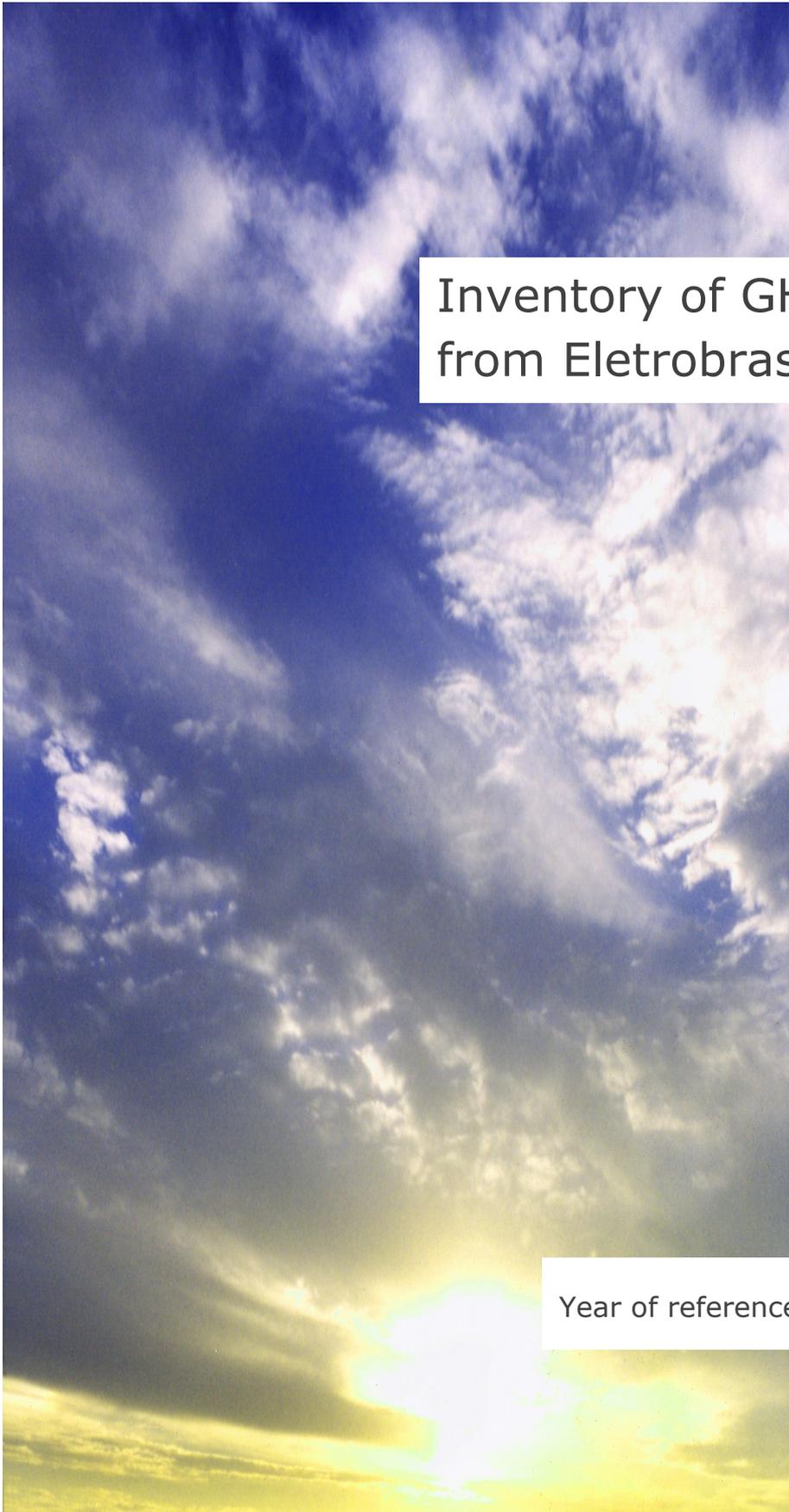




Eletrobras



Inventory of GHG Emissions
from Eletrobras Companies

Year of reference 2013 | June 2014

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Annex: Letter of Assurance of the Independent Auditors

1 | Presentation/Forewords

For the sixth consecutive year, Eletrobras publishes its inventory of greenhouse gases (GHG) emissions¹, following the guidelines of its Sustainability Policy and the Executive Board resolution no 1,262 of 2010, establishing the commitment of delivering annually the greenhouse gas emissions inventory of Eletrobras companies.

This document presents the GHG emissions of the 15 companies which form the Eletrobras² Companies System, in the base year of 2013.

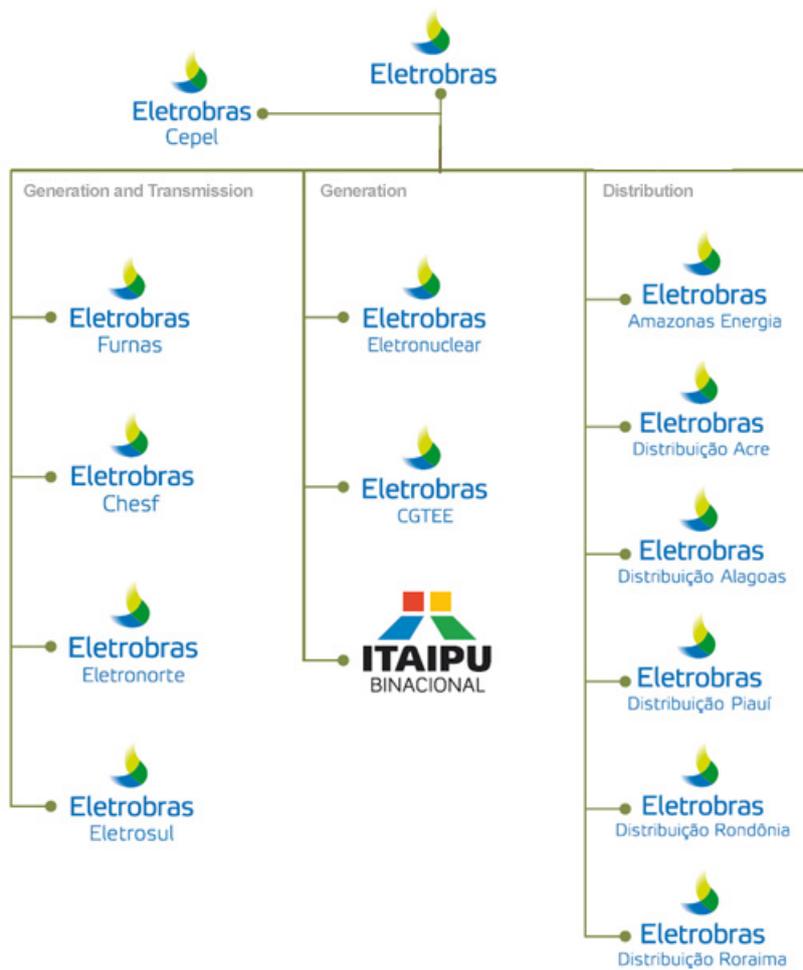


Figure 1 - Eletrobras Companies Organogram

¹ All GHG Inventories of Eletrobras companies are available at the Eletrobras portal. Visit the website: <http://www.eletrobras.com> > Sustainability > Environment > Inventory of Greenhouse Gas Emissions.

