MW and its transmission systems have over 9,844.68 km of lines.

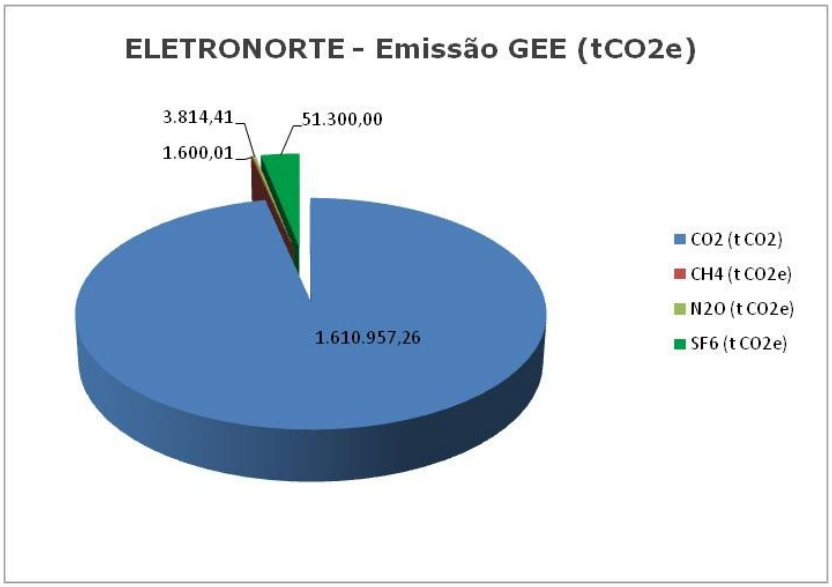
The Eletronorte thermoelectric base is divided into three systems: Acre, Rondônia and Amapá. Although the Acre and Rondônia systems have recently been connected to the SIN (2009), they operated in isolation during the period of this inventory. Its operation was not subject to the dispatch of the National Interconnected System, but rather to meet local demand.

Eletronorte 2009 - Results by scope and type of gas

ELETRONORTE 2009	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	1,610,869.05	N/av	N/A	N/A	88.21	1,610,957.26
CH_4 (tCO_2e)	1,600.01	N/av	N/A	N/A	N/A	1,600.01
N_2O (tCO_2e)	3,814.41	N/av	N/A	N/A	N/A	3,814.41
SF6 (tCO_2e)	N/A	N/A	51,300.00	N/A	N/A	51,300.00
TOTAL (tCO_2e)	1,616,283.47	N/av	51,300.00	N/A	88.21	**1,667,671.68**

In Rondônia and Amapá, there is also hydroelectric generation (The Samuel and Coaracy Nunes Hydroelectric Power Plants). However, in these markets,

the thermoelectric plants also operate in the base, resulting in the greenhouse gas emissions from stationary sources presented here.



ELETRONORTE- GHG Emissions (tCO2e)

Therefore, Eletronorte **operates** thermoelectric power plants in the states of Amapá, Acre, Rondônia and Roraima, and in the last three, the thermoelectric plants functioned in 2009 as "hot reserves", in other words, for the guaranteed power output of the System.

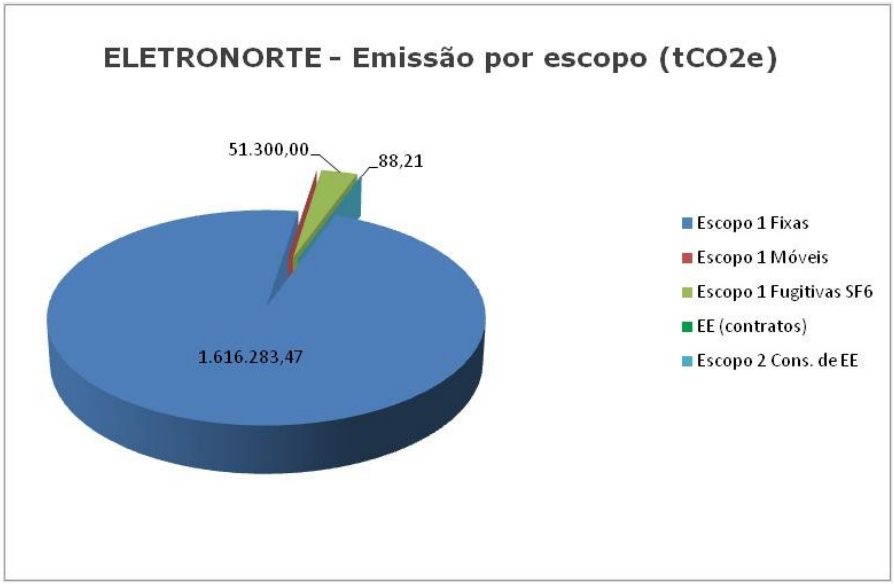
The company's electricity consumption refers to facilities in all the states where it operates.

Information on fugitive emissions (SF_6) was only obtained for the Tucuruí unit and it was not possible to gather information on the contribution of mobile sources (vehicular fleet).

A system for acquiring information on GHG emissions is being implemented in the company that will improve information on fugitive emissions, mobile sources and others, making for an increasingly more accurate Inventory.

Eletronorte 2009 - Results by scope and type of gas

Scope		tCO2e
Scope 1	Stationary Sources	1,616,283.47
	Mobile Sources	N/av
	Fugitive Emissions (SF6)	51,300.00
Scope 2	Electricity Consumption	88.21
TOTAL		**1,667,671.68**



ELETRONORTE - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Electricity (contracts)
Scope 2 Electricity Cons.

2.5 ELETRONUCLEAR

Eletrobras Eletronuclear was founded in 1997 for the purpose of building and operating thermonuclear power plants in the country. The Eletrobras subsidiary is responsible for generating approximately 3% of the electricity consumed in Brazil. This power reaches the country's main consumption centers through the interconnected electricity system and accounts for more than 50% of the electricity consumed in the state of Rio de Janeiro, a proportion that will increase considerably with the completion of the third plant (Angra 3) of the Central Nuclear Almirante Álvaro Alberto – CNAAA.

The plants that are currently in operation are Angra 1, with 657 MW generation capacity, and Angra 2, with 1,350 MW whose heat source comes from the nuclear fission that take place in its reactors. Angra 3, which is practically a replica of Angra 2 (incorporating technological advances that have occurred since the construction of the latter), is expected to generate 1,405 MW.

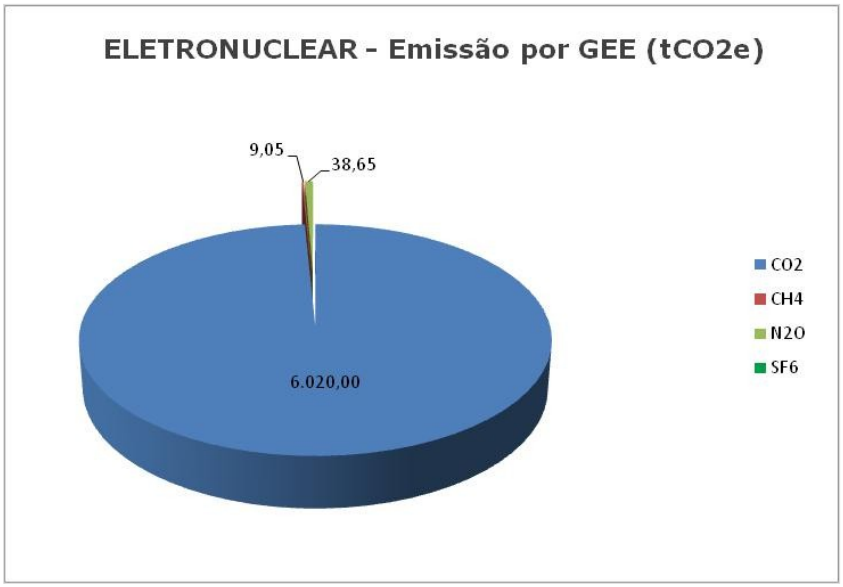
Eletronuclear 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	2,734.90	1,345.02	N/A	N/A	1,940.08	6,020.00
CH_4 (tCO_2e)	2.80	6.25	N/A	N/A	N/A	9.05
N_2O (tCO_2e)	6.67	31.98	N/A	N/A	N/A	38.65
SF6 (tCO_2e)	N/A	N/A	N/A	N/A	N/A	0.00
TOTAL (tCO_2e)	2,744.36	1,383.25	N/A	N/A	1,940.08	**6,067.69**

As far as direct emissions (Scope 1A, Stationary Sources), this nuclear fission process for power generation does not cause greenhouse gas emissions. However, there is burning of fuel (diesel) in both plants, used in the auxiliary boilers and emergency diesel generators. Since diesel oil consumption occurs on a very small scale, the amount of GHG emissions are much smaller that those found in the other companies of the Eletrobras System.

In terms of Scope 1B emissions – Mobile Sources, attributed to the fleet of vehicles controlled by the company, the figures presented here are primarily due to trips between the company's headquarters in Rio de Janeiro, and the Nuclear Power Plants, located in Angra dos Reis – RJ, at an approximate distance of 160 km.

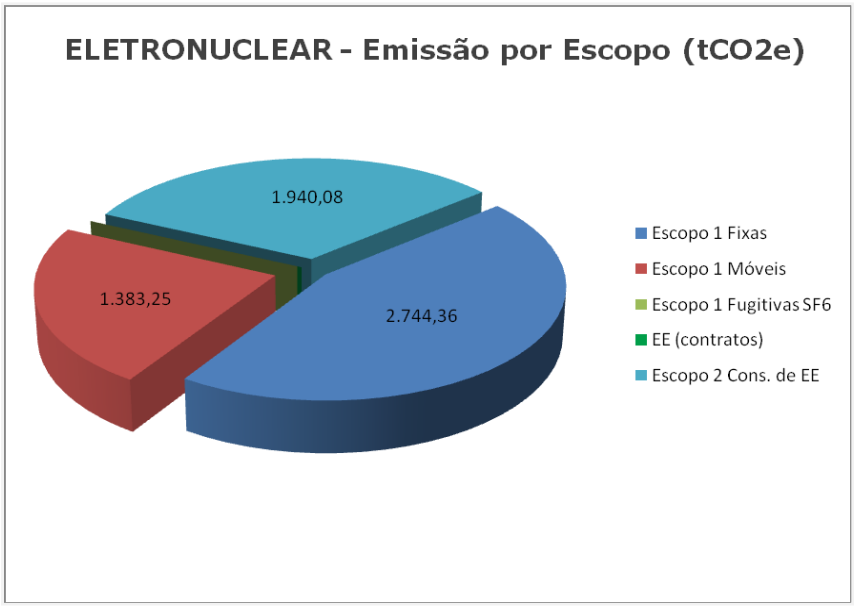
Regarding electricity consumption, Scope 2 – Indirect Emissions, the Angra nuclear power plants, for the most part, use their own generation. Besides administrative consumption, the electricity that comes from the system is used in the Nuclear Power Plants to complement their operational needs and supply consumption during the shutdowns made for maintenance and fuel replenishment in the plants.



ELETRONUCLEAR - Emisión por GEE (tCO2e)

Eletronuclear 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	2,744.36
	Mobile Sources	1,383.25
	Fugitive Emissions (SF6)	N/A
Scope 2	Electricity Consumption	1,940.08
TOTAL		**6,067.69**



ELETRONUCLEAR - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 2 Electricity Cons.

2.6 ELETROSUL

Eletrobras Eletrosul transmits and generates electricity for states in the South region, Mato Grosso do Sul and more recently in Rondônia – serving nearly 29 million people. The Eletrosul transmission system, with a total transformation capacity of 22,660.3 MVA, is interconnected with the transmission system in the southeast region of Brazil. Energy integration between Brazil and Argentina is done through the Uruguaiana frequency converter substation and integration between Brazil and Uruguay is done through the Livramento – Rivera transmission line.

The generating complex of the company was privatized in 1998 but, under Federal Law No. 10.848, in 2004, it was once again authorized to engage in building plants to generate electricity. With the implementation of the new model of the electric power sector, the company resumed power generation and has different projects in the implementation phase, such as the following Hydroelectric Power Plants – Passo São João (77 MW, in Rio Grande do Sul), São Domingos (48 MW, in Mato Grosso do Sul) and Jirau (3,300 MW, in Rondônia), the latter also involving the Suez Energy, Camargo Correa Investimentos and Chesf companies – apart from the Cerro

Chato Wind Farms I, II and III (90 MW), in Rio Grande do Sul, on the border between Brazil and Uruguay.

In this edition of the GHG Inventory, Eletrosul presents fugitive emissions related to the consumption of Sulfur Hexafluoride (SF_6), emissions from mobile sources coming from its own and subcontracted vehicle fleet, as well as emissions from electricity purchased for consumption involving internal services within the company.

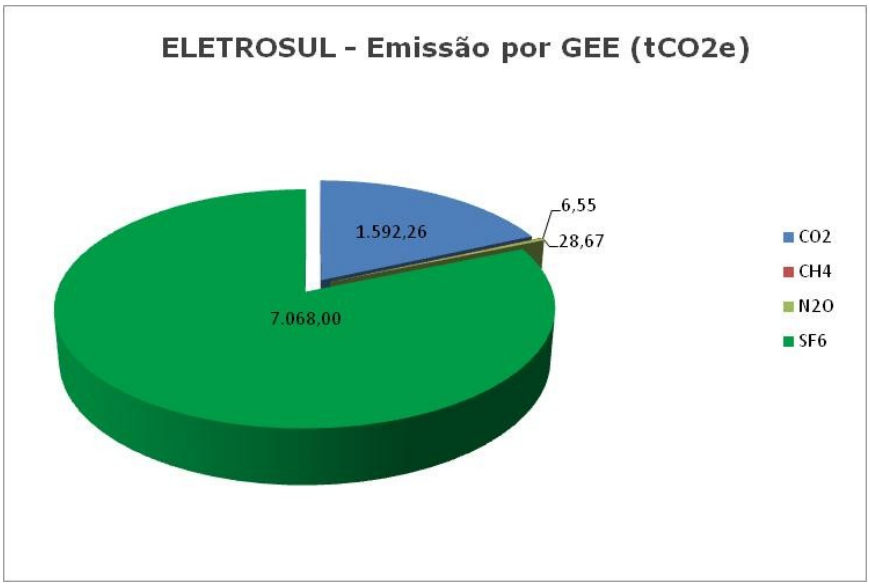
Eletrosul 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	N/A	1,320.15	N/A	N/A	272.11	1,592.26
CH_4 (tCO_2e)	N/A	6.55	N/A	N/A	N/A	6.55
N_2O (tCO_2e)	N/A	28.67	N/A	N/A	N/A	28.67
SF6 (tCO_2e)	N/A	N/A	7,068.00	N/A	N/A	7,068.00
TOTAL (tCO_2e)	N/A	1,355.37	7,068.00	N/A	272.11	**8,695.48**

The data relating to SF_6 fugitive emissions was obtained from the Database of the System Maintenance Department. Of their own 41 substations, 40 have equipment insulated with SF_6 gas or mineral oil. The exception is the Alegrete Substation, located in Rio Grande do Sul, which uses compressed air or mineral oil as an electrical insulator.

