

## 2012 Greenhouse Gas Inventory

Cemig – Companhia Energética de Minas Gerais



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## 1. Cemig

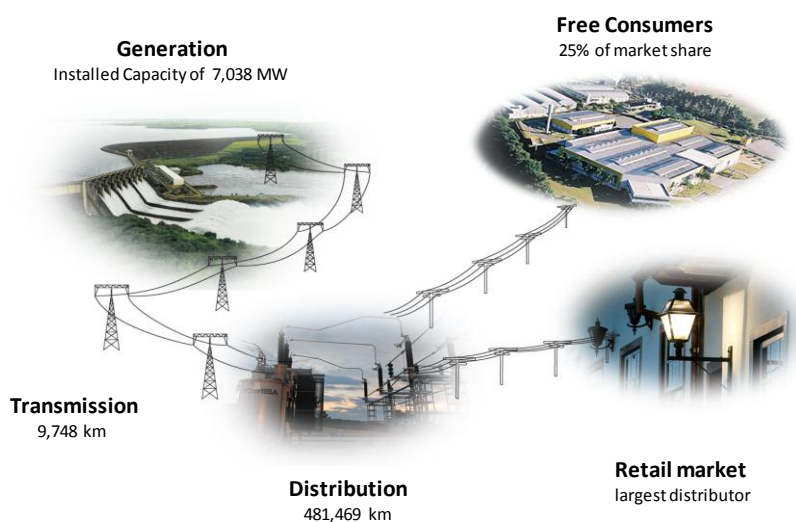
**Companhia Energética de Minas Gerais – Cemig** turned 60 in May 2012 and is proud to be a Company that combines its traditions with modern market practices. Far beyond generating, transmitting and distributing the best energy in the country, Cemig seeks to be dynamic and innovative in its activities to fulfill its social role and further collective wellbeing. Few companies in the world can so safely say their actions are guided by sustainability, which is borne out by international recognition by figuring for 13 consecutive years in the Dow Jones Sustainability Index, being listed in the BM&FBovespa Corporate Sustainability Index for 8 years running, and numerous other indicators the Company is regularly assessed by.

Cemig's main business areas are electric energy Generation, Transmission, Commercialization and Distribution and Energy Solutions. It also invests in prospecting and distributing natural gas as well as data transmission. While continuing to focus on hydropower, Cemig has been researching into, and investing in, energy alternatives, particularly wind power, as a means to expand its generating system using renewable resources and technologies that entail less impact on the environment. Cemig's current total installed capacity is 6,747 MW. If Light's generation capacity is added, it amounts to 7,038 MW. At the end of 2012, Cemig had 8,368 direct employees.

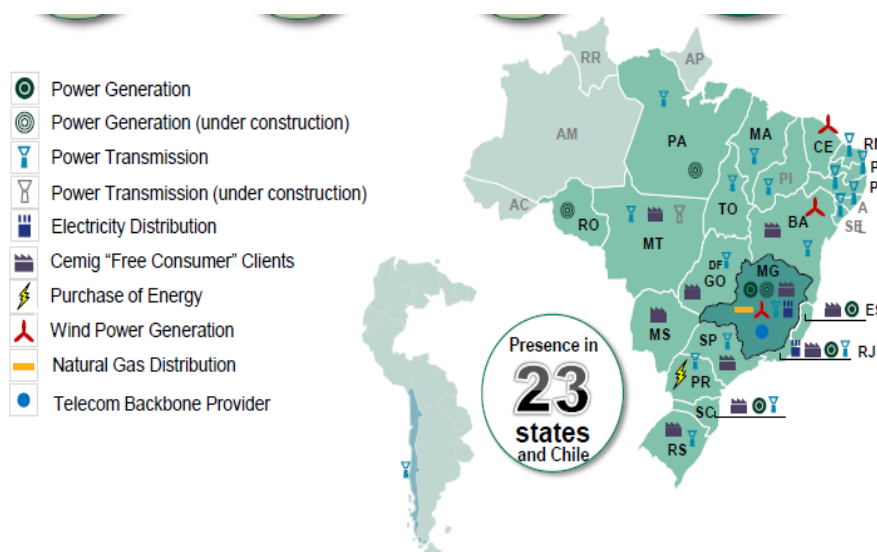
Cemig is one of the Brazilian electric energy industry's main consolidation vectors, Its operations are coordinated by a holding company, Companhia Energética de Minas Gerais – Cemig, and two subsidiaries: Cemig Geração e Transmissão S.A. (Cemig GT) and Cemig Distribuição S.A. (Cemig D), It also holds equity stakes in 120 companies, 15 consortia and one equity fund, with assets in 23 different Brazilian states – including the Federal District – and in Chile (data from January/2013).