² Since Itaipu is a binational company, only the emissions corresponding to the interest of the company which is owned by Brazil are accounted for (50%).

2| Premises and GHG Inventory Building Process

The GHG Emission Inventory from Eletrobras companies follows the IPCC methodology (2006) and the guidelines of the Greenhouse Gas Protocol GHG Protocol³ (WRI, 2004), with the organizational limit considering those companies in which Eletrobras holds operational⁴ control.

The information necessary for the preparation of this Inventory was raised in each of the companies through their representatives in the GT 3-Climate Strategy Working Group established under the SCMA – Environmental Subcommittee of Eletrobras Companies.

Emissions corresponding to the losses in the electrical energy transmission system were calculated on the basis of information provided by the Department of Transmission Operation of the holding company. The result for these losses emissions is reported for each transmitter company separately.

For the calculation of emissions from electricity consumption, losses in transmission and distribution losses were used the emission factors in the National Interconnected System (SIN), which are calculated and published by the Ministry of Science, Technology and Innovation - MCTI⁵.

The emission factors of petroleum-based fuels in Brazil are different from those used internationally due to the legal obligation of addition in the fuel mix of a fraction of sugar cane ethanol (in gasoline) and biodiesel (in the diesel fuel), which decreases their polluter potential and modifies their carbon emissions when burned.

³ GHG Protocol: corporate greenhouse gas emissions accounting and reporting standard, launched in 1998 and revised in 2004, internationally recognized and today the most used tool by companies and governments worldwide to understand, quantify and manage their emissions.

⁴ Under the operational control approach, a company accounts for 100% of GHG emissions from unities over which it has operational control. It does not account for GHG emissions from operations in which it only owns an interest. To have operational control over a unity/operation consists in the fact that a company – or one of its subsidiaries – has absolute authority to introduce and implement policies on the respective operation.

⁵ Available on the website:
<http://www.mct.gov.br/index.php/content/view/321144.html#ancora>.

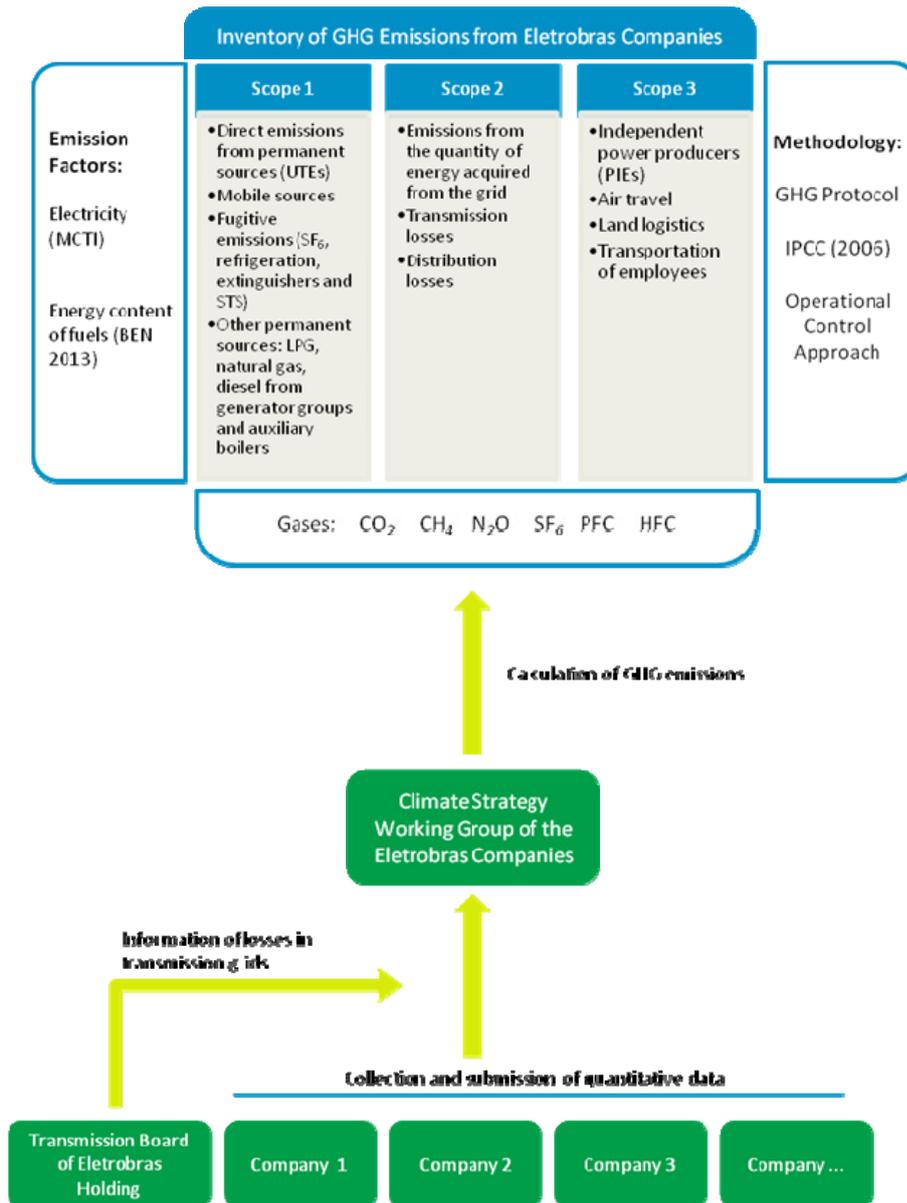


Figure 2 - presents the process of preparation of the GHG inventory from Eletrobras companies, its scope, the general structure and scheduled sources.

In this issue, for the first time, emission factors were used from the First National Inventory of air emissions by Road Vehicles (MMA, 2011) for road mobile sources (ethanol, natural gas, gasoline and diesel fuel) as a replacement to the IPCC factors. This change followed the good practice of using national emission factors, wherever and whenever there is availability of such information.