The fuel consumption data for both its own and subcontracted fleet was obtained from the Computerized System of Vehicle Supply Management. The company uses the Goodcar system which is fed in real time, when employees traveling to work fill up their vehicles at gas stations accredited by this system.

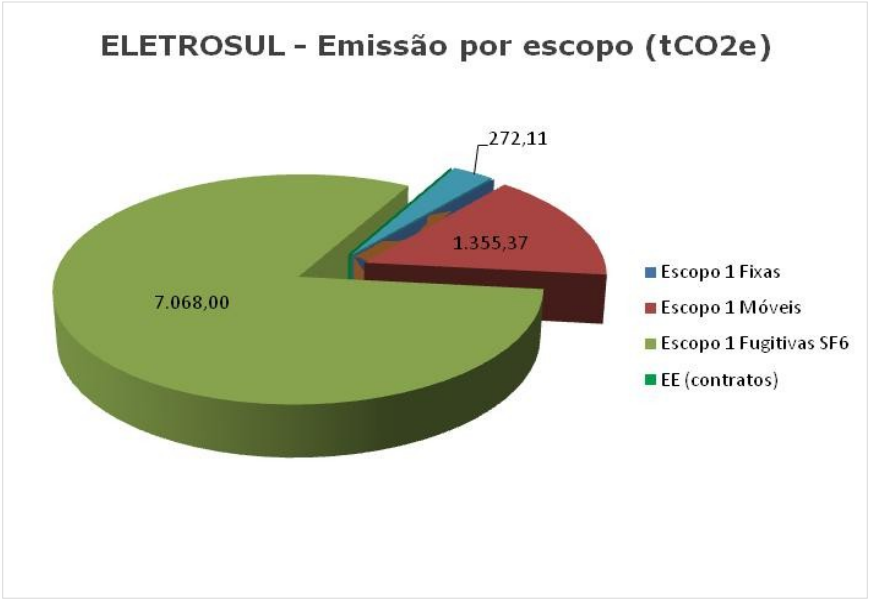
The data on energy consumption in different areas of the company was obtained by means of Environmental Management software called the Environmental Actions Monitoring System - SMAA, implemented in 2008, and which comes from the National Interconnected System (SIN). This data corresponds to approximately 86% of the total electricity consumption used by the company in carrying out its services.



ELETROSUL - GHG Emissions (tCO2e)

Eletrosul 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	N/A
	Mobile Sources	1,355.37
	Fugitive Emissions (SF6)	7,068.00
Scope 2	Electricity Consumption	272.11
TOTAL		**8,695.48**



ELETROSUL - Emissions by Scope (tCO2e)
Scope 1 Mobile
Scope 1 Fugitive SF6
Scope 2 Electricity Cons.

2.7 AMAZONAS ENERGIA

The State of Amazonas, in spite of its huge hydro potential, has always been lacking in electricity supply. Among various reasons, one is the long distance of consumer centers, making it necessary to use thermoelectric plants.

Eletrobras Amazonas Energia is responsible for the generation, transmission, distribution and sale of all the energy for the state of Amazonas, serving about 680,000 consumers, and is divided into two distinct systems: The Manaus System with the markets of Manaus, Iranduba, Presidente Figueiredo, Puraquequara and part of Rio Preto da Eva, and the Interior System, with the remaining locations.

The Manaus System, made up of a complex of different electricity generation sources (Thermoelectric Plants, Balbina Hydroelectric Power Plant and IPPs), serves 442,555 active consumers (data from December/2009), with 399,479 being residential. Its actual power is pegged at 1,081 MW. The goal of the Interior System is to attend to the other municipalities, covering an area of 1.57 million square kilometers. It comprises 105 locations (61 municipal seats and 44 localities), serving 236,903 consumers, of which 188,517 are residential. The actual power of its generation complex is 314 MW. The results presented below correspond to the sum of the emissions and amounts of energy generated by the two complexes.

The emissions taken into account in the Manaus System were those from the Aparecida, Electron and Mauá plants that use fuel oil, and the Cidade Nova, Flores and São José Thermoelectric Power Plants, which use diesel oil for electricity generation. The Interior System is composed of more than 100 plants, all working on diesel oil.

The GHG emissions in this period are directly related to meeting the demand of these systems, predominantly thermal.

Amazonas 2009 - Results by scope and type of gas

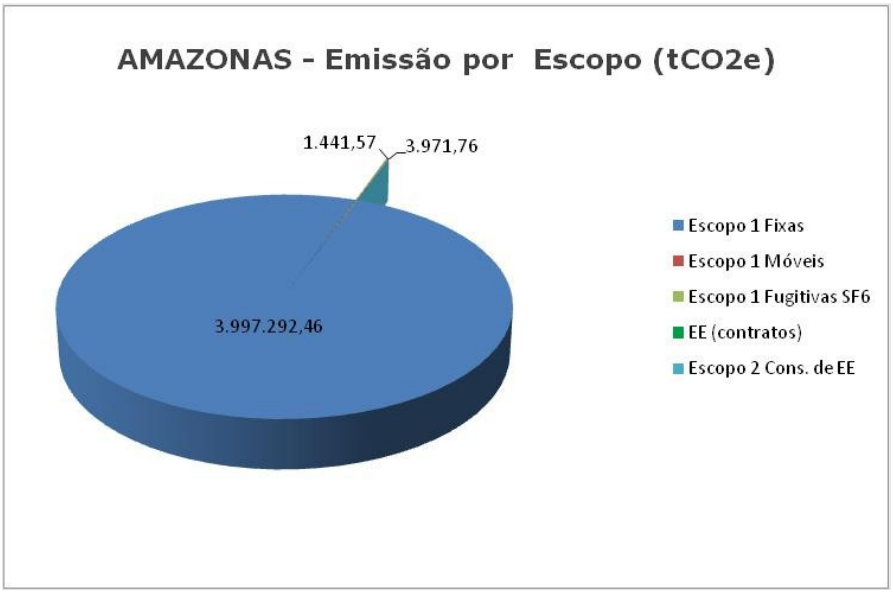
GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	3,983,943.44	1,394.24	N/A	N/A	N/av	3,985,337.68
CH_4 (tCO_2e)	3,944.75	8.72	N/A	N/A	N/A	3,953.47
N_2O (tCO_2e)	9,404.27	38.60	N/A	N/A	N/A	9,442.88
SF6 (tCO_2e)	N/A	N/A	3,971.76	N/A	N/A	3,971.76
TOTAL (tCO_2e)	3,997,292.46	1,441.57	3,971.76	N/A	N/av	**4,002,705.79**

The Amazonas electric power market is the only one in the country that is totally non-interconnected. The interconnection of the Manaus System with the National Interconnected System (SIN) will occur via the Tucuruí – Manaus Transmission Line, scheduled to go into operation in January 2013. Thus, the tendency is that greenhouse gas emissions will decrease. However, a transition and adaptation period needs to be taken into account that cannot yet be determined at present.

AMAZONAS ENERGIA – GHC Emissions (tCO2e)

Amazonas 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	3,997,292.46
	Mobile Sources	1,441.57
	Fugitive Emissions (SF6)	3,971.76
Scope 2	Electricity Consumption	N/av
TOTAL		**4,002,705.79**



AMAZONAS ENERGIA - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Electricity (contracts)
Scope 2 Electricity Cons.

2.8 ITAIPU BINACIONAL

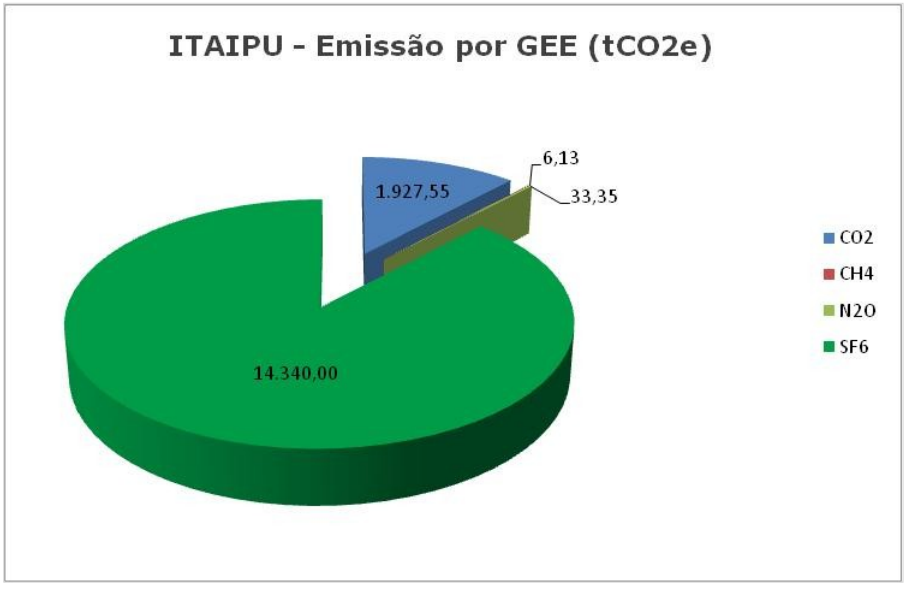
Located along the Paraná River between Foz do Iguaçu (Brazil) and Ciudad del Este (Paraguay), Itaipu Binacional is the result of joint efforts between Brazilians and Paraguayans to build the world's largest hydroelectric plant in terms of power generation. It has 14,000 MW of installed power in a single power plant, with 20 generating units of 700 MW each. It provides 18.9% of the energy consumed in Brazil and 77% in Paraguay.

Itaipu is governed by a Public International Law document created to regulate the hydroelectric exploitation of the Paraná River, called the Treaty of Itaipu. According to the treaty, each country has the right to purchase for its own consumption one half of the energy that is produced. The energy not consumed by one partner is wholly purchased by the other.

Since 2006, Itaipu Binacional (the Brazilian half) has elaborated annual Sustainability Reports, seeking to refine already included items and to improve the quantification of variables, among them GHG emissions related to the Company's production process.

Itaipu 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	2.078	1,864.12	N/A	N/A	61.35	1,927.55
CH_4 (tCO_2e)	0.001	6.13	N/A	N/A	N/A	6.13
N_2O (tCO_2e)	0.001	33.35	N/A	N/A	N/A	33.35
SF6 (tCO_2e)	N/A	N/A	14,340.00	N/A	N/A	14,340.00
TOTAL (tCO_2e)	2.080	1,903.598	14,340.00	N/A	61.35	**16,307.03**



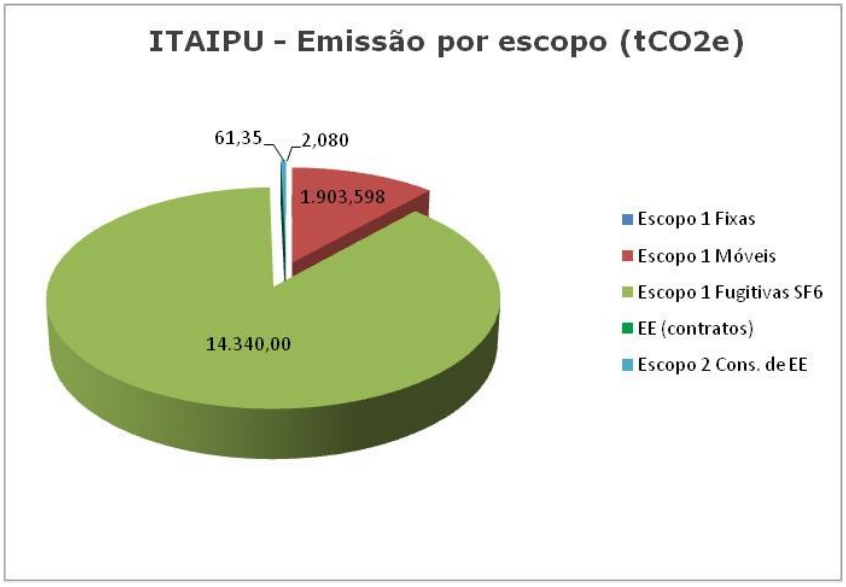
ITAIPU- GHG Emissions (tCO2e)

Itaipu Binacional has been implementing measures in an effort to reduce their GHG emissions. In its own fleet, it gives preference to Flex Power vehicles (67% of the total). As a result, in 2009, its own transportation consumed 197,000 liters of ethanol, which avoided the emission of

hundreds of tons of CO_2 had the vehicles used gasoline. In addition, the company began to monitor and register SF_6 fugitive emissions.

Itaipu 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	2.08
	Mobile Sources	1,903.60
	Fugitive Emissions (SF6)	14,340.00
Scope 2	Electricity Consumption	61.35
TOTAL		**16,307.03**



ITAIPU - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Scope 2 Electricity Cons.