Cemig is controlled by the Minas Gerais State Government (51%). It is a joint-stock company with more than 121,000 shareholders in 40 different countries (data from December/2012). Cemig shares are traded on the São Paulo, New York and Madrid stock exchanges.

The Conglomerate's consolidated net operating income came to R\$ 18.46 billion in 2012. The following figure shows Cemig's business portfolio.



**Figure 1: Cemig's business portfolio**



**Figure 2: Map of Geographical Location of the Company's Main Activities**

### Cemig's Main Business

Cemig's wholly-owned subsidiary, Cemig Distribuição (Cemig D), is responsible for supplying nearly 18 million people in 774 municipalities in the State of Minas Gerais, and for managing Latin America's largest distribution network, extending over 480,000 kilometers. Jointly with Cemig Geração e Transmissão (Cemig GT), Cemig is one of Brazil's largest power generators, with a generating system made up of 63 hydroelectric power plants, three thermal

power plants and four wind farms. Further information on Cemig D and on Cemig GT can be found in the Investments chapter of this report.

In addition to its subsidiary companies, Cemig D and Cemig GT, Cemig has several direct and indirect equity stakes in other companies. The entire Cemig conglomerate consists of 120 companies and 16 consortia (data base from December 31<sup>st</sup>, 2012).

## **2. About the inventory**

This report presents the results of Cemig's Greenhouse Gas Emissions Inventory for the year 2012. The inventory was developed according to the directives under the ISO 14.064-1 norm and the Brazil GHG Protocol Program, using 2008 as its historical base year. Drawing up the GHG emissions inventory is an important step for Cemig, since it determines the quantity and the origin (sources) of reduceable emissions.

Although not legally obliged to, Cemig has submitted its GHG report for independent verification a second time, thereby making its document more reliable. Verification was done by *Bureau Veritas Certification*.

Calculation methods were chosen mainly in view of the availability of data and specific emission factors. Data were gathered from records in the company's ERP system and from corporate systems, invoices or worksheets.

The inventory was drawn up based on the following methodologies:

- ABNT NBR ISO 14064-1. Specification and guidance to organizations to quantify and develop greenhouse gas emission and removal reports
- "*The Greenhouse Gas Protocol – a Corporate Accounting and Reporting Standard – Revised Edition.*" 2010
- Brazil GHG Protocol Program Specifications – Accounts, Quantification and Publication of Corporate Greenhouse Gas Emission Inventories – 2010.
- *Intergovernmental Panel on Climate Change (IPCC) 2006, IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Program*

Calculation of GHG emissions was done using the “Tool for Estimating Greenhouse Gases for Intersectoral Sources” (GHG Protocol Tool) – Brazilian Version “Ferramenta v2012.0.1”.

For mobile sources the N<sub>2</sub>O and CH<sub>4</sub> emission factors from the IPCC *Guidelines for National GHG Inventories* (2006) were adopted to enable comparison with emission levels around the world.

For an estimate of the SF<sub>6</sub> loss percentage, a 0.7<sup>1</sup>% per annum factor was utilized.