CO² emissions from the consumption of biofuels (biodiesel and ethanol) are reported separately from the calculations of this inventory, because these emissions are reabsorbed through photosynthesis in the cultivation of sugar cane, soybeans, among other vegetables, used in the production of these fuels.

Emissions resulting from the thermoelectric generation from independent producers of energy (PIE), whose energy is used by

the generation/distribution utilities Eletrobras Amazonas Energia, Eletronorte, Rondônia Distribution Company, Acre Distribution Company and Roraima Distribution Company, and, in the end of this process, resold to their final consumers, are quantified in the scope 3. Therefore, they are presented separated from emissions relating to the Eletrobras companies' own thermoelectric park, which are considered in scope 1.

The value of energy content of fuels consumed was calculated on the basis of the conversion factors set out in BEN-National Energy Balance (base year 2013).

On the basis of the information on consumption of fossil fuels (in thermal powerplants owned by Eletrobras companies) were estimated emissions of sulphur oxides (SO_x) and nitrogen oxides (NO_x), according to indirect⁶ calculation methodology.

In this inventory, the GHG emission intensity of previous years has been rectified by virtue of the change in terms of calculation procedure, which hitherto considered the three scopes, and now consider the scopes 1 and 2 (direct and indirect emissions related to purchase of energy), as calls for the Carbon Disclosure Project (CDP) and other instruments for GHG emission reporting.

Emissions from hydroelectric reservoirs belonging to Eletrobras companies were not considered because there isn't, so far, international scientific consensus methodology that allows to estimate GHG emissions in these reservoirs and to calculate the balance of emissions (or net emissions) of water bodies.

This inventory was verified by independent third party and all information and memories of calculation, in addition to identification of data sources, are archived. The independent auditor assurance letter was issued in May 9, 2014 by KPMG Risk Advisory Services Ltd⁷ (**Annex**).

⁶ Source: European Environmental Agency. Air pollutant emission inventory guidebook: Technical guidance to prepare national emission inventories (2009).

⁷ KPMG Risk Advisory Services Ltda is a Brazilian simple limited liability company and a member firm of the KPMG network of independent member firms and affiliated with KPMG International Cooperative ("KPMG International"), a swiss entity.

3| GHG Emissions from Eletrobras Companies [GRI EN 16 and EN 17]

In 2013, Eletrobras companies issued an overall amount of 13,870,272 tCO₂e, considering their direct emissions (scope 1) and indirect (scope 2 and 3). Of this total, 74% correspond to emissions from scope 1, 13% are from the scope 2, and 13% of scope 3 (**Figure 3**).

GHG emissions per scope (tCO₂e)

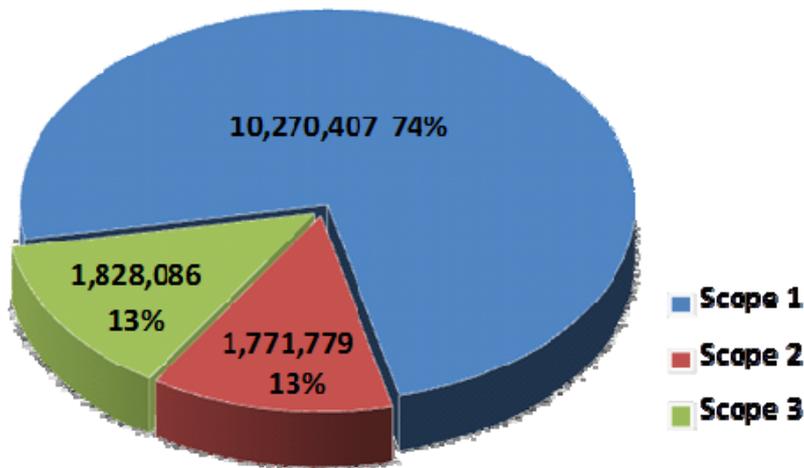


Figure 3 - Absolute emissions and GHG percents per scope

Of the total GHG issuance from Eletrobras companies, 73.5% are from its own thermal powerplants (scope 1), 13% originate from purchase of energy from Independent Power Producers - PIE (scope 3), and 12.5 percent come from losses in transmission and distribution systems (scope 2). All other issues combined reach only 1% of the total emissions.

Inventory of GHG emissions – base year 2013



Eletrobras Companies	Scope 1										Scope 2			Scope 3					SUBTOTAL PER COMPANY
	Permanent Sources			Mobile Sources			Fugitive Sources				Electricity Consumption	Distribution Losses	Transmission Losses	Transportation of Fuel	Independent Power Producer	Transportation of non-energetic products	Scope 3 Air Business Travel	Transportation of Employees	
	Thermal Powerplants	Generator Groups	Other types	Road	Waterway	Airway	SF6	Refrigeration and Air-Conditioning	Industrial Sewage	Fire Extinguishers									
CGTEE	3,486,316	n.a.	0	270	n.a.	n.a.	n.a.	7	552	2	26,592	n.a.	n.a.	n.d.	n.a.	5,481	91	613	3,519,925
Chesf	816,110	66	20	4,099	n.a.	417	0	n.a.	n.a.	16	746	n.a.	194,071	n.a.	n.a.	n.a.	1,840	n.a.	1,017,385
Furnas	1,439,570	79	70	4,138	7	n.a.	13,357	2,689	92	0	3,285	n.a.	541,828	n.d.	n.a.	n.d.	2,181	31	2,007,326
Eletronorte	446,717	97	88	2,544	111	12	0	59	8,456	18	662	n.a.	125,279	n.a.	632	14	2,152	292	587,134
Eletronuclear	n.a.	2,406	8	1,075	15	n.a.	n.a.	95	157	8	2,617	n.a.	n.a.	17	n.a.	545	444	2,264	9,650
Eletrosul	n.a.	63	9	1,435	n.a.	80	15,956	0	n.a.	3	642	n.a.	177,553	n.a.	n.a.	1	864	332	196,940
Amazonas Energia	4,006,629	n.d.	n.a.	1,163	n.d.	n.d.	0	14	n.d.	16	5	333,929	n.a.	n.d.	1,406,130	n.d.	680	n.d.	5,748,568
Itaipu	n.a.	38	234	473	6	n.a.	6,840	146	n.d.	9	201	n.a.	n.a.	n.a.	n.a.	27	818	967	9,759
Cepel	n.a.	2	36	40	n.a.	n.a.	n.a.	0	n.a.	2	628	n.a.	n.a.	n.a.	n.a.	n.a.	206	537	1,450
Eletrobras Holding	n.a.	n.a.	n.a.	11	n.a.	n.a.	n.a.	n.a.	n.a.	1	551	n.a.	n.a.	n.a.	n.a.	n.a.	1,724	n.a.	2,287
Distribuição Acre	n.a.	n.a.	1	261	n.d.	n.a.	456	n.a.	n.a.	0	102	25,787	n.a.	n.d.	127,975	n.d.	219	n.a.	154,802
Distribuição Alagoas	n.a.	1	n.a.	1,710	n.a.	n.a.	n.d.	n.d.	n.a.	0	360	116,143	n.a.	n.a.	n.a.	n.a.	177	n.d.	118,391
Distribuição Rondônia	n.a.	6	23	1,141	n.a.	n.a.	0	n.d.	n.a.	2	349	86,890	n.a.	n.d.	197,890	n.d.	342	n.d.	286,644
Distribuição Roraima	n.a.	n.a.	1	250	n.a.	n.a.	n.d.	n.a.	n.a.	0	n.a. ⁸	10,510	n.a.	n.d.	72,455	n.d.	n.d.	n.a.	83,217
Distribuição Piauí	n.a.	4	n.a.	1,760	n.a.	n.a.	1,838	n.d.	n.a.	3	387	122,661	n.a.	n.a.	n.a.	n.a.	142	n.a.	126,794
Subtotal Sources	10,195,343	2,762	490	20,371	139	509	38,447	3,009	9,257	79	37,127	695,922	1,038,731	17	1,805,083	6,069	11,881	5,036	TOTAL
Subtotal Source Types	10,198,595			21,020			50,792				37,127	695,922	1,038,731	17	1,805,083	6,069	11,881	5,036	(tCO₂e)
Subtotal Scopes	10,270,407										1,771,779			1,828,086					13,870,272