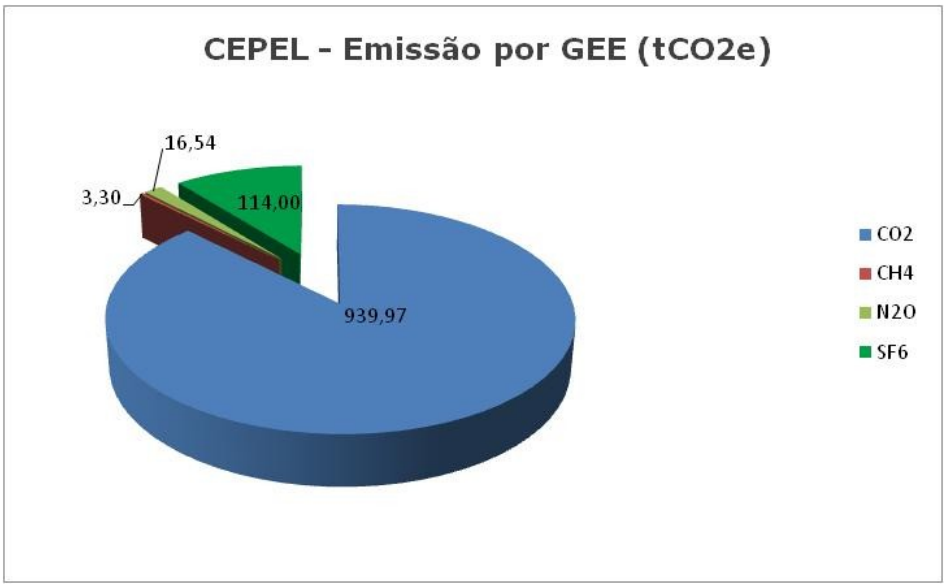
2.9 CEPEL

The Research Center for Electric Energy – Eletrobras Cepel has two laboratory units that are split between the headquarters (Electric Systems Laboratory) set up at the university campus of Ilha do Fundão, Rio de Janeiro, and the Adrianópolis unit (Electrical Equipment Laboratory) in the city of Nova Iguaçu, in Rio de Janeiro.

Given the nature of its activities and final purpose, limited to research and development (R&D), Cepel does not engage in electricity generation, transmission or distribution. However, some activities undertaken in the labs, as well as office activities, transportation and food for its employees do result in GHG emissions.

Cepel 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	24.39	733.10	N/A	N/A	180.05	939.97
CH_4 (tCO_2e)	0.01	3.29	N/A	N/A	N/A	3.30
N_2O (tCO_2e)	0.01	16.52	N/A	N/A	N/A	16.54
SF6 (tCO_2e)	N/A	N/A	114.00	N/A	N/A	114.00
TOTAL (tCO_2e)	26.833	752.914	114.000	N/A	180.05	**1,073.80**



CEPEL - GHG Emissions (tCO2e)

The work of collecting data for the sources of GHG emissions was done through the Sustainability Committee of the Center. As a result, we obtained the following information:

- From stationary sources:
  - diesel oil consumption in emergency generator groups in the Fundão and Adrianópolis units;

- LPG consumption in chemical analysis laboratories and in the Fundão and Adrianópolis restaurants.

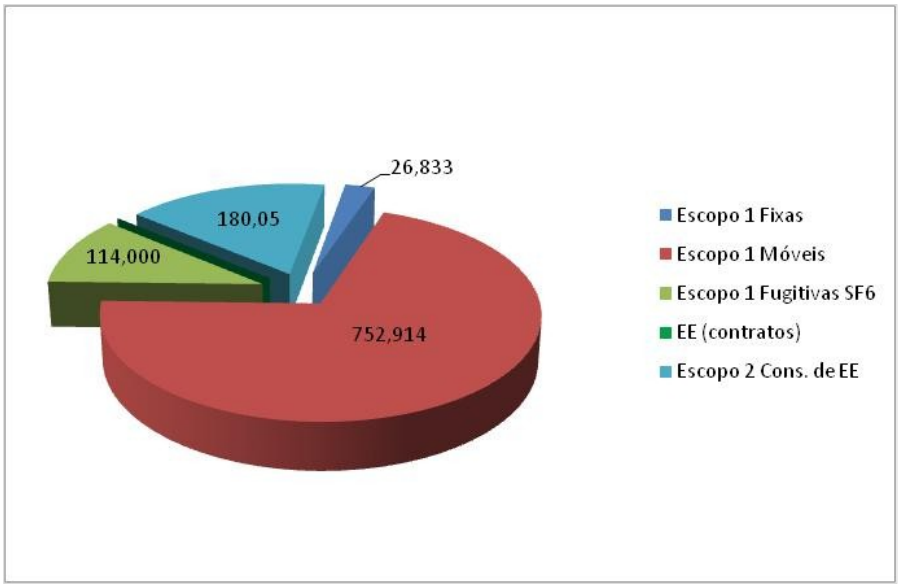
- From mobile sources:
  - consumption of gasoline, ethanol, diesel and LPG in its own and subcontracted vehicle fleet for transporting employees, including buses (routes);
  - diesel and gasoline consumption used in forklift trucks, lawn mowers and other mobile equipment.

- Fugitive emissions: SF_6 balance from electrical equipment in the Adrianópolis substation unit.

- Electricity consumption: in the Fundão and Adrianópolis units.

Cepel 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	26.84
	Mobile Sources	752.91
	Fugitive Emissions (SF6)	114.00
Scope 2	Electricity Consumption	180.05
TOTAL		**1,073.80**



CEPEL - Emissions by Scope (tCO2e)
Scope 1 Stationary
Scope 1 Mobile
Scope 1 Fugitive SF6
Scope 2 Electricity Cons.

2.10 ELETROBRAS Holding

Eletrobras Holding engages in management and administration functions for the Eletrobras Companies.

Its units are located in Brasilia (two floors of a commercial building) and Rio de Janeiro, where it occupies different floors in four different commercial buildings in the city center.

In this edition of the Inventory, its emissions can be summed up as those coming from its own vehicle fleet (scope 1B) and the consumption of energy purchased from local distributors (scope 2).

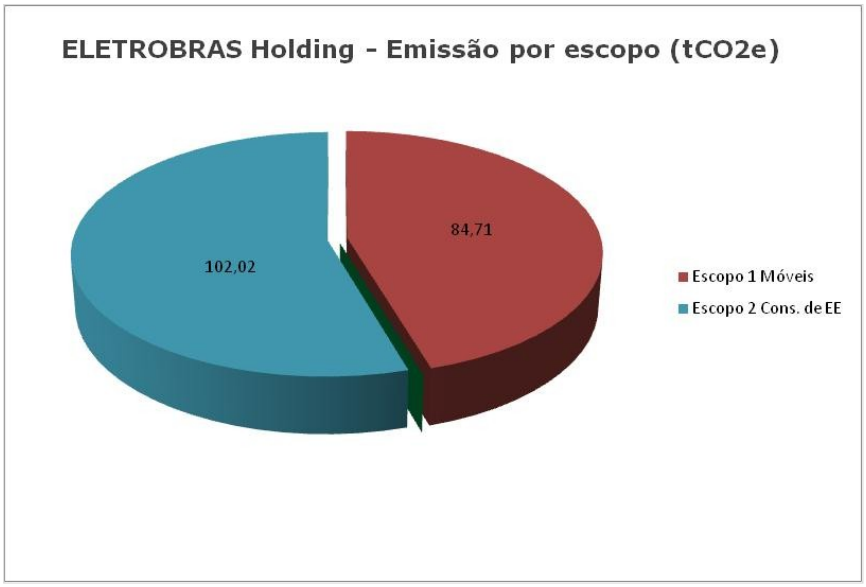
Eletrobras Holding 2009 - Results by scope and type of gas

GHG	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	Electricity (contracts)	Scope 2 Electricity Consumption	TOTAL
CO_2 (tCO_2)	N/A	81.18	N/A	N/A	102.02	183.20
CH_4 (tCO_2e)	N/A	0.73	N/A	N/A	N/A	0.73
N_2O (tCO_2e)	N/A	2.79	N/A	N/A	N/A	2.79
SF6 (tCO_2e)	N/A	N/A	N/A	N/A	N/A	0.00
TOTAL (tCO_2e)	N/A	84.71	N/A	N/A	102.02	**186.73**

ELETROBRAS Holding - GHG Emissions (tCO2e)

Eletrobras Holding 2009 - Results by scope

Scope		tCO2e
Scope 1	Stationary Sources	N/A
	Mobile Sources	84.71
	Fugitive Emissions (SF6)	N/A
Scope 2	Electricity Consumption	102.02
TOTAL		**186.73**



ELETROBRAS Holding - Emissions by Scope (tCO2e)
Scope 1 Mobile
Scope 2 Electricity Cons.

3. CONSOLIDATED RESULTS of the ELETROBRAS COMPANIES

The consolidated result of the Eletrobras Companies, corresponding to the sum total of emissions from ten of their companies, is equal to 7,367,259.48 tons of CO_2 equivalent (tCO_2e).

Of this total, the largest share of emissions comes from stationary sources at 7,088,518.38 tCO_2e, which corresponds to **96%**. This is due to the thermoelectric generating base[3] set up under the responsibility of the CGTEE, Eletronorte and Amazonas Energia companies.

Another important source is SF_6 fugitive emissions from electrical equipment which use this gas, totaling 236,316.24 tCO_2e (3% of total emissions).

The other sources inventoried - vehicles (mobile sources) and electricity purchased by companies, which although not negligible emissions, together represent less than 1% of the total.

Table 3.1
GHG Emissions from Eletrobras Companies - base year 2009 (tCO2e)

COMPANY	Scope 1 Stationary	Scope 1 Mobile	Scope 1 Fugitive SF6	EE (contracts)	Scope 2 EE Consumption	Subtotal by Company	Percentage share by company
CGTEE	1,455,780.37	341.91	N/A	27,651.11	58.54	1,483,831.93	20.14%
Chesf	14,442.19	1,685.46	49,010.88	N/A	129.72	65,268.25	0.89%
Furnas	1,946.61	2,278.44	110,511.60	N/A	714.45	115,451.10	1.57%
Eletronorte	1,616,283.47	N/av	51,300.00	N/A	88.21	1,667,671.68	22.63%
Eletronuclear	2,744.36	1,383.25	N/A	N/A	1,940.08	6,067.69	0.08%
Eletrosul	N/A	1,355.37	7,068.00	N/A	272.11	8,695.48	0.12%
Amazonas Energia	3,997,292.46	1,441.57	3,971.76	N/A	N/av	4,002,705.79	54.33%
Itaipu	2.08	1,903.60	14,340.00	N/A	61.35	16,307.03	0.22%
Cepel	26.83	752.91	114.00	N/A	180.05	1,073.80	0.01%
Eletrobras *Holding*	N/A	84.71	N/A	N/A	102.02	186.73	0.00%
SUBTOTAL	7,088,518.38	11,227.22	236,316.24	27,651.11	3,546.53	**TOTAL (tCO_2e)**	**7,367,259.48**
Percentage share	96.22%	0.15%	3.21%	0.38%	0.05%		

Note: N/A = not applicable; N/av = not available

3 Thermoelectric power plants attached to the National Interconnected System (SIN) are dispatched according to stipulations from the National Electricity System Operator – ONS. Thus, their emissions are a consequence of the amount of energy generated through the operating rules established by the ONS. These operating rules are not discussed in this Inventory.

Table 3.2
GHG Emissions by company - Contribution by type of gas - base year 2009

COMPANY	CO_2 (tCO_2)	CH_4 (tCO_2e)	N_2O (tCO_2e)	SF_6 (tCO_2e)	TOTAL (tCO_2e)
CGTEE	1,476,587.89	449.19	6,794.86	0	**1,483,831.93**
Chesf	16,164.41	23.35	69.61	49,010.88	**65,268.25**
Furnas	4,148.21	16.5	60.4	110,511.60	**114,736.71**
Eletronorte	1,610,957.26	1,600.01	3,814.41	51,300.00	**1,667,671.68**
Eletronuclear	6,020.00	9.05	38.65	0	**6,067.69**
Eletrosul	1,592.26	6.55	28.67	7,068.00	**8,695.48**
Amazonas Energia	3,985,337.68	3,953.47	9,442.88	3,971.76	**4,002,705.79**
Itaipu	1,927.55	6.13	33.35	14,340.00	**16,307.03**
Cepel	939.97	3.3	16.54	114	**1,073.80**
Eletrobras *Holding*	183.2	0.73	2.79	0	**186.73**
TOTAL	7,103,858.43	6,068.28	20,302.16	236,316.24	**7,366,545.09**

Looking at the index of "quantity of GHG emissions per energy generated" (Table 3.3), it can be seen that this ratio is very small, except for the companies that engage more in thermoelectric generation. This index is extremely positive for all of the Eletrobras Companies, showing an overall clean energy production.

Table 3.3
GHG Emissions by Net Generation - base year 2009

COMPANY	EMISSIONS (tCO2e)	TOTAL NET GENERATION (MWh)	EMISSIONS / TOTAL NET GENERATION	
			(tCO2e / MWh)	(tCO2e / kWh)
CGTEE	1,483,831.93	723,581.61	2.05068	2050.68
Chesf	65,268.25	49,954,605.00	0.00131	1.31
Furnas	115,451.10	37,137,333.00	0.0031	3.19
Eletronorte	1,667,671.68	43,310,431.91	0.03851	38.51
Eletronuclear	6,067.69	11,876,916.91	0.00051	0.51
Eletrosul	8,695.48	N/A	-	-
Amazonas Energia	4,002,705.79	4,361,860.00	0.91766	917.66
Itaipu	16,307.03	41,945,520.00	0.00039	0.39
Cepel	1,073.80	N/A	-	-
Eletrobras *Holding*	186.73	N/A	-	-
TOTAL	**7,367,259.48**	**189,310,248.43**	**0.03891**	**38.91**

In the historical series of emissions from Eletrobras Companies, a considerable increase can be noted that occurred in the 2009 total. This is due to the fact that, until 2008, the information only covered part of the existing stationary sources. In 2009, data from a greater number of generating units was obtained, especially in the area of operation of Amazonas Energia.

Another factor was increased electricity demand in the systems in the North region of the country, in the states of Acre, Rondônia and, especially, Amazonas, traditionally served by thermoelectric generation with petroleum derivatives.