With respect to the calculation of the distance between airports in item “Business Trips – Scope 3”, the following site was used: <http://www.gcmap.com>.

### **3. Coverture Period**

The current inventory covers emissions from activities undertaken by Cemig between January 1st, 2012 and December 31st, 2012.

### **4. Organizational limits and Emitting activities**

Cemig adopted the Operational Control approach, that is, the companies which are owned (100% of control) by Cemig. Therefore, in drawing up developing the inventory the following companies were considered:

- Cemig Geração e Transmissão S.A. (Cemig GT)
- Cemig Distribuição S.A. (Cemig D)
- Rosal Energia S.A.
- Sá Carvalho S.A.
- Efficientia S.A.
- Cemig Serviços S.A.
- Usina Térmica Ipatinga S.A.
- Cemig PCH S.A.<sup>2</sup>
- Horizontes Energia S.A.<sup>3</sup>

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<sup>1</sup> E.Preisegger, R.Dürschner, W.Klotz, C.-A.König, H.Krähling, C.Neumann, B Zahn. Life Cycle Assessment Electricity Supply Using SF<sub>6</sub> Technology. Available at: <http://www.denix.osd.mil/cmrmnd/upload/Life-Cycle-Assessment-SF6-Preisegger-at-al.pdf>

<sup>2</sup> Four Small Hydropower Plants operated by Cemig GT. Emissions are accounted for by Cemig GT.

- Usina Térmica do Barreiro S.A.
- Cemig Telecomunicações S.A.

These companies provided 82% of the Group's operating income. The following emission sources were identified in these companies:

Scope	Comment	Emission Sources
<b>Scope 1: Direct GHG emissions</b>	Emission sources that are owned or controlled by the company.	<ul style="list-style-type: none"> <li>- Mobile sources: <ul style="list-style-type: none"> <li>• Fuel consumption by the following companies' fleets: Cemig GT, Cemig D, Rosal HPP, Sá Carvalho HPP, Cemig Telecom, Efficientia and Cemig Serviços</li> <li>• LPG, diesel and gasoline consumption by forklifts and cranes</li> <li>• Fuel consumption by aircraft</li> <li>• Fuel consumption by small boats</li> </ul> </li> <li>- Stationary sources</li> <li>- Gas processing thermal power station starts – Barreiro Thermal Power Plant (natural gas) <ul style="list-style-type: none"> <li>• Igarapé Thermal Power Plant</li> <li>• Emergency generators</li> <li>• Air conditioning</li> <li>• Fossil fuel consuming machines</li> <li>• Fugitive emissions of SF<sub>6</sub></li> <li>• Fertilizers to produce seedlings and plant riparian vegetation</li> </ul> </li> </ul>
<b>Scope 2: Indirect emissions</b>	Emissions from company's consuming electric energy	<ul style="list-style-type: none"> <li>- Electric energy consumption at the administration and operations units</li> <li>- Electric energy losses in the transmission and distribution systems</li> </ul>
<b>Scope 3: Other indirect emissions</b>	Emission sources not owned or controlled by the company	<ul style="list-style-type: none"> <li>- Staff transportation</li> <li>- Electric energy consumption by end consumers</li> <li>- Transportation of materials and equipment</li> <li>- Business air travel</li> <li>- Gasoline, ethanol and diesel oil for distribution contractors<sup>4</sup></li> </ul>

It should be stressed that the contribution of hydroelectric reservoirs to climate change was not assessed either quantitatively or qualitatively, due to the lack of

<sup>3</sup> Small Hydropower Plant operated by Cemig GT. Emissions are accounted for by Cemig GT.

<sup>4</sup> Calculated for the first time in 2012.

a clear methodology to assess their role regarding greenhouse gases. There are as yet no methodologies or conceptual models universally accepted to quantify GHG emissions from reservoirs. In 2011, Cemig started an as yet uncompleted research project on the subject.