Table 1 - Eletrobras Companies' GHG Emissions – base year of 2013 (tCO₂e)

Legend: n.a.: not applicable | n.d.: not available data

⁸ Since Roraima Distribution Company generates and distributes electricity in its area of operation, its emissions from electricity consumption (scope 2) are not accounted, since these emissions have already been considered in scope 1.

Of the total direct emissions (scope 1), 99.3% originate in thermoelectric generation (own thermal powerplants), while fugitive emissions represent 0.5% and 0.2% mobile sources.

Referring scope 2, 59% of the emissions are derived from losses in the transmission, 39% of the losses in the distribution and 2% are emissions from electricity consumption by the Eletrobras companies.

Emissions from Independent Power Producers (PIE) correspond to the largest portion of scope 3 emissions (99 percent). The sum of the parts "air travel", "employees", "fuel transport " and "non-energy products transportation" add up to approximately 1% of this scope.

CO₂ emissions derived from the burning of biofuels - ethanol and biodiesel (B-100) - are not accounted for in the calculation of such inventory due to the fact that they are reabsorbed in the process of photosynthesis. These emissions are presented in **Table 2**, below.

COMPANY	CO ₂ emissions from bio-fuels burning (tCO ₂ e)
CGTEE	327.83
Chesf	9,359.04
Furnas	440.53
Eletronorte	197,417.63
Eletronuclear	389.62
Eletrosul	175.08
Amazonas Energia	102,878.71
Itaipu	424.40
Cepel	29.12
Eletrobras Holding	36.05
Acre Distribution Company	6,004.61
Alagoas Distribution Company	136.92
Rondônia Distribution Company	9,338.40
Roraima Distribution Company	3,412.39
Piauí Distribution Company	115.43
TOTAL (tCO₂e)	330,485.73

Table 2 - CO₂ emissions from the burning of bio-fuels ethanol and bio-diesel (B-100) - base year 2013 (tCO₂e)

When analyzed by GHG type, it turns out that the emissions of Eletrobras companies are composed almost entirely by carbon dioxide – CO₂ (99.4 percent). Sulphur hexafluoride-SF₆ represents only 0.3% of emissions, followed by nitrous oxide-N₂O (0.2%) methane-CH₄ (0.1%) and the gases used in cooling systems – HFCs and PFCs, which represent less than 0.1% of the total emissions. Details can be seen in **Table 3** below.

COMPANY	CO ₂ (tCO ₂ e)	CH ₄ (tCO ₂ e)	N ₂ O (tCO ₂ e)	SF ₆ (tCO ₂ e)	HFCs e PFCs (tCO ₂ e)	SUBTOTAL (tCO ₂ e)	(%)
CGTEE	3,502,099.5	1,543.6	16,274.6	n.a.	6.89	3,519,924.6	25
Chesf	1,016,036.8	484.7	863.6	0.00	n.a.	1,017,385.1	7
Furnas	1,989,646.2	755.4	879.5	13,356.70	2,688.74	2,007,326.5	14
Eletronorte	576,305.7	9,123.9	1,645.4	0.00	58.54	587,133.6	4
Eletronuclear	9,308.3	169.4	78.1	n.a.	94.64	9,650.4	0
Eletror sul	180,925.0	9.2	49.1	15,956.35	0.00	196,939.6	1
Amazonas Energia	5,735,401.1	4,241.2	8,911.5	0.00	14.30	5,748,568.0	41
Itaipu	2,736.2	5.4	31.5	6,840.00	145.86	9,759.0	0
Cepel	1,436.9	1.8	11.3	n.a.	0.00	1,450.0	0
Eletrobras Holding	2,269.5	0.7	16.5	n.a.	n.a.	2,286.7	0
Acre Distribution Company	153,880.8	136.1	329.4	456.00	n.a.	154,802.3	1
Alagoas Distribution Company	118,347.1	6.8	37.0	n.d.	n.d.	118,390.9	1
Rondônia Distribution Company	285,907.3	212.8	523.7	0.00	n.d.	286,643.8	2
Roraima Distribution Company	82,951.2	77.8	188.2	n.d.	n.a.	83,217.2	1
Piauí Distribution Company	124,919.6	4.5	32.5	1,837.68	n.d.	126,794.3	1
SUBTOTAL (tCO₂e)	13,782,171.4	16,773.1	29,871.9	38,446.7	3,009.0	TOTAL (tCO₂e)	
(%)	99.4	0.1	0.2	0.3	0.0	13,870,272.1	

Table 3 - GHG Emissions from Eletrobras Companies segregated by gas type (tCO₂e) – base year 2013

Legend: n.a.: not applicable | n.d.: not available data

In comparison to the total amount inventoried in 2012 (11,772,144 tCO₂e), Eletrobras companies GHG issuing increased about 15% in 2013 (13,870,272 tCO₂e).