Table 3.4
GHG Emissions from Eletrobras Companies - 2003 to 2009

GHG	2003	2004	2005	2006	2007	2008	2009
CO_2 (tCO_2)	4,564,580	4,806,020	5,744,560	4,667,800	4,900,920	5,080,970	7,103,858
CH_4 (tCO_2e)	2,650	2,670	2,800	2,650	2,810	3,370	6,069
N_2O (tCO_2e)	16,110	17,790	18,960	18,920	17,500	16,110	20,312
SF_6 (tCO_2e)	-	-	-	-	-	-	236,316
TOTAL (tCO_2e)	4,583,340	4,826,470	5,766,330	4,689,370	4,921,240	5,100,450	**7,366,545**

Note: Until 2008 only Stationary Sources were taken into account (Scope 1A of the GHG Protocol).

In addition, this Inventory does not only include those companies whose core business is thermoelectric generation. With the expansion of scope 1 (to include information on fugitive emissions from sulfur hexafluoride - SF_6) and scope 2 (emissions proportional to energy purchased in the national interconnected system -SIN), the number of companies included in the Inventory went up from six to ten.

Table 3.5
GHG Emissions from Eletrobras Companies - Annual Estimates in Gg CO2e

company	2003	2004	2005	2006	2007	2008	2009
CGTEE	1,984.63	2,298.34	2,525.61	2,631.52	2,196.73	1,497.57	1,483.83
Chesf	224.73	54.28	35.46	3.56	45.09	594.07	65.26
Furnas	394.78	170.55	149.88	4.11	24.94	144.44	114.73
Eletronorte	1,187.35	2,298.34	1,882.75	1,116.70	1,584.51	1,630.15	1,667.67
Eletronuclear	2.61	1,484.25	2.28	3.19	3.14	2.65	6.07
Eletrosul	N/A	N/A	N/A	N/A	N/A	N/A	8.69
Amazonas Energia	789.23	816.73	1,170.35	930.30	1,066.83	1,231.56	4,002.70
Itaipu	N/av	N/av	N/av	N/av	N/av	N/av	16.31
Cepel	N/av	N/av	N/av	N/av	N/av	N/av	1.07
Eletrobras *holding*	N/A	N/A	N/A	N/A	N/A	N/A	0.18
Eletrobras Companies	**4,583.34**	**4,826.47**	**5,766.33**	**4,689.37**	**4,921.24**	**5,100.45**	**7,366.54**

Note: 1) N/A = not applicable; N/av = not available
2) 1 Gg = 1,000 tons

Table 3.6
GHG Emissions from Eletrobras Companies - Percentage Contributions

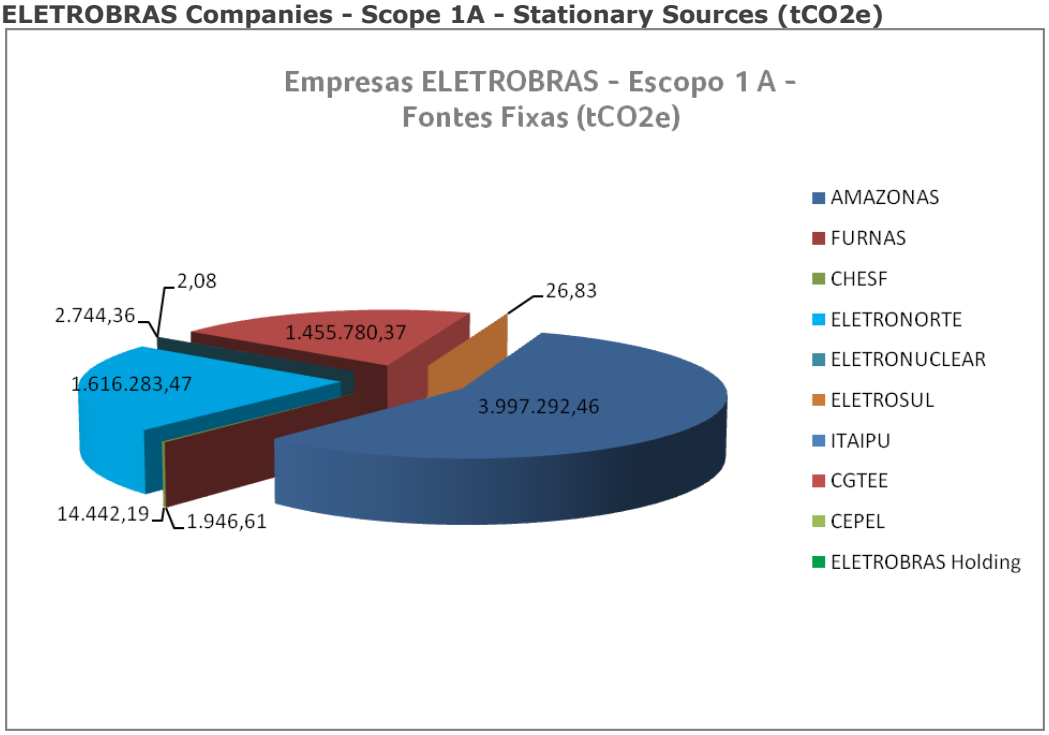
	% 2003	% 2004	% 2005	% 2006	% 2007	% 2008	% 2009
CGTEE	43.30	47.62	43.80	56.12	44.64	29.36	20.14
Chesf	4.90	1.12	0.61	0.08	0.92	11.65	0.89
Furnas	8.61	3.53	2.60	0.09	0.51	2.83	1.57
Eletronorte	25.91	47.62	32.65	23.81	32.20	31.96	22.63
Eletronuclear	0.06	30.75	0.04	0.07	0.06	0.05	0.08
Eletrosul	-	-	-	-	-	-	0.12
Amazonas Energia	17.22	16.92	20.30	19.84	21.68	24.15	54.33
Itaipu	-	-	-	-	-	-	0.22
Cepel	-	-	-	-	-	-	0.01
Eletrobras *holding*	-	-	-	-	-	-	0.00
Eletrobras Companies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

It is expected that, in the short term, as the information gathering process for the annual GHG Inventory of the Eletrobras Companies is further refined, both by expanding the scopes and with more accurate measurements for a larger share of the organizational units of the companies, there will also be an increase in the total amount of GHG emissions. This increase, however, should not be significant, since it will reflect information from other less important contributions than those from stationary sources which clearly have greater weight and whose emissions are sufficiently known and reported. Even with a change of approach in *organizational boundaries,* by including the *equity shares* from corporate partnerships of the Eletrobras Companies, this reasoning can still be considered valid.

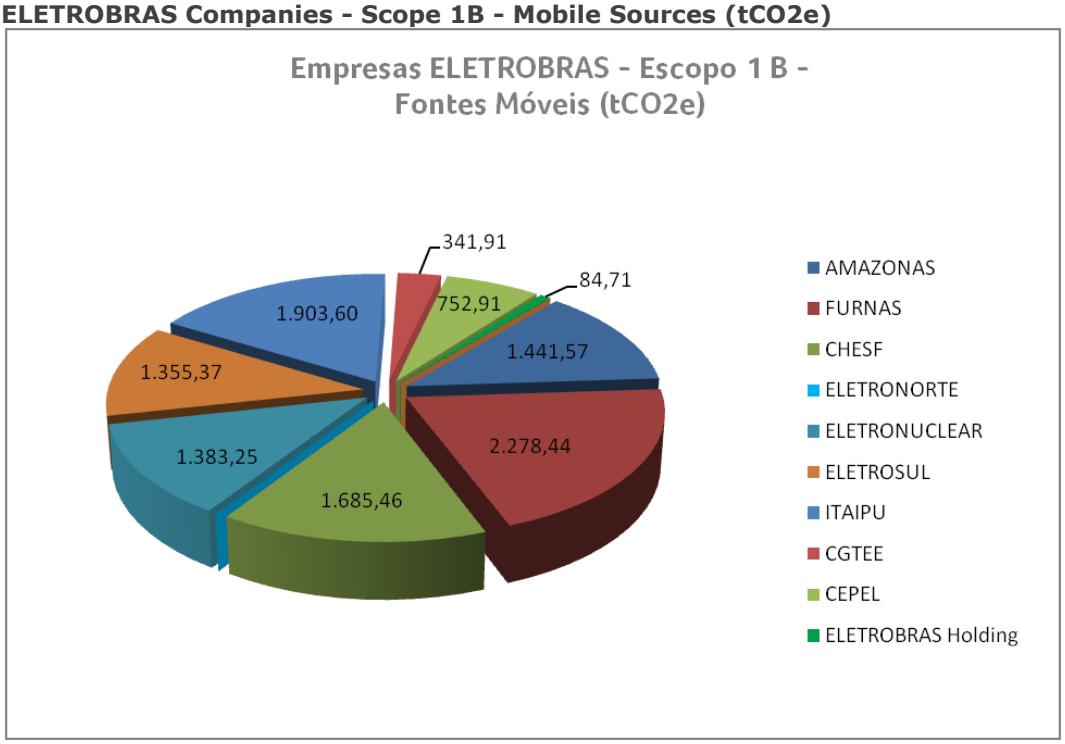
It is also possible that over a longer time period, with effective environmental management actions focused on a climate strategy, stabilization, or even a decline, in emissions from Eletrobras Companies will occur.

Eletrobras Companies – Emissions by Scope

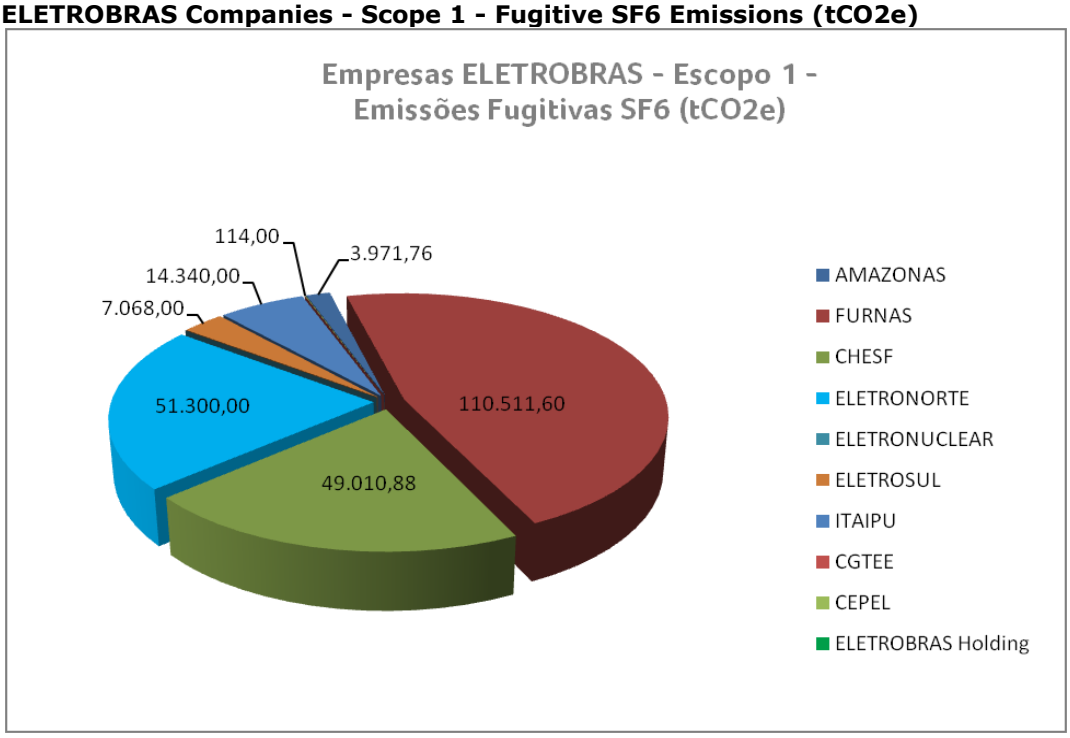
ELETROBRAS Companies - Scope 1A - Stationary Sources (tCO2e)



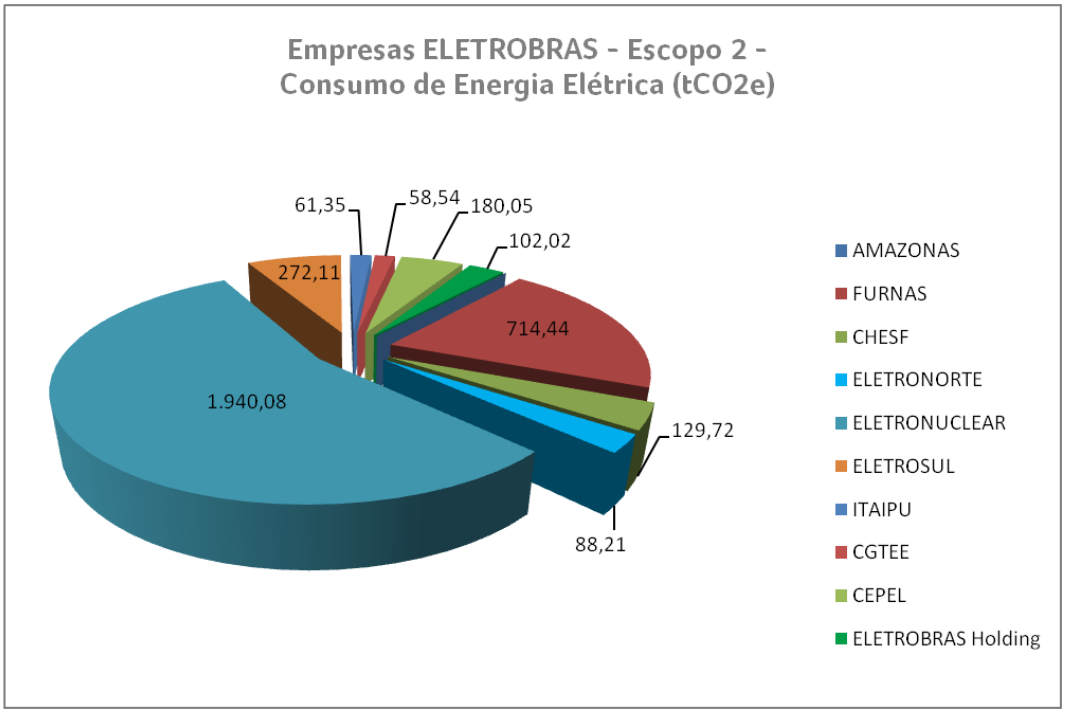
ELETROBRAS Companies - Scope 1B - Mobile Sources (tCO2e)



ELETROBRAS Companies - Scope 1 - Fugitive SF6 Emissions (tCO2e)



ELETROBRAS Companies - Scope 2 - Electricity Consumption (tCO2e)



4. FINAL CONSIDERATIONS

In compliance with the Environmental Policy of the Eletrobras Companies, and in line with its Sustainability Policy, adopted in September 2010, this Inventory consolidates and makes public the estimated amount of greenhouse gas emissions from Eletrobras Companies in 2009.