## 5. GHG Emissions

Cemig's total GHG emissions calculated for the Inventory were classified into Scope 1 emissions (direct emissions), Scope 2 emissions (indirect emissions from energy consumption or losses) and Scope 3 emissions (other indirect emissions). The table below presents historical data for Scopes 1, 2, and 3 emissions from 2008 to 2012.

**Table 1: Historical Data for Scope 1, 2 and 3 GHG Emissions– 2008 to 2012.**

<b>Year</b>	<b>Scope 1 (t CO<sub>2</sub>e)</b>	<b>Scope 2 (t CO<sub>2</sub>e)</b>	<b>Scope 3 (t CO<sub>2</sub>e)</b>
<b>2008</b>	287,307	282,439	NA
<b>2009</b>	111,758	390,039	NA
<b>2010</b>	59,642	295,478	4,937,535
<b>2011</b>	24,384	168,189	5,202,775
<b>2012</b>	<b>53,567</b>	<b>436,750</b>	<b>5,341,863</b>

NA: not available

Scope 1 emissions in 2008 and 2009 were high in comparison to the following years due to the considerable rise in running time at the Igarapé Thermal Power Plant, which was also why emissions between 2011 and 2012 rose.

Hence, the magnitude of Cemig's Scope 1 emissions in 2012 was 1.39 KgCO<sub>2</sub>e/MWh, which, compared to the National Interconnected System's (68.6 KgCO<sub>2</sub>e/MWh) and worldwide and European averages (603<sup>5</sup> kg CO<sub>2</sub>e/MWh and

<sup>5</sup> Source: How the energy sector can deliver on a climate agreement on Copenhagen International Energy Agency 2009 p.



412<sup>6</sup> kg CO<sub>2</sub>e/MWh, respectively), it is clear how much less intense Cemig's GHG emissions are.

Indirect Scope 2 and 3 emissions increased significantly in 2012 due to the increase in the National Interconnected System (SIN) Emissions Factor, the largest in the five years inventoried by Cemig.

Details on these results are discussed as follows.

### 5.1. Scope 1 Emissions

Scope 1 emissions in 2012 totaled 53,567 tCO<sub>2</sub>e, of which 12,322 tCO<sub>2</sub>e were from the vehicle and aircraft fleet, 3,950 tCO<sub>2</sub>e from SF<sub>6</sub> gas leakage from electrical equipment, 24,344 tCO<sub>2</sub>e from the Igarapé Thermal Power Plant, 12,446 tCO<sub>2</sub>e from the Barreiro Thermal Power Plant startup, 23 tCO<sub>2</sub>e from the use of emergency generators, 470 tCO<sub>2</sub>e from the use of machines and forklift trucks and 12 tCO<sub>2</sub>e from the use of fertilizers. Even though it has been identified as a potential source of GHG emissions, there were no emissions from air conditioning gas leakage.

Figure 3 shows Scope 1 emissions as per source type, for 2011 and 2012.