	2012	2013	absolute variation tCO ₂ e	variation %
Scope 1	8,169,464	10,270,407	2,100,943	15.15
Scope 2	1,654,496	1,771,779	117,284	0.85
Scope 3	1,948,185	1,828,086	-120,099	-0.87
Total	11,772,144	13,870,272	2,098,128	15.13

Table 4 - Inter-annual variation of GHG emissions from Eletrobras companies (tCO₂e)

Note: the percent variation indicates the contribution of each scope to the increase of total emissions verified.

The increase in emissions from scope 1 is responsible for the completeness of the increase of total emissions, having expanded 15 percent compared to the year 2012 (**Table 4, Figure 4**). The scope 2 had a small contribution to the increase in total emissions from 2013, with an expansion of 0.85%. Scope 3 emissions retreated 0.87 compared to those of 2012.

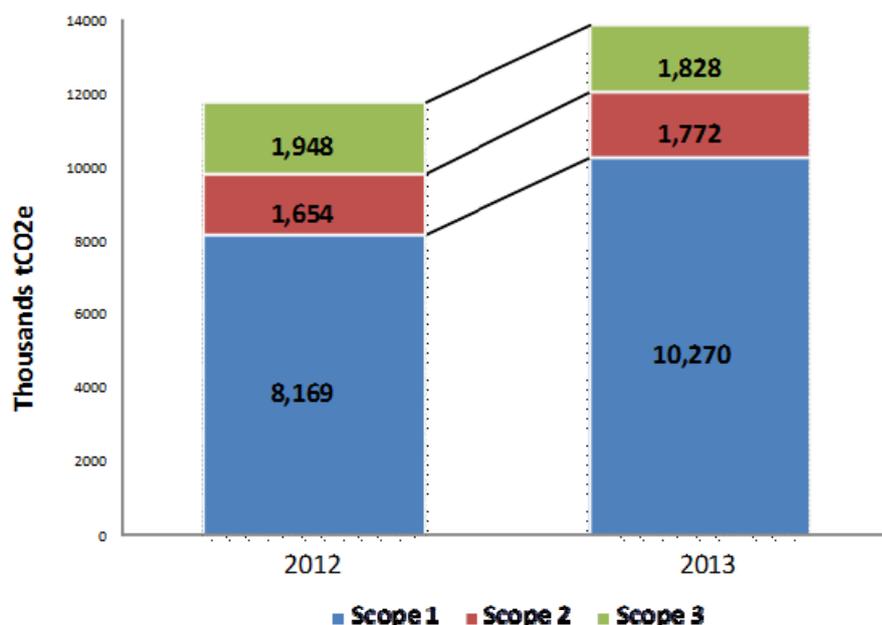


Figure 4 - Comparison of total emissions per each scope from Eletrobras companies between the base years of 2012 and 2013

The main factor that explains the increase in GHG emissions from Eletrobras companies relates to the fact that, starting from 2012, the National Electric System Operator (ONS) is increasing the order/dispatch of thermoelectric powerplants due to the decrease in the volume of water stored in reservoirs of hydroelectric plants, as a result of a major drought which has occurred in central and South-East of the country.

The following tables show the inventory history of GHG issuance from the Eletrobras companies by scope (**table 5**) and by company (**table 6**). The figures highlight the increasing scope and also scheduled sources over the years.

	GHG Emissions (tCO ₂ e)									
	2009	%	2010	%	2011	%	2012	%	2013	%
Scope 1	7,336,062	99.58	5,053,803	58.31	5,772,344	61.62	8,169,464	69.40	10,270,407	74.05
Scope 2	31,198	0.42	554,314	6.40	575,079	6.14	1,654,496	14.05	1,771,779	12.77
Scope 3	n.i.	n.i.	3,058,828	35.29	3,020,151	32.24	1,948,185	16.55	1,828,086	13.18
Total	7,367,259	100	8,666,946	100	9,367,574	100	11,772,144	100	13,870,272	100

Table 5 - Temporal evolution of GHG emissions from Eletrobras companies per scope
Legend: n.i.: not inventoried

Company	2009	2010*	2011	2012	2013
CGTEE	1,483,830	1,340,800	2,598,888	3,322,914	3,519,925
Chesf	652,680	26,084	131,059	300,080	1,017,385
Furnas	114,730	105,395	399,507	1,150,036	2,007,326
Eletronorte	1,667,670	490,439	1,956,962	990,191	587,134
Eletronuclear	6,070	7,906	4,720	7,587	9,650
Eletrosul	8,690	11,348	61,847	190,890	196,940
Amazonas Energia	4,002,700	4,641,068	3,739,712	5,210,824	5,748,568
Itaipu	16,310	9,192	10,040	10,494	9,759
Cepel	1,070	959	832	1,295	1,450
Eletrobras Holding	180	329	2,821	2,842	2,287
Rondônia Distribution Company	–	1,396,267	232,149	134,411	286,644
Acre Distribution Company	–	96,034	116,772	85,942	154,802
Piauí Distribution Company	–	3,391	38,967	262,477	126,794
Alagoas Distribution Company	–	–	38,323	17,343	118,391
Roraima Distribution Company	–	–	34,977	84,820	83,217
Eletrobras companies	7,366,540	8,666,946	9,367,574	11,772,144	13,870,272

Table 6 - Temporal evolution of GHG emissions from Eletrobras companies (tCO₂e)

Obs. * For the 2010 base year emissions due to transmission losses were calculated for the whole set of companies (537,734.82 tCO₂e); the distribution companies began to report their emissions for the inventory of base year 2010.

4| Generation Matrix and Emissions Intensity [GRI EN 3]

In 2013, Eletrobras companies generated 186,092 GWh. Of this total, approximately 85% corresponded to hydroelectric generation, 8.5% to nuclear generation and 0.3% to wind generation, being these no GHG emitting sources. GHG emitting sources corresponded to 6.5% of the total generation (**Figure 5 and Table 7**).