During this period, greenhouse gas emissions were estimated at around seven and a half million tons of CO_2 equivalent.

Considering that the quantity of energy generated by all electric power generation sources used by Eletrobras Companies was 189,310,248.43 MWh, its GHG emissions rate was 0.0389 tCO_2e / MWh or 38.91 tCO_2e / kWh, which is considered low when compared to other corporations in the world in the same sector and of equivalent size.

The Eletrobras Companies continue to support actions geared towards expanding the use of renewable sources of electricity, with an emphasis on wind power and increased energy efficiency.

Likewise, they continue to promote the development of studies and research aimed at increasing the level of knowledge of processes that cause global warming. This is especially so in relation to the issue of estimating GHG emissions in hydroelectric reservoirs.

In this case, Eletrobras and its generation companies have actively participated in the development of technologies and methodologies to ensure that emissions from hydroelectric reservoirs can be estimated reliably. Its technical staff has been following developments in international studies, but is aware of the fact that in Brazil there is a wide variety of cases to be examined[4]. To date, in the national and international arena, scientists have not yet reached a consensus on the most reliable methodology for estimating GHG emissions from water bodies in general and, in particular, from hydroelectric reservoirs.

Therefore, the *non-participation* of hydroelectric generation in this Inventory is justifiable.

Next year, for the 2011 edition of the GHG Inventory of the Eletrobras Companies, base year 2010, the following information will be collected:

Scope 1: Direct emissions

- Stationary sources: from thermoelectric power plants, from diesel generator groups, including those from substations, from LPG and natural gas (kitchens and labs)
- Mobile sources: differentiate the different fuels: gasoline, diesel, biodiesel, LPG, natural gas for vehicles (CNG), aviation fuel, ethanol, lubricating oils for two-stroke engines

4 Each reservoir has its own peculiarities: size, geographic location (latitude), biota, type of vegetation and soil under submersion, biological processes, input of sediment and organic load coming from the contribution basin, and more. Therefore, the results from studies done on a given reservoir in Brazil cannot be extrapolated to others. The extrapolation of results leads to significant errors, because there is still no scientific basis for making generalizations in this field of knowledge.

- Fugitive emissions: SF_6 gas for refrigeration, fire extinguishers (gas consumed and refills)

Scope 2: Indirect emissions

- **Energy purchased** from the SIN, improving the quality of information: the goal is to get information from all of the organizational units;
- **Transmission and Distribution:** obtain the amounts of technical losses from all the companies that work with T&D.

Scope 3: Indirect emissions – emissions proportional to the amount of Air Travel

In order to improve the management of GHG emissions, in a transparent and effective fashion, and on the basis of provisions contained in Chapter 8 of the *Inventory of Greenhouse Gas Emissions from Thermoelectric Power Plants (stationary sources) for 2003 to 2008,* the following commitments are hereby reaffirmed:

1. Perform, on a yearly basis, the GHG Inventory of the Eletrobras Companies in order to publicly disclose its data;

2. In preparing the annual GHG Inventory of the Eletrobras Companies, seek to cover the largest possible number of its organizational units, always taking into account scopes 1, 2 and 3 of the GHG Protocol;

3. Include the record of atmospheric emissions (monitored, controlled or estimated) in accordance with CONAMA Resolutions and current legislation;

4. Promote the integration of GHG emission data into the Database of *Project IGS – Social-environmental Indicators for Corporate Sustainability Management of the Eletrobras Companies* in order to help meet the goals of the Strategic Action Program - PAE 2009-2012 (ISE-Bovespa and DJSI*)* and other demands *(*Carbon Disclosure Project - CDP, ICO2, etc.);

5. Support the Sustainability Committees of the Eletrobras Companies and their deliberations, providing support in issues concerning climate change;

6. Promote, monitor and participate in studies and research for the development of knowledge, technologies and methodologies for estimating GHG emissions from water bodies and reservoirs of hydroelectric plants;

7. Promote, monitor and participate in the development of studies and research on renewable energy sources and energy efficiency as a way of reducing GHG emissions;

8. Support corporate initiatives and actions aimed at energy efficiency and environmental conservation;

9. Promote, monitor and participate in studies and research on the Vulnerability of the Brazilian Electric Power System in light of the consequences of climate change;

10. Promote, monitor and participate in studies, research and risk analysis of business ventures, taking into account the scenarios of declining rainfall and reduced flows in the rivers of drainage basins, and their incorporation into expansion strategies of the Eletrobras Companies;

11. Promote, monitor and participate in studies and research for the adaptation and mitigation of the effects of Climate Change in projects of the Eletrobras Companies;

12. Keep track of the evolution of regulations and standards relating to air emissions, especially the development of ISO standardization norms dealing specifically with greenhouse gas emissions;

13. Participate in specific forums on Climate Change in Brazil and abroad, in particular the Brazilian Forum on Climate Change - FBMC, prioritizing those with specific technical councils on the subject;

14. Develop a plan of **voluntary measures** for the management of GHG emissions for the Eletrobras Companies.

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6. APPENDICES

Appendix 1 - Calculation Methodology

Appendix 2 - Climate Change

Appendix 3 – Eletrobras

Appendix 4 - The Environmental Subcommittee of the Eletrobras Companies – SCMA and the Working Group on Greenhouse Gas Emissions – (GT 3)

APPENDIX 1 - Calculation Methodology

1. Stationary Sources

Stationary sources include: electricity generation, heat or steam resulting from fuel combustion in stationary sources. In the Eletrobras Companies, the main stationary sources are thermal machines (engines, boilers and turbines) used for thermoelectric generation. Then, the emergency generator groups and starting boilers that operate in substations, laboratories and nuclear power plants are taken into account. LPG and natural gas consumption in kitchens and laboratories is also included.

The methodology for calculating GHG emissions from burning fossil fuels in stationary sources considers the fuel consumption of each source and the carbon content of each fuel. This methodology is based on the 2006 IPCC Guidelines (IPCC, 2006 (a)) TIER 1.

The results need to be presented in tons of carbon dioxide equivalent (tCO_2e), on the basis of CO_2 emissions and adding to that amount the emissions of other gases (CH_4 and N_2O). For this purpose, CH_4 and N_2O emissions are multiplied by the respective Global Warming Potential (GWP) values, based on IPCC, 2007.

Step 1 - Calculating Energy Consumption:

Fuel consumption data (CA1) needs to be collected for all stationary sources inventoried, which may be in units of mass or volume, depending on the type of fuel (solid, liquid or gaseous). The first step is to obtain the variable of *Energy consumption for stationary sources* (CC1), by applying the following equation:

$$CC1 = CA1 \times FC1 \times FC2 \quad (1)$$

Where:

CC1	Energy consumption for stationary sources (TJ);
CA1	Fuel consumption for stationary sources (fuel unit);
FC1	Conversion factor 1 (tep / fuel unit);
FC2	Conversion factor 2 (0.04189 TJ / tep).

Conversion Factor 1 (CF1) is used to convert the amount of *Fuel consumption* (CA1), reported in units of mass or volume - such as: cubic meters (m^3), liters (l), kilograms (kg) or tons (t) - into energy units, namely tonnes of petroleum equivalent (tep), based on the *National Energy Balance 2009* (EPE, 2009 (a)), the table presented in Appendix 1.

In some cases, it is necessary to first convert units of volume into mass, or vice versa, in order to use the FC1s (Appendix 1). Therefore, fuel density

values are used, based on the *National Energy Balance 2009* (EPE, 2009 (b)).

Conversion Factor 2 (FC2) = 0.04189 TJ / tep is used to convert the amount of *Energy consumption for stationary sources* (CC1), going from the amount calculated in tep to another energy unit, namely Terajoule (TJ) [5], based on the *National Energy Balance 2009* (EPE, 2009 (c)).

Step 2 - Calculating the Quantity of Carbon:

To calculate the *Quantity of carbon for stationary sources* (QC1) contained in the amount of fuel consumed, the following equation is applied:

$$QC1 = CC1 \times FE1 \qquad (2)$$

Where:

QC1	Quantity of carbon for stationary sources (tC);
CC1	Energy consumption for stationary sources (TJ);
FE1	Carbon emission factor for stationary sources (tC / TJ).

The emission factors (FE1) used are based on the 2006 IPCC Guidelines (IPCC, 2006 (a)) TIER 1, presented in Appendix 3.

Step 3 - Calculating the Quantity of Fixed Carbon:

In this case, the amount of *Fixed Carbon* (QCF) is considered to be zero, because there is no non-energy carbon consumption, since all the fuel will be burned to generate electricity.

$$QCF = 0 \qquad (3)$$

Where:

QCF	Quantity of fixed carbon.

[5] *Terajoule (TJ) = 10^{12} J.*

Step 4 - Calculating Net Carbon Emissions:

The following equation is applied:

$$ELC = QC1 - QCF \quad (4)$$

Where:

QC	Quantity of carbon for stationary sources (t C);
QCF	Quantity of fixed carbon (t C);
ELC	Net carbon emissions (t C).

Step 5 - Calculating Actual Carbon Emissions:

The following equation is applied:

$$ERC = ELC \times FCO \quad (5)$$

Where:

ERC	Actual carbon emissions (t C);
ELC	Net carbon emissions (tC);
FCO	Oxidized carbon fraction (dimensionless).

The values of *Oxidized carbon fraction* (FCO) are: 0.980 for mineral coal, 0.990 for liquid fuels, and 0.995 for gaseous fuels.

Step 6 - Calculating Carbon Dioxide Emissions:

The amount of *Carbon dioxide emissions from stationary sources* (EF1) is calculated through the following equation:

$$EF1 = ERC \times (44/12) \quad (6)$$

Where:

EF1	Carbon dioxide emissions by stationary sources (t CO_2);
ERC	Actual Carbon Emissions (t C);
(44/12)	Ratio between the molecular weights of CO_2 and C.

Step 7 - Calculating CH_4 and N_2O Emissions:

Methane and nitrous oxide emissions for stationary sources are obtained through the following equations:

$$EF2 = CC1 \times FE2 \quad (7)$$

$$EF3 = CC1 \times FE3 \quad (8)$$

Where:

EF2	CH_4 emission by stationary sources (t CH_4);
EF3	N_2O emission by stationary sources (t N_2O);
CC1	Energy Consumption for stationary sources (TJ);
FE2	CH_4 Emission Factor for stationary sources (t CH_4 / TJ);
FE3	N_2O Emission Factor for stationary sources (t N_2O / TJ).

The FE2 and FE3 emission factors used respectively for the gases CH_4 and N_2O are based on 2006 IPCC Guidelines (IPCC, 2006 (a)), the table presented in Appendix 3.

Step 8 - Calculating Total Emissions for Stationary Sources:

In this step, the total emissions for stationary sources are calculated, by adding up the emissions of the three gases, converted to a common unit, namely, tonnes of carbon equivalent (tCO_2e), using global warming potential values (GWP - Global Warming Potential).

$$EFT = EF1 + (EF2 \times GWP_{CH4}) + (EF3 \times GWP_{N2O}) \quad (9)$$

Where:

EFT	Total emissions by stationary sources (tCO_2e);
EF1	Carbon dioxide emissions by stationary sources (t CO_2);
EF2	CH_4 emission by stationary sources (t CH_4);
GWP_{CH4}	Global warming potential of CH_4;
EF3	N_2O emission by stationary sources (t N_2O);
GWP_{N2O}	Global warming potential of N_2O.

The values used for global warming potential (GWP) are 25 for CH_4 and 298 for N_2O (IPCC, 2007).

2. Mobile Sources

Mobile sources include the use of fuels for the transportation of materials, products and employees, done with company-owned or controlled vehicles (trucks, trains, ships, planes, buses and cars).

The methodology for calculating GHG emissions from burning fossil fuels in mobile sources uses the top-down approach, taking into account the fuel

consumption of each source and the carbon content of each fuel. This methodology is based on 2006 IPCC Guidelines (IPCC, 2006 (b)) TIER 1.

The results need to be presented in tons of carbon dioxide equivalent (CO_2e), starting with CO_2 emissions and adding to that amount the emissions of other gases (CH_4 and N_2O). For this purpose, the emissions of CH_4 and N_2O are multiplied by the respective GWP values.

Step 1 - Calculating Energy Consumption:

Data on *Fuel consumption from mobile sources* (CA2) needs to be collected for all mobile sources inventoried, which are normally in volume units (l, m^3). The first step is obtaining the variable of *Energy consumption from mobile sources* (CC2), by applying the following equation:

$$CC2 = CA2 \times FC1 \times FC2 \quad (10)$$

Where:

CC2	Energy consumption from mobile sources (TJ);
CA2	Fuel consumption from mobile sources (fuel unit);
FC1	Conversion factor 1 (tep / fuel unit);
FC2	Conversion factor 2 (0.04189 TJ / tep).

Conversion Factor 1 (CF1) is applied to convert the amounts of *Fuel consumption* (CA1), reported in volume units to energy units, namely, tonnes of petroleum equivalent (tep), based on the *National Energy Balance 2009* (EPE, 2009 (a)), the table presented in Appendix 1.

Conversion Factor 2 (FC2) = 0.04189 TJ / tep is applied to convert the amount of *Energy consumption for mobile sources* (CC1), going from the amount calculated in tep to another energy unit, namely Terajoule (TJ) , based on the *National Energy Balance 2009* (EPE, 2009 (c)).

Step 2 - Calculating the Quantity of Carbon:

To calculate the *Quantity of carbon for mobile sources* (QC2) contained in the amount of fuel consumed, the following equation is applied:

$$QC2 = CC2 \times FE4 \quad (11)$$

Where:

QC2	Quantity of carbon from mobile sources (tC);
CC2	Energy Consumption from mobile sources (TJ);
FE4	Carbon emission factor for mobile sources (tC / TJ).