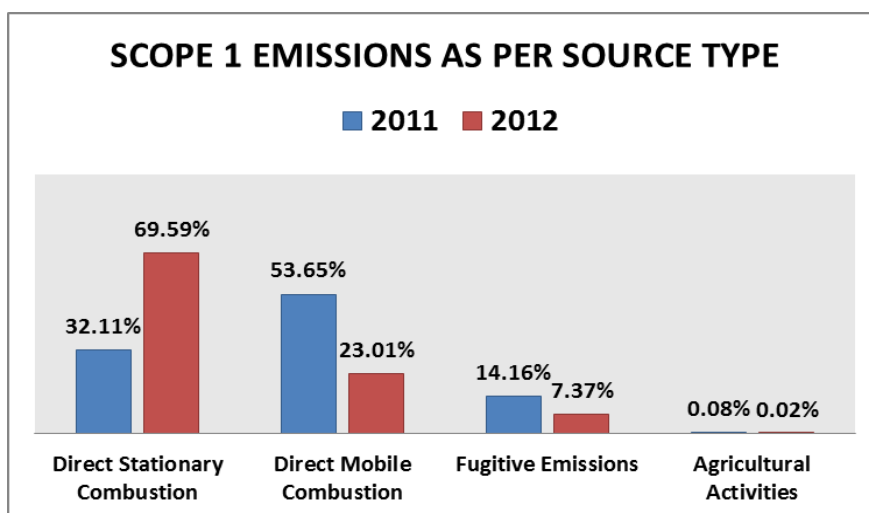


Figure 3: Direct emissions as per source type between 2011 and 2012 (Scope 1).

It can be seen that most of the Scope 1 emissions were from stationary sources (70%) due to reactivating the Igarapé Thermal Power Plant and consumption of

31. [http://www.worldenergyoutlook.org/docs/weo2009/climate\\_change\\_excerpt.pdf](http://www.worldenergyoutlook.org/docs/weo2009/climate_change_excerpt.pdf)

<sup>6</sup> Source: International Energy Agency - WEO 2010 (p. 640): 412 kg/MWh

natural gas at the Barreiro Thermal Power Plant. This is a different picture from the scope 1 emission characteristics in 2011, when most emissions came from mobile sources (54%) since the Igarapé Thermal Power Plant did not run.

### 5.1.1. Stationary Combustion

Stationary combustion consists of burning fossil fuels for different applications. At Cemig, most of these emissions are from thermal power plants. The fuel used at the Igarapé Thermal Power Plant (131 MW) is fuel oil and residual oil. The plant started up again after a 2 year standstill for overhauling and modernization, with the resulting rise in Scope 1 emissions. The main fuels used at the other two thermal plants, the Ipatinga Thermal Power Plant (40 MW) and the Barreiro Thermal Power Plant (12.9 MW), are blast furnace gases, tar and other residual gases produced during steel mill industrial processes as main fuels. Fossil fuels (fuel oil and natural gas at the Ipatinga and Barreiro Thermal Power Plants, respectively) are only used at machine startup. In 2012, the Ipatinga Thermal Power Plant used gases from coke-burning plants instead of fossil fuels to start up its machines. However, Natural Gas consumption at the Barreiro Thermal Power Plant rose from 2,698,118 Nm<sup>3</sup> in 2011 to 6,195,851 Nm<sup>3</sup> in 2012. Figure 4 shows the GHG emissions according to the type of fuel used.