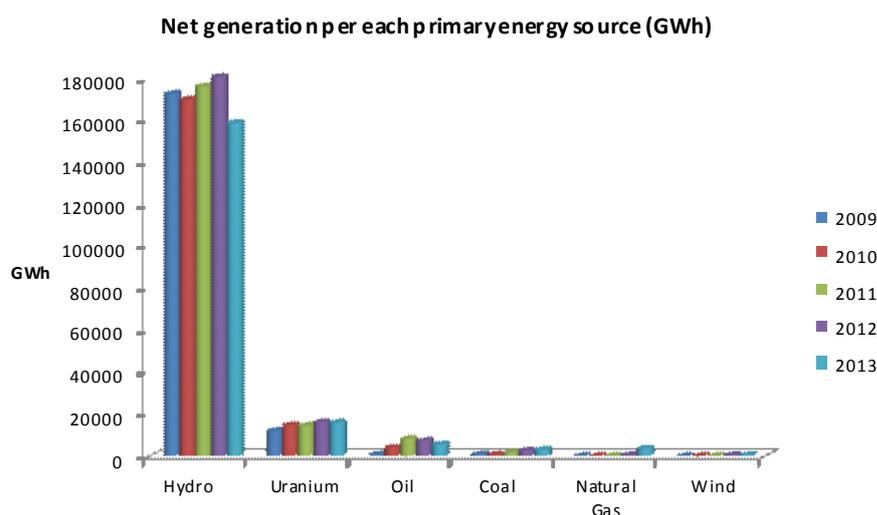


Figure 5 - Historic of energy generation per each primary source from Eletrobras companies

Renewable energies (wind and water) together accounted for 85% of the total Eletrobras companies generation in 2013. If included nuclear generation, this number increases to approximately 94%, featuring an array of low-GHG emission generation.

Primary source of energy	Net Generation (GWh)									
	2009	%	2010	%	2011	%	2012	%	2013	%
Hydro	171,931	92.9	169,105	89.8	175,304	87.8	180,757	86.3	157,958	84.9
Nuclear	11,877	6.4	14,544	7.7	14,351	7.2	16,007	7.7	15,829	8.5
Oil	586	0.3	3,956	2.1	8,135	4.1	7,159	3.4	5,524	3.0
Coal	724	0.4	613	0.3	1,620	0.8	2,677	1.3	2,836	1.5
Natural Gas	10	0.0	6	0.0	192	0.1	473	0.2	3,468	1.9
Wind	0	0.0	0	0.0	0	0.0	333	0.2	477	0.3
Total	185,128	100.0	188,223	100.0	199,602	100.0	207,405	100.0	186,092	100.0

Table 7 - Temporal evolution of energy generation from Eletrobras companies (per primary source)

In the base year 2013, the emission intensity from Eletrobras⁹ companies was 0.0647 tCO₂e/MWh (**table 8**), whereas direct emissions (scope 1) and indirect (scope 2). With respect to the year 2012, this figure had increased to 26% (**table 9**), due to the fact that there was a highest thermoelectric dispatching ordered by ONS and by smaller hydroelectric power generation from Eletrobras companies. Thus, in 2013, there was an increase in emissions from scope 1 and reduction of net generation from Eletrobras companies, as shown in **Table 7**.

Eletrobras companies	Emissions (tCO ₂ e)	Net total generation (MWh)	tCO ₂ e/MWh
CGTEE	3,513,739	2,836,000	1.2390
Chesf	1,015,546	33,369,000	0.0304
Furnas	2,005,115	35,153,000	0.0570
Eletronorte	584,043	41,632,000	0.0140
Eletronuclear	6,380	15,829,000	0.0004
Eletrosul	195,742	1,711,000	0.1144
Amazonas Energia	4,341,758	6,203,000	0.6999
Itaipu	7,947	49,315,000	0.0002
Cepel	707	-	-
Eletrobras Holding	563	44,000	0.0128
Acre Distribution Company	26,607	-	-
Alagoas Distribution Company	118,214	-	-
Rondônia Distribution Company	88,411	-	-
Roraima Distribution Company	10,762	-	-
Piauí Distribution Company	126,652	-	-
Total	12,042,186	186,092,000	0.0647

Table 8 - Emissions intensity from Eletrobras companies in the year of 2013 (sum of scopes 1 and 2)

	2011	2012	2013
Emissions (tCO₂e)	6,347,423	9,823,960	12,042,186
Net Total Generation (MWh)	197,943,000	207,405,000	186,092,000
tCO₂e/MWh	0.0321	0.0474	0.0647

Table 9 - Temporal evolution of emission intensity from Eletrobras companies (sum of scopes 1 and 2)

⁹ In this Inventory, the GHG emission intensity of previous years was rectified due to the change in the calculation method, which until then considered the three scopes, and now considers the scopes 1 and 2 (direct emissions and indirect emissions from purchased electricity), as it is already reported in the Carbon Disclosure Project (CDP).

The emission intensity of Eletrobras companies is low if compared to the average emission intensity of the major companies from the electricity sector of some relevant countries/regions (**table 10**), including Brazil. This is due to the majority of low-intensity sources of GHG emission in the array of generation from Eletrobras companies, reaching the mark of 94% of its total net generation (**see table 7**).

	tCO ₂ e/MWh
China¹	0.764
EUA¹	0.503
European Union ¹	0.406
Brazil ²	0.115
<u>Eletrobras companies</u>	0.065

Table 10 - Average emission intensity (tCO₂e/MWh) of the electric sector worldwide in comparison with Eletrobras companies

Source: ¹ International Energy Agency (2012); ² Brazilian State Energy Research Company – EPE (2013).

5] Sulfur and Nitrogen Oxide Emissions (SO_x and NO_x) [GRI EN 20]

Emissions of sulphur oxides (SO_x) and nitrogen oxides (NO_x) were estimated for the 5 companies Eletrobras that generate energy from fossil fuels, namely: CGTEE, Amazonas Energia, Eletronorte, Furnas and Chesf. These emissions are calculated indirectly based on fuel consumption for power generation and in specific emission factors for each fuel¹⁰.

The total emission estimated for sulphur oxides (SO_x) of the Eletrobras companies, in 2013, was of 51,849.98 tons. The largest contribution to these emissions coming from CGTEE, being followed by Amazonas Energia, Eletronorte, Chesf and Furnas (**Table 11 and Figure 6**).

Emissions of nitrogen oxides (NO_x) totaled 21,339.15 tons in the year 2013. CGTEE is the largest issuer of this gas, followed by Amazonas Energia, Furnas, Chesf and Eletronorte.

¹⁰Source: European Environmental Agency. Air pollutant emission inventory guidebook: Technical guidance to prepare national emission inventories (2009).