The emission factors (FE4) used are based on the 2006 IPCC Guidelines (IPCC, 2006 (a)) TIER 1, presented in Appendix 3.

Step 3 - Calculating Real Carbon Emissions:

The following equation is applied:

$$EM1 = QC2 \times (44/12) \quad (12)$$

Where:

EM1	Carbon dioxide emissions by mobile sources (t CO_2);
QC2	Amount of carbon from mobile sources (tC);
(44/12)	Ratio between the molecular weights of CO_2 and C.

Step 4 - Calculating CH_4 and N_2O Emissions:

Methane and nitrous oxide emissions are obtained by the following equations:

$$EM2 = CC2 \times FE5 \quad (13)$$

$$EM3 = CC2 \times FE6 \quad (14)$$

Where:

EM2	CH_4 emission by mobile sources (t CH_4);
EM3	N_2O emission by mobile sources (t N_2O);
CC2	Energy Consumption for mobile sources (TJ);
FE5	CH_4 emission factor for mobile sources (t CH_4 / TJ);
FE6	N_2O emission factor for mobile sources (t N_2O / TJ).

The FE2 and FE3 emission factors used respectively for the gases CH_4 and N_2O are based on 2006 IPCC Guidelines (IPCC, 2006 (a)), the table presented in Appendix 3.

Step 5 - Calculating Total Emissions for Stationary Sources:

In this step, the total emissions for mobile sources, by adding up the emissions of the three gases, converted to a common unit, namely, tonnes of carbon equivalent (tCO2e), using global warming potential values (GWP - Global Warming Potential).

$$EMT = EM1 + (EM2 \times GWP_{CH4}) + (EM3 \times GWP_{N2O}) \quad (15)$$

Where:

EMT	Total emissions by mobile sources (tCO_2e);
EM1	Carbon dioxide emissions by mobile sources ($t\ CO_2$);
EM2	CH_4 emission by mobile sources ($t\ CH_4$);
GWP_{CH4}	Global warming potential of CH_4;
EM3	N_2O emission by mobile sources ($t\ N_2O$);
GWP_{N2O}	Global warming potential of N_2O.

The global warming potential (GWP) values are 25 for CH_4 and 298 for N_2O (IPCC, 2007).

3. Fugitive SF_6 Emissions

Sulfur hexafluoride (SF_6) is used for electrical insulation and current interruption in equipment used for electric transmission and distribution. Emissions occur during each phase of the life cycle of the equipment, including manufacturing, installation, operation, maintenance and disposal. In scope 1, the direct emissions of this gas are included, with the limit established for the operation and maintenance phases.

Using MDL[6] methodology AMM0035 (UNFCCC, 2006) as a reference, the calculation of SF6 emissions is based on an annual mass balance, where the initial and final stocks of the gas are checked, as well as the purchase and disposal of gas contained in cylinders (for replacement) or in the equipment itself.

$$BE = (DI + AI - SI + REC - NEC) \times (GWP_{SF6} / 1000) \quad (16)$$

Where:

BE	Emissions during a reference year ($t\ SF_6$);
DI	Decrease in stock during the reference year – consider only cylinders; render accounts from the beginning of the reference year to the end; the number may be negative. This is expressed as "cylinders in the inventory at the beginning of the year minus those in the inventory at the end of the year" ($t\ SF_6$);
AI	Additions to the inventory during the reference year – purchases of cylinders, gas recycled from equipment that

[6] Clean Development Mechanism.

	was used and any SF6 included in new equipment (t SF_6);
SI	Subtractions from the inventory during the reference year – consider only cylinders, sold back to the supplier or sent for recycling (t SF_6);
REC	Nominal capacity of equipment used (t SF_6);
NEC	Nominal capacity of new equipment (t SF_6);
GWP_{SF6}	Global warming potential of SF_6 (tCO2e/tSF6).

4. Calculation of Scope 2 Emissions

The calculation of indirect GHG emissions resulting from electricity purchased by the company (brought within the organization's premises) is done by applying the following equation:

$$EEA = EA \times FEEA \quad (17)$$

Where:

EEA	Emissions resulting from purchased electricity (t CO_2);
EA	Electricity purchased (MWh);
FEEA	FEEA emission factor for electricity purchased (t CO_2 / MWh).

The FEEA reflects the quantity of CO_2 that is associated with the process of generating the electricity which was purchased by the company. In most cases, the energy purchased by the companies comes from the National Interconnected System (SIN) and in these cases the FEEA is provided by the Ministry of Science and Technology (MCT) via the following electronic address: http://www.mct.gov.br/index.php/content/view/74694.html .

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EPE, 2009 (b). **National Energy Balance 2009: Base year 2008**. Energy Research Company (EPE). Rio de Janeiro: EPE, 2009. 274 p. Table VIII.9 - Densities and Lower Calorific Values - 2008, p. 216.

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APPENDIX 2 – Climate Change

"If your plan is for one year, plant rice.
If your plan is for ten years, plant trees.
If your plan is for one hundred years, educate children.
If your plan is for one thousand years – then preserve the environment."
Confucius

1. The Global Scenario

In early 2007, the Intergovernmental Panel on Climate Change (IPCC)[7] released its fourth assessment report on climate change, called Climate Change 2007. Its main conclusions were:

- The warming of the climate system is unequivocal.
- Most of the increases observed in global average temperature since the mid-twentieth century is very similar to the increases observed in the concentrations of anthropogenic greenhouse gases.
- Anthropogenic warming and rising ocean levels will continue to increase for centuries due to the timescales associated with climatic processes and feedback, even if the concentration of greenhouse gases were to remain stable.
- The probability that this is only caused by natural climatic processes is less than 5%.
- Global temperatures could increase between 1.1 and 6.4° C during this century and also:
    - Sea levels will likely rise in the range of 18 to 59 cm.
    - There is more than 90% confidence that there will be more melting of glaciers, heat waves and torrential rains.
    - There is more than 66% confidence that there will be an increase in droughts, tropical cyclones and elevated high tides.

- Both past and future emissions of anthropogenic carbon dioxide will continue to contribute to global warming and rising ocean levels for more than a thousand years.
- Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750.
- Governments need to reduce carbon dioxide (coal and oil), use renewable energies and promote reforestation.
- In order for this to happen it will be necessary to designate 0.50% of world GDP to save the world from major catastrophes and tragedies.

That same year, the Nobel Peace Prize was awarded to the IPCC (shared with Al Gore Jr.), "for their efforts to build and disseminate greater

[7] The IPCC **(Intergovernmental Panel on Climate Change)** was established in 1988 by the World Meteorological Organization and the United Nations Environment Program (UNEP) to provide relevant scientific, technical and socio-economic information for understanding climate change, its potential impact and the adaptation and mitigation options. It is an intergovernmental body that is open to member countries of the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO).

knowledge about climate change caused by man and to lay the foundations for the measures needed to counteract such change."

The latest IPCC reports and the COP 15 itself[8], in Copenhagen, in December 2009, served to convince public opinion and the majority of the scientific community that the Earth's climate is changing. Extreme events, which were previously only *foretold,* have been happening with greater frequency and intensity throughout the world. Hurricanes, tornadoes, floods and droughts, excessive heat and cold appear on the news daily, causing perplexity and even grief due to their magnitude.

The issue of greenhouse gas emissions (GHG) is always an important one since it is considered the main instigator of climate change. Human activities – industrial processes, transportation, agricultural activities, prospecting for fossil fuels and their various uses – have been increasing the concentration of these gases in the atmosphere.

Today, we can already perceive the need for adaptation that currently organized systems will be obliged to face. The welfare of humanity depends on the pace and way in which socio-economic development occurs. Recent studies indicate that the impacts of global warming occur in five areas: vegetation, water resources, food production, ocean levels, and on human health. The table below summarizes some of the implications.

[8] *United Nations Climate Change Conference in Copenhagen* - COP 15

Estimates via models that offer some scenarios of the future if emissions are not reduced

Impact of global warming on:	Examples of probable implications
1. Vegetation	a. Reduction of the number of species: decreased biodiversity. b. CO2 emissions through the death of soil biomass: a possible feedback cycle between emissions and warming.
2. Water resources	c. Change of climatic characteristics will affect the flow of rivers, causing drought in some regions (South America) and floods in others (China, India, Pakistan ...). d. Increased number of countries using more than 20% of their freshwater resources per year (considered a dangerous limit by the FAO).
3. Agriculture (food)	a. Only taking into account temperature increase (not considering lack of water), grain yield could increase in some countries (N. America, China, Argentina) and be reduced in others (Africa, Middle East). b. Hunger may be intensified in several regions of Africa.
4. Ocean levels	a. Population exposed to the risk of flooding will rise from 13 million to 94 million, with a 40 cm increase in ocean levels. More than 70% occurring in Asia. b. In all the scenarios studied, with or without reduction of current emissions, ocean levels are expected to rise. The difference may lie in the speed, which would allow for some adaptations.
5. Human Health	*a. In light of current forecasts for the year 2080, an additional 290 million people could be at risk of malaria, especially in China and Central Asia.* *b. Mortality may be reduced in temperate regions due to the reduction of deaths caused by harsh winters.*

Source: Adapted from the Hadley Center – CRU – Climate Research Unit (1999)

2. The Sustainable Company

In the world of today, companies must incorporate into their activities and business an assessment of their risks, initiating projects that prepare them for adapting to inevitable environmental change. Most certainly, these changes are already being reflected in the market environment.

Even for the most skeptical, it's undeniable that water, air and land, with all its biodiversity, can no longer be considered as infinite resources, to the contrary. Investors have shown a clear preference to give resources to companies committed to sustainability and customers already manifest their preference for products and services from companies that engage in sustainable practices in their business activities.

Thus, this new company model aims to create shareholder value over the long term. The success of this type of company is constantly highlighted by investors in the U.S. and Europe, who for some time, have begun to analyze their business prospects in terms of indexes and sustainability reports, as well as other indicators, released by the New York and London Stock Exchanges.

The Sustainable Company

This is the corporation that is concerned with inserting itself in the milieu wherein it operates and seeks to take into account the needs and concerns of all its stakeholders - customers, employees, communities, governments, partners and suppliers. It draws in its different internal sectors, reflecting the company's performance in the social and environmental realms, in its relationship with suppliers, in its communication policy and in the transparency of its information.

3. Climate Changes

Climate change is understood today as a result of the increased concentration of *greenhouse gases* in the atmosphere, especially carbon dioxide (CO_2), causing global warming and its consequences. The increased concentration of greenhouse gases in the atmosphere is primarily attributable to man's activities, including deforestation and the burning of fossil fuels, such as oil, mineral coal and natural gas. The clearing of tropical forests and forest fires in different ecosystems are serious problems that induce global warming, and that continue to occur in our country.

> Climatic variations are natural occurrences. We know that the flooding of rivers occurs in cyclical periods, just as some years are naturally hotter and others cooler. Meteorological knowledge has advanced greatly and we now have the ability both to predict and to understand climate processes, like the effects of El Nino and La Nina. By drilling ice that is deposited in regions such as Greenland and Antarctica, we can analyze the air bubbles contained in deep layers of the ice, which corresponds to the atmosphere of ancient times. Through this information, it has been possible to discover the sequence of GHG concentrations in the atmosphere around 500,000 years ago. We know that the concentration of CO_2 in the atmosphere has increased by about a third over the last 200 years. For the time period considered, this variation has never happened so quickly. At the same time, the current concentration is equivalent to a record of 160,000 years and, apart from that, 1998 was the hottest year on record until now.
>
> Excerpt from Climate Change Actions and Prospects for the New Millennium published in **World Watch Magazine** - www.worldwatch.org.br **July/August – 2000** (*Warwick Manfrinato: Agricultural Engineer and graduate student at the Center for Nuclear Energy in Agriculture - CENA/USP, is Manager of the Division of Natural Resources and Forestry Management at Winrock International. (www.winrock.org.br))

Although climate change has been studied by scientists for a long time, it was in 1988 that the United Nations decided to form the Intergovernmental

Panel on Climate Change (IPCC)[9], having realized that human actions could be exerting a strong influence on the climate. The organ is composed of scientific delegations from 130 governments to provide regular evaulations of climate change.

In 1992, the issue was awarded a new status within the global political agenda, with the creation of the *Climate Convention* during the United Nations Conference on Environment and Development, held in Rio de Janeiro (Rio-92)[10], in order to study and establish guidelines for addressing sustainable socio-economic activities around the planet.

In 2007, the 2,500 scientists of the IPCC released the fourth assessment report of the panel, which became one of the most cited papers worldwide in discussions concerning climate change. In it, man's responsibility for climate change is classified as "unequivocal" and it points towards an average global temperature increase of about 3 degrees Celsius by 2100. In Brazil, climate models indicate that warming could occur from 4° to 6° C in some parts of the country, including the Amazon, by the end of this century. That same year, the IPCC was awarded the Nobel Peace Prize.

The Stern Report - a study on the economic costs of climate change commissioned by the British government to economist Nicholas Stern, published in 2006 - points out that curbing the impacts of this new climatic reality would represent an expenditure of 1% of world GDP. The study also concludes that the *cost of inaction* could reach 20% of world GDP.

[9] The IPCC does not carry out new research, monitor data related to climate change or formulate climate policies.

[10] Eletrobras was one of the main sponsors of Rio 92. Since that time, the company has been developing and supporting studies on climate change and it participated, in support of the Ministry of Science and Technology - MCT, in the drafting of the first national inventory, besides having promoted the participation of Brazilian researchers and experts in the meetings of the Convention of the Parties to the Kyoto Protocol.

Definition of climate change according to the IPCC

The IPCC defines climate change as a statistically significant variation in an average climatic parameter or its variability, persisting over an extended period of time (typically decades or longer). Climate change can be due to natural processes or external forces, or due to persistent changes caused by man's actions in the composition of the atmosphere or the use of land.

Working Groups

The IPCC has three working groups and a special team for national inventories of greenhouse gases (GHGs).

- *Working Group I:* assesses the scientific aspects of the climate system and climate change
- *Working Group II:* assesses the vulnerability of socio-economic and natural systems in the face of climate change as well as the possibilities of adapting to them
- *Working Group III*: assesses options that would allow for limiting greenhouse gas emissions

Each Working Group, as well as the special team, has two chairmen, one from a developed country and the other from a developing country, and a technical support unit.