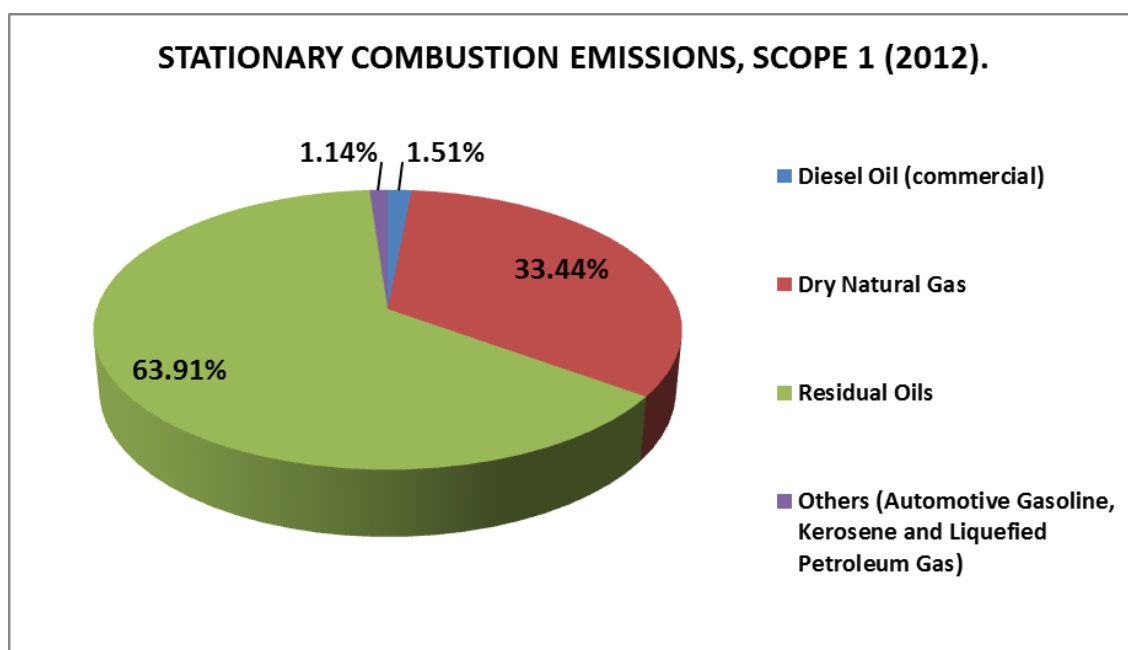


Figure 4: Stationary combustion emissions, Scope 1.

### 5.1.2. Mobile Combustion

Mobile combustion consists of burning fossil or renewable fuels for land, maritime or air transportation. Of note is Cemig's initiative for its efficient management of fuel consumption by its vehicle fleet, which reduced emissions by 36.59% from 2008 to 2012. Compared to 2011, fleet emissions fell from 13,053 tCO<sub>2</sub>e in 2011 to 12,183 tCO<sub>2</sub>e in 2012.

This reduction was accomplished by implementing measures such as improving the Fleet Control System, implementing Fueling Cards and reducing the company's vehicle fleet.

These emissions are from consuming gasoline, diesel, Compressed Natural Gas (CNG) and aviation fuel in Cemig's fleet. As illustrated in the figure below, the majority of mobile emissions are from diesel vehicles.

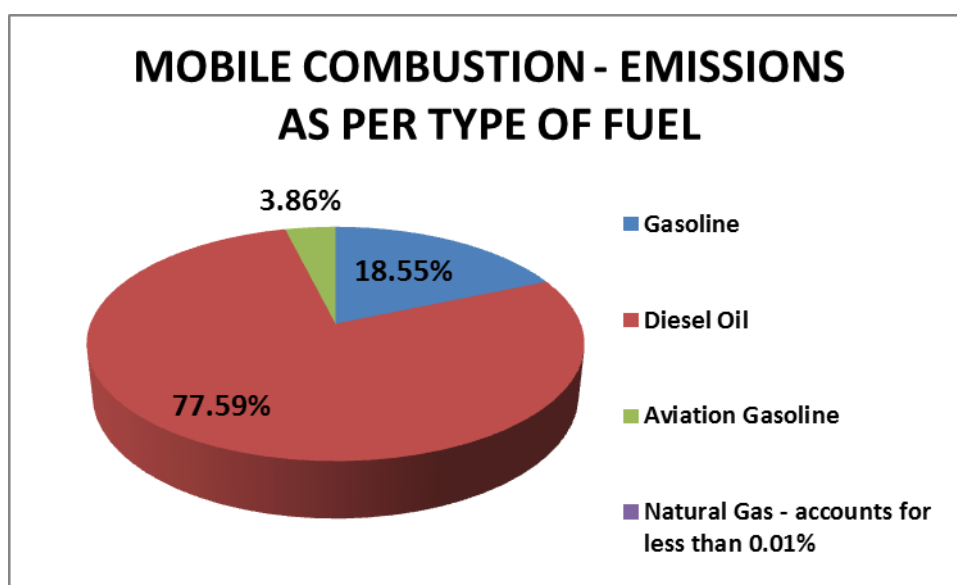


Figure 5: Emissions per fuel used, Scope 1.