Eletrobras companies	SO _x Emissions	NO _x Emissions
CGTEE	29,851.84	11,318.45
Amazonas Energia	17,958.99	9,145.13
Eletronorte	2,899.04	1,134.41
Furnas	10.40	2,282.05
Chesf	1,129.70	1,459.11
Subtotal per source	51,849.98	25,339.15

Table 11 - Estimative of SO_x and NO_x gases emissions from Eletrobras companies in the year of 2013

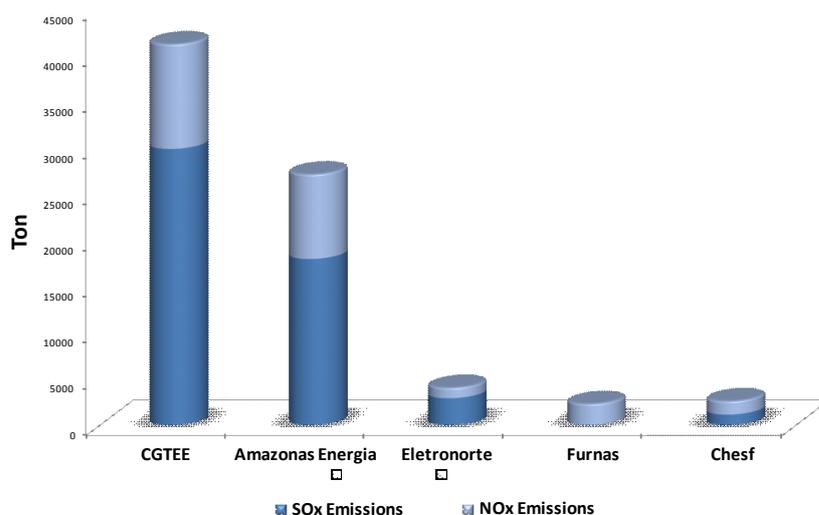


Figure 6 - SO_x and NO_x emissions from Eletrobras companies – base year of 2013

6| Actions for Elimination / Reduction of GHG Emissions [GRI EN 5 and EN 7]

Eletrobras companies have developed various actions that contribute to the mitigation and reduction of GHG emissions, notably in reforestation and energy efficiency activities. Although these initiatives do not come in the calculations of this inventory, they configure themselves in relevant steps towards reducing and offsetting GHG emissions of Eletrobras companies.

Eletrobras companies maintain control programs, environmental monitoring and recovery actions taking into account the reduction of damages related to the implementation and operation of their ventures. In 2013, was recomposed an area of 1,160.22 km², which equals almost to 108 thousand football fields and planted, voluntarily, 204,148 seedlings of various native species. In

addition, were recovered, also voluntarily, almost 5 thousand km² of degraded areas.

Until 2013, Eletrobras provided support to 162 protected areas, which together amount to about 190,108 km², distributed between protected areas, indigenous lands and archaeological sites. In addition, approximately \$10 million were destined, in the same period, to the support of these protected areas. The amount of \$1.7 million was destined to voluntary actions, including riparian re-vegetation projects and environmental education.

With regard to energy efficiency, there is the institutional internal instance called “Integrated Committee of Energy Efficiency of the Eletrobras System” (CIEESE), coordinated by the holding company and which is formed by representatives of the whole set of companies from Eletrobras System, who gather periodically to process improvement, elaboration and follow-up of action plans in accordance with the competences developed by each company.

The CIEESE was responsible for the development of new energy efficiency policy, published in December 2012, and during the year of 2013, the holding discussed along with the other companies their respective projects, actions of internal commissions for energy conservation (CICEs), plus energy efficiency indicators and the implementation of ISO 50,001 in those Eletrobras companies.

In the Eletrobras holding company, its internal CICE has implemented several actions to reduce electric consumption, as planning the energizing and de-energizing of loads, standardization of efficient equipment purchases for facilities, and awareness programs for employees and outsourced workers, plus the creation of a space in CICE’s Intranet page. At the end of the year 2013, it was possible to reach 6.8% of energy consumption reduction compared to the year 2012, which represents a saving of 414,007 kWh of energy consumption in daily activities.

The CIEESE, along with the targets of reduction of GHG emissions in 2013, encouraged companies to develop specific actions and projects to reduce energy consumption. Itaipu Binacional, for example, promoted the modernization of the refrigeration

equipment, implementation of more efficient thermal insulation in buildings and the exchange of light bulbs for more economical models in the offices of the plant. Eletrobras Furnas also promoted the retrofit of acclimatization systems and lighting.

In the distribution segment, we highlight the Conscious Consumption Project, which discloses information to employees about the importance of the rational use of energy. The campaign motivates the shutdown of appliances and light bulbs in the intervals of business hours and during absences within the workplaces.

7| Climate Strategy of Eletrobras Companies [GRI EN 5, EN 7, EN 18]

As one of the commitments made by Eletrobras to fight climate changes¹¹, were institutionalized in 2013 goals for reducing emissions of greenhouse gases. These goals were established through a joint effort by all Eletrobras companies and aims to reduce the consumption of fossil fuels in their vehicle fleets (scope 1) and reduced consumption of electricity (scope 2) in the year 2015, taking as a reference the consumption of these resources in the year 2012. Each Eletrobras company set their own goals, taking into account its peculiarities and consumption reduction potentials.

This year is being held the first performance evaluation of targets proposals, aiming to ratify or reorient the actions in progress towards achieving those targets until 2015.

To reduce emissions from vehicles fleets it is considered the gradual replacement of gasoline or diesel-powered vehicles for flexible-fuel vehicles powered by ethanol, the increased use of electric vehicles and reducing transportation trips for the same locations in separate vehicles.

The initiatives of GHG emissions reduction of electric power consumption, include the retrofit of acclimatization and lighting systems, the development of conscious consumption programs to motivate employees as the reduction in the consumption of electricity and other resources, establishment of hours of operation

¹¹Read the Eletrobras Declaration of Commitment on Climate Change: <http://www.eletrobras.com> > Sustainability > Environment > Declaration of Commitment on Climate Change.

for lighting and air conditioning and adjustments in measurement and billing system, by installing their own meter.

In addition to these initiatives, the Eletrobras Amazonas Energia promoted the replacement of the fuel used in the operation of four thermal powerplants in the State, from fuel oil to natural gas. The Eletrobras Furnas also promoted the fuel replacement in thermoelectric plants. The two plants operated by the company are already using natural gas instead of fuel oil. These initiatives represent significant reductions in the emission of pollutants (particulates) and greenhouse gases.

All these actions comprise the portfolio of projects focused on sustainability developed by Eletrobras companies who seek each year contributing to the reduction of GHG emissions.

8| References

ELETROBRAS, 2008. Inventário de Gases de Efeito Estufa do Sistema Eletrobras – 2005.

ELETROBRAS, 2009. Inventário de Emissões de Gases de Efeito Estufa provenientes de Usinas Termelétricas (fontes fixas) do período 2003 a 2008.

ELETROBRAS, 2009. Programa de Ações Estratégicas do Sistema ELETROBRAS (PAE 2009 – 2012).

ELETROBRAS, 2010. Política Ambiental das Empresas ELETROBRAS.