The three groups are preparing analysis reports on the following topics:

- Scientific information about climate change
- Environmental and socio-economic impacts of climate change
- Formulation of response strategies (mitigation and adaptation)

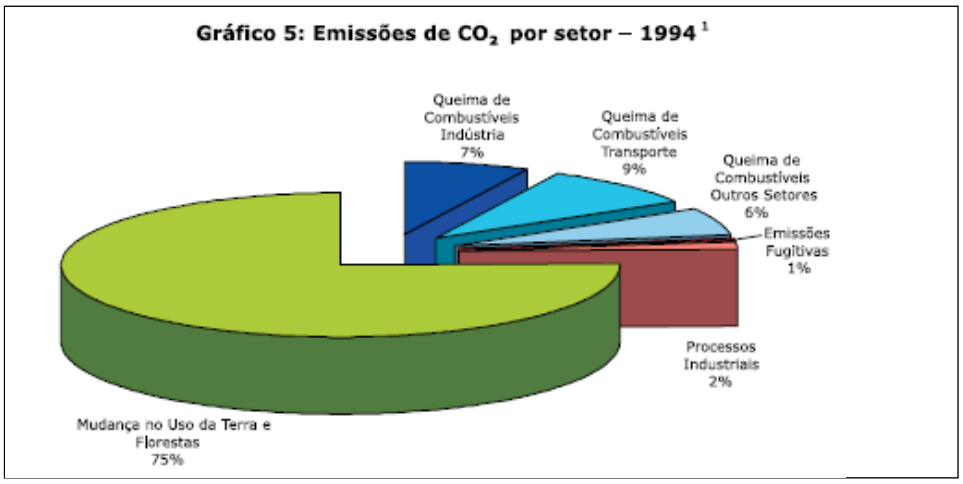
Globally, greenhouse gas emissions covered by the Kyoto Protocol increased by about 70% (from 28.7 to 49.0 **$GtCO_2$-e**) during the period from 1970-2004 (24% during the period from 1990-2004) with carbon dioxide (CO_2) showing the largest increase, approximately 80%. The CO_2 increase basically comes from electricity generation and road transport (IPCC, 2007).

According to data from the last IPCC report (2007), in 2004, in the world, the supply of energy accounted for approximately 26% of GHG emissions, industry 19%, changes in the use of land and forests 17%, agriculture 14%, transportation 13%, residential, commercial and service sectors 8%, and the waste sector 3%.

Sectoral participation in GHG emissions in 2004 (%)

SECTOR	**Worldwide** Source: IPCC, 2007	**In Brazil** Source: Brazil, 2008
Supply of energy	**26**	N/av
Industry	19	7
Change in use of lands and forests	17	**75**
Agriculture	14	N/av
Transport	13	9
Residential, commercial and services	8	6
Waste	3	N/av
	100	100

In Brazil, the profile of greenhouse gas emissions is quite unique, compared to the global profile, since 75% of total GHG emissions comes from the sector involving change in the use of lands and forests; the transportation sector emits around 9%, industry 7%, the burning of fuels by other sectors 6%, industrial processes 2% and fugitive emissions 1% (Brazil, 2008).



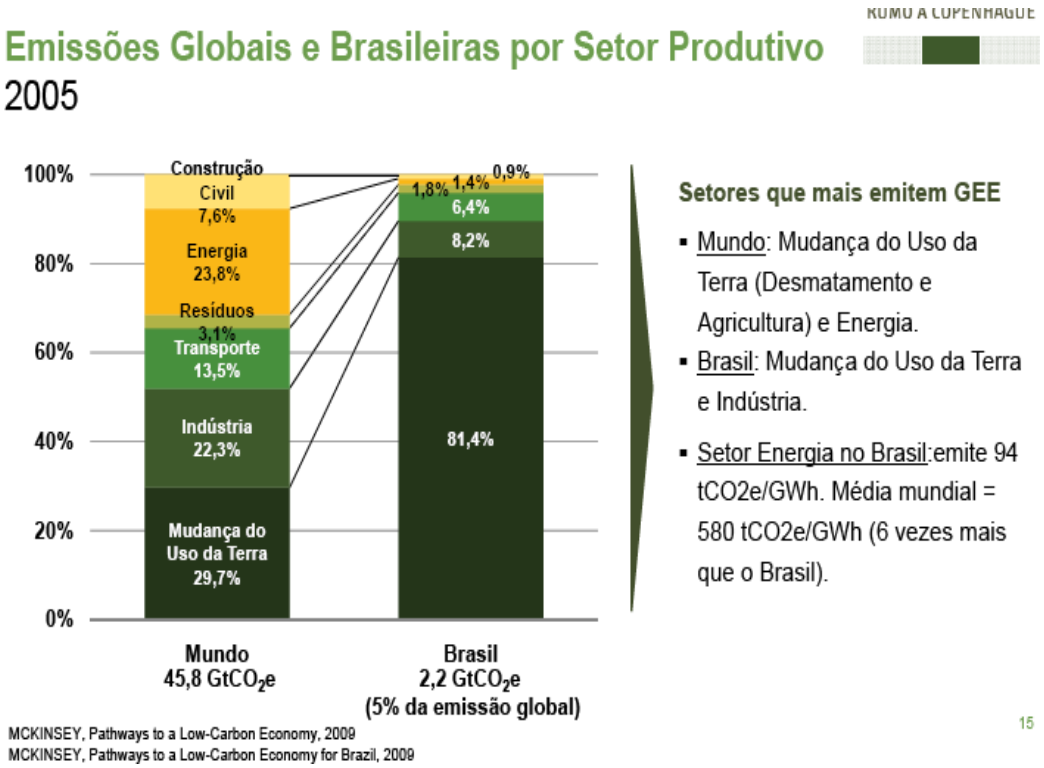
Source: National Plan on Climate Change, 2008

Graph 5: CO2 Emissions by sector – 1994
Burning of Fuel Industry 7%
Burning of Fuel Transportation 9%
Burning of Fuel Other sectors 6%
Fugitive Emissions 1%
Industrial Processes 2%
Changes in Use of Land and Forests

Countries that most contribute to GHG emissions

Country	Emissions (Billion tCO2e)
China	7.4
USA	7.3
Indonesia	2.85
Brazil	2.19
Russia	1.59
Japan	1.21
India	1.01
Germany	0.85
Malaysia	0.81
Canada	0.59

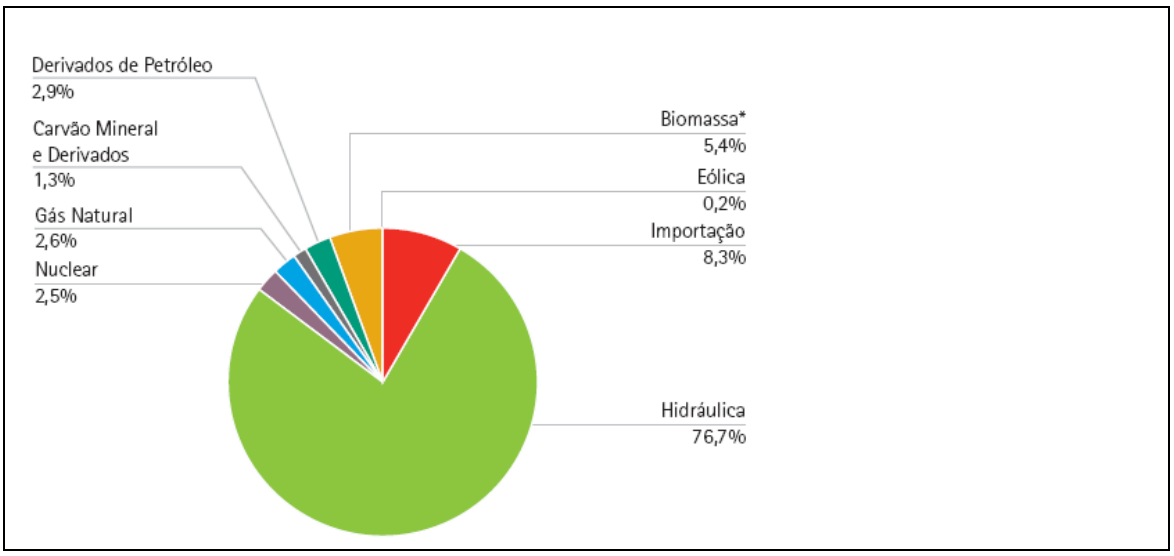
Base year: 2000, except for China, Brazil and the USA (2005).
Source: 2nd National Communication of Brazil to the United Nations Framework Convention on Climate Change (2010).



Global and Brazilian Emissions by Productive Sector
Construction
Energy
Waste
Transport
Industry
Change in Use of Land
World Brazil (5% of global emissions)
Sectors that emit the most GHG
World: Change in the Use of Land (Deforestation and Agriculture) and Energy
Brazil: Change in the Use of Land and Industry
Energy Sector in Brazil: emits 94tCO2e/GWh. World average = 580tCO2e/GWh (6 times more than Brazil).

Specifically, in the case of the national electricity matrix, it is noteworthy that 90% is from renewable sources, with 76% of the share attributed to hydroelectric power (BEN, 2009).

Brazilian electricity generation matrix in 2009 (90.6% renewable)



Source: EPE. National Energy Balance. 2009

Petroleum Derivatives
Mineral Carbon and Derivatives
Natural Gas
Nuclear
Biomass*
Wind
Importation
Hydro

With a **low carbon intensity energy matrix** and **greenhouse gas emissions profile that is distinct from the rest of the world,** Brazil is a world leader in the transition to a low carbon economy. These qualities should be acknowledged so that the clean sectors of its economy are not penalized for the contribution that forest fires that occur in the country make to the global warming process.

To date, under the terms of the Kyoto Protocol, Brazil, as part of the bloc of developing countries *(not under Appendix 1)*, is not obligated to establish quantitative targets for reducing GHG emissions, unlike developed countries *(under Appendix 1)* which did establish goals, that until now have unfortunately not been satisfactorily fulfilled.

Even without being under obligation, Brazil, at COP 15, in December 2009, in Copenhagen, voluntarily undertook a goal to reduce emissions - **from 36 to 39% by 2020.** In the best case scenario, of the 38.9% emissions reduction forecasted for 2020, the reduction of deforestation would be responsible for 24.7%. The remaining 14.2% would be divided between the following sectors: energy (7.7%), agriculture (6.1%) and others (0.4%).

With this, Brazil hopes to reap the benefits of its positive attitude toward climate change, apart from contributing to the stabilization of atmospheric carbon levels.

Actions to Mitigate Emissions by 2020

Mitigation Actions (NAMAs)	Scenario trend 2020 (mil tCO_2)	Magnitude of reduction in 2020 (mil tCO_2)	Percentage Reduction
Energy	**901**	**166 to 207**	**6.1% to 7.7%**
Energy Efficiency		12 to 15	0.4% to 0.6%
Increased use of biofuels		48 to 60	1.8% to 2.2%
Expansion of energy supply through Hydroelectric power plants		79 to 99	2.9% to 3.7%
Alternative Sources (SHP, Bioelectricity, Wind)		26 to 33	1.0% to 1.2%

Source: MMA 2010

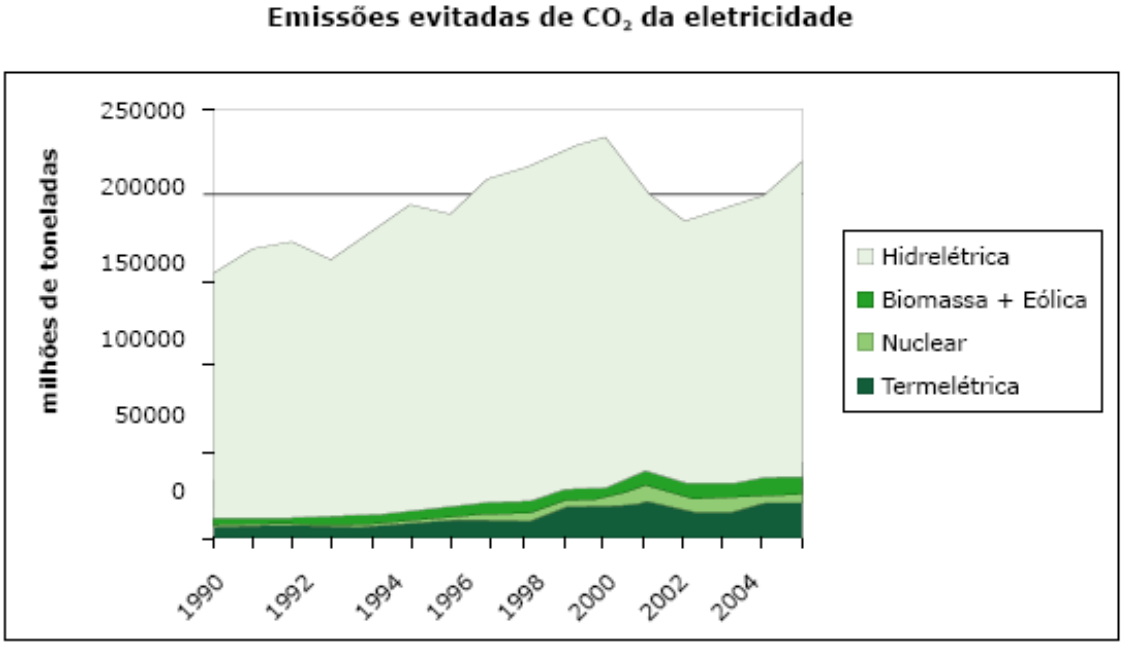
On December 29, 2009, President Lula signed, with some vetoes, **Law No. 12.187 that Institutes the National Policy on Climate Change - PNMC** which establishes:

Art. 12. In order to achieve the objectives of the PNMC, the country shall adopt, in the form of a voluntary national commitment, actions to mitigate greenhouse gas emissions, in order to reduce its projected emissions, by 2020, in the range of 36.1% (thirty-six integers and one tenth percent) to 38.9% (thirty-eight integers and nine tenths percent).