### 5.1.3. Fugitive Emissions

Cemig's fugitive gas emissions are from SF<sub>6</sub> gas used in electrical equipment as insulators or to extinguish electric arcs. In 2011 SF<sub>6</sub> gas emissions went from 3.452 tCO<sub>2</sub>e to 3.950 tCO<sub>2</sub>e in 2012.

#### 5.1.4. Farming Activities

Emissions from Cemig's farming activities are characterized by the use of organic or chemical fertilizers in the production of native species seedlings for urban tree planting, planting riparian vegetation and as nutrients used for fish farming. By way of comparison, between 2011 and 2012 values went from 19 tCO<sub>2</sub>e to 12 tCO<sub>2</sub>e.

#### 5.2. Scope 2 Emissions

Scope 2 emissions refer to the electric energy consumed at industrial facilities and offices, and from the National Interconnected System (SIN), as well as from power losses in the electric energy system, which is the Company's main emission source. Losses are considered to be electric energy consumption because they require the generation of such energy, and so they must be considered as an indirect emission. It should be stressed that Scope 2 emissions are strongly influenced by the Brazilian emission factor, which varies depending on the extent to which thermal power plants are dispatched throughout the year (Table below).

**Table 2: History of National Interconnected System's Emission Factors.**

Year	Parameters	Yearly Average
2008	National Interconnected System (SIN) Emission Factor (EF) tCO <sub>2</sub> /MWh	0.0484
2009	SIN EF tCO <sub>2</sub> /MWh	0.0246
2010	SIN EF tCO <sub>2</sub> /MWh	0.0513
2011	SIN EF tCO <sub>2</sub> /MWh	0.0292
2012	SIN EF tCO <sub>2</sub> /MWh	0.0686

Of all the scope 2 emissions in 2012, 0.8% (3,509 tCO<sub>2</sub>e) is from power consumption and 99.2% (433,241 tCO<sub>2</sub>e) from technical losses.

It is noted that all the electric energy consumed ranged from 5,763 GWh to 6,368 GWh between 2008 and 2012, while scope 2 emissions ranged from 168,189 tCO<sub>2</sub>e to 436,750 tCO<sub>2</sub>e.