ELETROBRAS, 2010. Política de Sustentabilidade das Empresas ELETROBRAS.

ELETROBRAS, 2012. Relatório de Sustentabilidade ELETROBRAS.

ELETROBRAS, 2013. Relatório de Sustentabilidade ELETROBRAS.

Empresa de Pesquisa Energética (EPE), 2014. Balanço Energético Nacional 2013.

GHG Protocol. Especificações do Programa Brasileiro GHG Protocol: Contabilização, Quantificação e Publicação de Inventários Corporativos de Emissões de Gases de Efeito Estufa, 2ª edição.

IPCC, 2006. Guidelines for National Greenhouse Gas Inventories. Volume 2: Energy. International Panel for Climate Change.

MCT, 2010. Segunda Comunicação Nacional do Brasil à Convenção-Quadro das Nações Unidas sobre Mudança do Clima.

MCT, 2014. Fatores de emissão médios do sistema interligado nacional. Disponível em: <http://www.mct.gov.br/>. Acesso em: fevereiro/2014.

MMA, 2011. Primeiro Inventário nacional de emissões atmosféricas por veículos automotores rodoviários. Brasília.

WRI, 2004. The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard. World Resources Institute (WRI). World Business Council for Sustainable Development (WBCSD). Revised Edition.

ANNEX | Letter of Assurance of the Independent Auditors



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LIMITED ASSURANCE REPORT ISSUED BY INDEPENDENT AUDITORS

To the Board of Directors and Shareholders of
 Centrais Elétricas Brasileiras S.A. - Eletrobras
 Rio de Janeiro - RJ

Introduction

We have been engaged by Centrais Elétricas Brasileiras S.A. - Eletrobras (“Eletrobras” or “Company”) to apply limited assurance procedures on the compilation of the information regarding to the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” of Eletrobras, related to the year ended December 31st, 2013.

Responsibilities of Eletrobras Management

The management of Eletrobras is responsible for preparing and adequately presenting the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” in accordance with the criteria of “*The Greenhouse Gas (GHG) Protocol - Corporate Accounting and Reporting Standard - Revised Edition from WRI (World Resources Institute) and WBCSD (World Business Council for Sustainable Development) - (2004 Revised Edition)*”, “*2006 IPCC (Intergovernmental Panel on Climate Change) Guidelines for National Greenhouse Gas Inventories*”, “*Especificações do Programa Brasileiro GHG Protocol: Contabilização, Quantificação e Publicação de Inventários Corporativos de Emissões de Gases de Efeito Estufa - Segunda Edição*” and by the internal controls determined as necessary to allow the elaboration of those information free from material misstatement, even though it was resulted by fraud or error.

Independent auditors’ responsibility

Our responsibility is to express a conclusion about the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” based on the limited assurance engagement conducted and prepared in accordance with Technical Communication (TC) 07/2012, issued by the Federal Accounting Council and elaborated based on NBC TO 3000 (Assurance Engagements Other Than Audits or Reviews), issued by the Federal Accounting Council - CFC, which is the equivalent to international standard ISAE 3000 issued by the International Federation of Accountants applicable to Non-Financial Historical Information. These standards require compliance with ethical requirements, including independence ones and also that the engagement is conducted aiming to obtain limited assurance that the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” taken as a whole is free from material misstatement.

A limited assurance engagement conducted in accordance with NBC TO 3000 (ISAE 3000) primarily consists of making enquiries to Eletrobras management and other employees involved in preparing the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” and also applying analytical procedures to obtain evidence that permits us to make a

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limited assurance conclusion about the information taken as a whole. A limited assurance engagement also requires additional procedures when the independent auditor learns of issues which lead them to believe that the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” could present material misstatement.

The selected procedures were based on our understanding of the issues related to the compilation, materiality and presentation of the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” and other engagement circumstances and considerations about areas where material misstatement could exist. The procedures consisted of:

- (a) The planning of the work: consideration of relevance, consistency, amount of quantitative and qualitative information and the operational systems and internal controls that served as a basis for preparing the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” of Eletrobras.
- (b) the understanding of the calculation methodology and procedures used to consolidate the information through interviews with the managers in charge of the preparation the data.
- (c) the reviewing of the calculation records of greenhouse gas emissions taking into consideration Scope 1 (direct greenhouse gas emissions) amounting to 10,270,407 tons of CO₂e, Scope 2 (Electricity indirect greenhouse gas emissions), amounting to 1,771,779 tons of CO₂e and Scope 3 (other indirect greenhouse gas emissions), amounting to 1,828,086 tons of CO₂e, according to the GHG Protocol.
- (d) verification and analysis of evidences, sample-based verification of the direct and indirect energy consumption indicators used to calculate the greenhouse gas emissions.

We believe that the information, evidences and results obtained in our study is sufficient and appropriate to provide a basis for our limited conclusion.

Scope and limitations

The procedures applied in a limited assurance engagement are substantially less extensive than those applied in a reasonable assurance. Due to this, it does not ensure us that we are aware of all the issues that would be identified during a reasonable assurance engagement which aims to express an opinion. If we had conducted an engagement of reasonable assurance, we might have identified other issues and possible misstatements which can be in the information presented in the 2013 “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions”.

The nonfinancial data is subject to more inherent limitations than the financial data, due to the nature and diversity of the methods used to determine, calculate or estimate this data. Qualitative interpretations of the data’s materiality and accuracy are subject to individual presumptions and judgments. Additionally, we did not examine data informed for prior periods,



to assess the adequacy of their policies, practices and performance in sustainability, or in relation to future projections data.

Conclusion

Based on the applied procedures, described in this report, we have not identified any relevant information that leads us to believe that the information in the “Corporate Inventory of Direct and Indirect Greenhouse Gas Emissions” of Centrais Elétricas Brasileiras S.A. - Eletrobras was not compiled, in all material aspects, in accordance with the guidelines “*The Greenhouse Gas (GHG) Protocol - Corporate Accounting and Reporting Standard - Revised Edition* from WRI (World Resources Institute) and WBCSD (World Business Council for Sustainable Development)” - (2004 Revised Edition), “*2006 IPCC (Intergovernmental Panel on Climate Change) Guidelines for National Greenhouse Gas Inventories*” and “*Especificações do Programa Brasileiro GHG Protocol: Contabilização, Quantificação e Publicação de Inventários Corporativos de Emissões de Gases de Efeito Estufa - Segunda Edição*” and with the records and files that subsidized its elaboration.

São Paulo, May 9th 2014



KPMG Risk Advisory Services Ltda.
CRC 2SP023233/O-4



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