Sole paragraph. Projected emissions for 2020, as well as the outlining of actions for achieving the objective stated in the caput, shall be established by decree, based on the second Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases not Controlled by the Montreal Protocol, to be completed in 2010.

The Law consolidates the target percentage announced on November 13, 2009 and is based on **projected emissions by 2020**, but leaves the outlining of the actions, based on the Second Inventory, to be established by decree.

Apparently, this means that the announced sector targets shall be reviewed not only to take into consideration the numbers of the Inventory, but also **for the outlining of actions in order to achieve the stated objective.**



Source: Brazil's contribution to Prevent Climate Change, 2008

Avoided CO2 emissions of electricity
millions of tons
Hydroelectric
Biomass + Wind
Nuclear
Thermoelectric

APPENDIX 3 – ELETROBRAS

Mission To operate in energy markets in an integrated, profitable and sustainable way

Vision By 2020, to be the world's largest corporate system in clean energy, with profitability comparable to the best companies in the electric power sector

Values Focus on results, entrepreneurship and innovation, appreciation and commitment to people, ethics and transparency

1. The Eletrobras Companies

The largest company in the electric power sector in Latin America, Eletrobras was founded in 1962 to promote studies, projects and the construction of power plants, transmission lines and substations for supplying the country with electricity.

As a mixed economy and public corporation, with the Federal Government being the major stockholder, Eletrobras trades shares on stock markets in São Paulo (Bovespa), Madrid (Spain) and New York (USA).

The Eletrobras Companies act in an integrated fashion, with policies and guidelines set by the Superior Board of the Eletrobras System (CONSISE), which is formed by the CEOs of the companies and meets regularly. Eletrobras also provides support to strategic government programs, such as the Incentive Program for Alternative Electricity Sources (PROINFA), the Light for All Program and the National Electric Energy Conservation Program (PROCEL).

Source: ELETROBRAS 2010

A large part of the electricity generation and transmission system in Brazil is controlled by Eletrobras through its subsidiaries: Eletrobras Furnas, Eletrobras Chesf, Eletrobras Eletrosul, Eletrobras Eletronorte, Eletrobras CGTEE and Eletrobras Eletronuclear. Besides being the main shareholder of these companies, Eletrobras, on behalf of the Brazilian government, owns half the capital stock of Itaipu Binacional.

In the area of distribution, Eletrobras operates through its subsidiaries in the states of Amazonas, Acre, Roraima, Rondônia, Piauí and Alagoas. The Research Center for Electric Energy (Eletrobras Cepel) and Eletrobras Participações SA (Eletrobras ELETROPAR) are also part of the group of companies.

The Eletrobras Companies include 29 hydroelectric power plants, 15 thermoelectric power plants, two nuclear power plants, 237 substations and more than 59,000 kilometers of transmission lines (nearly 56% of the total lines in Brazil). Also among its properties are generation and transmission projects that are incorporated through Special Purpose Entities (SPEs).

The energy matrix of the Eletrobras Companies is predominantly clean, with 87.1% of installed capacity coming from hydroelectric power, 5.09% from nuclear power and only 7.74% from fossil fuels (6.5% from oil and 1.24 % from coal). This variety of fuels is important for the proper functioning of the electric power matrix, since there are periods where water shortages

occur in different regions of the country, as well as some complementarity restrictions between basins of different climatic regions.

The installed capacity of the Eletrobras Companies, on December 31, 2009, was 39,218 MW, including 7,000 MW that correspond to half of Itaipu Binacional, representing approximately 37% of the total amount in the country. The stake in SPEs[11] that are in operation provides another 235 MW to the Brazilian market, amounting to 39,453 MW.

Electricity generating capacity by generation source Eletrobras Companies

INSTALLED CAPACITY (MW) on 12.31.2009

Source:	**MW**
Coal	490
Oil	2,579 (1)
Wind	-
Nuclear	2,007
Hydroelectric	34,377 (2)
TOTAL	**39,453**

(1) Includes 861 MW from biofuel thermal plants (diesel oil /natural gas): Camaçari Thermoelectric Power Plant (347 MW) and Santa Cruz Thermoelectric Power Plant (932 MW)
(2) Includes half of Itaipu Binacional (7,000 MW)
Source: ELETROBRAS, 2010

[11] Special Purpose Company, also called a Corporate Consortium, is a corporate organization model by which a new limited company or corporation with a specific goal is incorporated.

ELETROBRAS COMPANIES – Total Net Generation by company (MWh) in 2009

Source:	CGTEE	Chesf	Eletronorte	Eletronuclear	Furnas	Itaipu	TOTAL
Coal	723,581.61						723,581.61
Oil		5,384.00	579,783.80		1,310.00		586,477.80
Nuclear				11,876,916.91			11,876,916.91
Natural Gas		10,021.00					10,021.00
Hydroelectric		49,939,200.00	42,730,648.10		37,136,023.00	41,945,520.00	171,751,391.10
Total	723,581.61	49,954,605.00	43,310,431.91	11,876,916.91	37,137,333.00	41,945,520.00	**184,948,388.43**

Source: Eletrobras, 2010

Notes:

1) Chesf: Camaçari Thermoelectric Power Plant: diesel oil and natural gas
2) The table includes the share Furnas has in the Serra da Mesa (48.46%), Manso (70%) and Baguari (15%) Plants.
3) The table does not include generation from Amazonas Energia

2. Sustainable Eletrobras

ELETROBRAS, in upholding its claim as a sustainable company, joined the Global Compact, created Sustainability Committees in the holding company and in every one of its companies it and publishes Sustainability Reports in accordance with guidelines from the Global Reporting Initiative (GRI), recommended by the UN. It is listed on the ISE Bovespa and seeks to join the list of companies on the Dow Jones Sustainability Index - DJSI.

One of the corollaries of pursuing sustainability is the adoption of an environmental policy. In order to meet the requirements of the process of strategic reorganization and repositioning of Eletrobras and its companies, its environmental policy was improved within the SCMA – Environmental Subcommittee of the Eletrobras Companies (See Appendix 4). Highlighted, below, is the objective and principle no. 6 of this policy, aimed at integrating environmental management with corporate management.

ELETROBRAS ENVIRONMENTAL POLICY

Objective
To provide guidelines for addressing environmental issues in the companies of Eletrobras, in compliance with sustainability principles
The Environmental Policy must:
- comply with public policies, especially those related to the environment, water resources, climate change and energy, within the legal and regulatory frameworks, as well as with international agreements entered into by Brazil;
- comply with corporate sustainability principles;
- ensure the maintenance of a systematic and continuous improvement process in management practices.

6. Principle of Environmental Management: Implement an environmental management system integrated with the other business management systems.
Guidelines:
6.1 Carry out actions that foster environmental performance improvement.
6.2 Use indicators to measure environmental management results.
6.3 Encourage compliance with environmental requirements on the part of employees, business partners and suppliers.
6.4 Foster energy conservation, energy efficiency and anti-waste actions in the company.
6.5 Raise the awareness of employees, partners and suppliers about their responsibilities to the environment.
6.6 Carry out environmental awareness-raising actions within the areas of influence of the business.

As far as responsibility in regards to the issue of climate change, the decision to participate in the CDP - Carbon Disclosure Project and the GRI - Global Reporting Initiative resulted in Eletrobras confirming the urgent need to set up a system for managing greenhouse gas emissions in their companies and to properly organize its information report.

Therefore, in 2009, the *Inventory of Greenhouse Gas Emissions from Thermoelectric Power Plants (stationary sources)* for 2003 to 2008 was prepared, with the goal of obtaining the first historical series of thermoelectric

generation emissions from Eletrobras Companies. This document is available in Portuguese, English and Spanish in the Eletrobras Portal.

In 2010, the work continued - with 2009 as the base year. In addition to inventorying direct emissions, i.e., those linked to the core activity of Eletrobras - the generation of electricity - the list of GHG emission sources that were measured was enlarged. This time, information was also obtained on GHG emissions by mobile sources, electricity consumption and fugitive emissions.

Thus, the *2010 Inventory of Greenhouse Gases of the Eletrobras Companies* represents the fulfillment of the commitment that was undertaken to inventory the GHG emissions from the Eletrobras Companies on an annual basis. In knowing them, it will be possible to propose effective measures for their management.

The Tucuruí Pact was signed on September 29, 2009 by all the CEOs of the Eletrobras Companies for the purpose of endorsing the commitment to joint action for meeting the sustainability goals set forth therein.

Integrated action on the part of the Sustainability Committees of the holding company and its subsidiaries has been promoted, in the pursuit of achieving measurable results, both for the participation of the Eletrobras System in high profile indicators in Brazilian and international markets, such as ISE Bovespa and the Dow Jones Sustainability Index - DJSI, as well as for moving up to Level 2 in Bovespa's Corporate Governance.

Eletrobras was authorized, with the enactment of Law 11.651, on April 7, 2008, to operate in the international market, taking their experience and knowledge to other countries. Currently, the company's focus is on the continent of the Americas – the energy integration of South America, particularly with the countries bordering Brazil, and with North and Central America. Also active in countries in Africa, Eletrobras been seeking investment opportunities in electricity, both in terms of generation and transmission.

Internationalization

The Eletrobras System shall operate in the international electricity market, either directly or in consortium with domestic or foreign companies, for implementing and operating business ventures, primarily in hydroelectric power generation and transmission, provided they meet with its business interests and a thorough assessment of risks and opportunities. The operation of the System in the international market should likewise take into account the creation of new investment opportunities in other countries and establishing new markets for the segment of suppliers of goods and services. It shall focus mainly on business opportunities in the Americas, notably in Argentina, Colombia, the United States and Peru.

Source: Eletrobras System Strategic Plan 2010-2020, released on March 17, 2010

Both in Brazil and in new markets, Eletrobras shall operate in line with its values and in pursuit of its claim to be a sustainable company.

In addition, Eletrobras, as a member of the **e8** [12] (see box), is committed to embrace commitments aimed at reducing greenhouse gas emissions and their impact on global warming, which are: investment in research to develop clean energy sources, the pursuit of energy efficiency, the responsible use of coal, and combating deforestation.

Eletrobras in the e8

Tenth largest electric power company in the world in terms of equity, Eletrobras is focusing on sustainable development and energy interconnection. The company is increasingly focusing its attention on the pursuit of joint solutions for global energy issues with its presence in important international forums.

Eletrobras is a permanent member of the e8, a group of the largest electric power companies of the G8 (U.S., Japan, Canada, France, Germany, Italy, England and Russia). The company was invited to join the group after participating in the 2009 meeting (as an invited guest). The recommendations resulting from that meeting, held in June, were discussed at the United Nations Conference on Climate Change, in Copenhagen, Denmark, from December 7 to 18, 2009. Investment in research to develop clean energy sources, energy efficiency, the responsible use of coal and combating deforestation, in order to reduce greenhouse gas emissions and their impact on global warming, are among the priorities that were established.

Representatives of companies participating in this year's e8 meeting signed a declaration – the Statement of Mutual Interest & Collaboration. The document states that the main primary energy sources are big hydroelectric power plants, nuclear, clean coal and CO2 capture and storage, and that experiences will be shared for developing new technologies in electricity generation and energy efficiency.

Its presence, with decision-making power, in the annual meetings of the e8 is an example that confirms the company's growing participation in international forums where the direction of energy supply and demand is discussed. Eletrobras also participates in the International Energy Agency, with regards to hydroelectric power plants, in the Water Forum of the Americas and in the World Energy Council, besides working together with Olade (Latin American Energy Organization) and through Bracier (Brazilian National Committee of Cier - Regional Energy Integration Commission).

Source: Eletrobras Portal - August 2010

[12] Created during the Rio 92 conference, the e8 is a nonprofit international organization formed by companies that are leaders in the electric power sector in the world. Its mission is to guide international debate on issues involving electricity generation and to promote its development in a sustainable manner. The group is composed of: American Electric Power (USA), Duke Energy (USA), EDF (France), Enel (Italy), RWE (Germany), Hydro Quebec (Canada), RusHydro (Russia), Kepco (Japan), Tepco (Japan) and now Eletrobras (Brazil).

APPENDIX 4 – The Environmental Subcommittee of the Eletrobras Companies and the Working Group on Greenhouse Gas Emissions – GT 3

The SCMA – Environmental Subcommittee of the Eletrobras System - is a board composed of managers from the environmental area of the Eletrobras Companies (or their representatives) whose purpose is to discuss and propose actions related to environmental issues that affect the companies. In this manner, it serves as a technical and institutional forum to enable consistent performance that is continually improved and adjusted to the legislation in force in the country and the principles and guidelines established by mutual agreement in the Environmental Policy of the Eletrobras Companies. The SCMA has ten Working Groups and two Committees to discuss and propose solutions for common social-environmental issues.

GT # 3 - Working Group on Greenhouse Gas Emissions - was formed within the SCMA to address all issues related to climate change. Its main objective is to develop a management system of GHG emissions of the Eletrobras Companies. Discussions regarding the approach toward direct and indirect emissions to be inventoried, as well as emissions attributed to hydroelectric generation, are topics on the GT3 meeting agenda. Apart from that, its members carefully follow the development of scientific knowledge concerning phenomena related to climate change and its reverberation in global and regional politics. Providing information on the different needs related to sustainability indicators (ISE BOVESPA, DJSI, ICO2, and others) are also among the tasks of the GT 3.

In addition, the GT 3 has been providing technical support for ANEEL's Strategic R&D Project entitled *"Carbon Balance in Hydroelectric Power Plant Reservoirs"*, to be developed in conjunction with the most representative research institutions in the country. The goal of this project, which has a two to four year timeline, is to deepen scientific knowledge regarding the emission and absorption processes of these gases in the hydric environment so that a more reliable picture of the balance of emissions in these reservoirs can be obtained.

Working Group on GREENHOUSE GAS EMISSIONS (GT 3)

Main Activities:

- Prepare the annual **Inventory** of GHG emissions of the Eletrobras Companies
- Study the most representative and well-known calculation **methodologies** so that they can be applied in the annual Inventory
- Monitor the **development** of the state-of-the-art and discuss issues related to climate change
- **Provide** support for activities focused on **corporate sustainability**, providing the necessary information (ISE Bovespa, DJSI, Sustainability Report, IGS Project, CDP, ICO2)