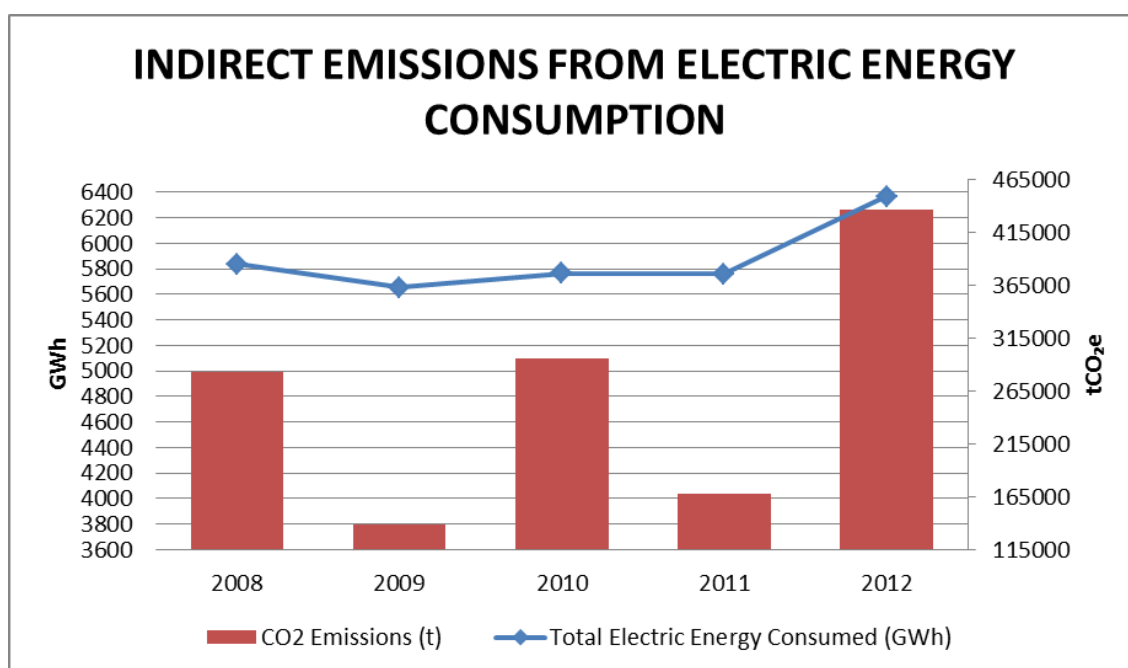


Figure 6: Indirect emissions from electric energy consumption, scope 2.

Actions to minimize emissions are described in item 11.

### 5.3. Scope 3 Emissions

In the Figure below, the history of GHG emission by scope 3 emitting activity is shown.

Table 3: GHG emissions in tCO<sub>2</sub>e by scope 3 emitting activity.

GHG emissions (t CO <sub>2</sub> e)	2010			2011			2012		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Staff and Equipment Transportation	1,063	1,618	2,874						
Business trips	2,310	1,786	1,953						
Operation and maintenance services for distribution services (Fossil fuel consumption by contractors)	NA	NA	15,313						
Sale of Power	4,934,159	5,199,371	5,321,724						

The main source of scope 3 emissions is electric energy consumption by end consumers, regardless of whether they are industrial, commercial or residential. As the power marketed by Cemig integrates the National Interconnected System (SIN), it used the grid's emission factor to calculate such emissions. In 2012 this source was accounted for 5,321,723.750 tCO<sub>2</sub>e.

By way of comparison, between 2011 and 2012, the power marketed by Cemig went from 75,811 GWh to 77,595 GWh. The emission factor went from 0.0292 tCO<sub>2</sub>/MWh in 2011 to 0.0686 tCO<sub>2</sub>/MWh in 2012, an increase 2.35 greater compared with emissions for 2011.

Additionally, 1,953 tCO<sub>2</sub>e were emitted as a result of business trips and 2,147 tCO<sub>2</sub>e from cargo shipments, an approximately 10% and 60% increase in relation to 2011, respectively. Emissions from cargo shipping increased significantly when compared to other scope 3 emissions, due to the need for greater transport of this type to meet the needs of work undertaken through the Distribution Development Plan (PDD), performed by the company all over the state. In contrast, emissions from the transportation employees fell by 10% between 2011 and 2012, in which the total was 720 tCO<sub>2</sub>e.

In 2012 Cemig began the quantification of emissions from vehicles of contractors that provide operation services and distribution service maintenance. Out of the 43 companies that provide this type of service, 21 provided information for the inventory, which is equivalent to 46% of the total contractual value for contractors in 2012 and totals 15,313 tCO<sub>2</sub>e.

### **5.3.1 Energy Consumption Emissions**

The energy commercialized by Cemig corresponds to the energy sales to captive and free consumers in the concession area in Minas Gerais and outside of the state, to the commercialization of energy to other electrical sector agents in the ACR – Regulated Procurement Environment and ACL – Free Procurement Environment and in the CCEE – Electric Energy Commercialization Chamber, thus eliminating existing transactions among the companies in the Group Cemig.

Of all the sectors in which Cemig commercializes energy, the industrial sector is the biggest consumer. For this reason, a series of analyses emissions resulting from Cemig's electric energy consumption is presented below. In order to calculate these emissions, the energy consumption in the sector and the emissions factor for the National Interconnected System were used.

CO<sub>2</sub> emissions by the Steel Industry were responsible for 18.34% of total industrial client emissions in 2012. The percentage of CO<sub>2</sub> emitted by each industrial sector in 2012 is presented in the following chart (Figure 7).

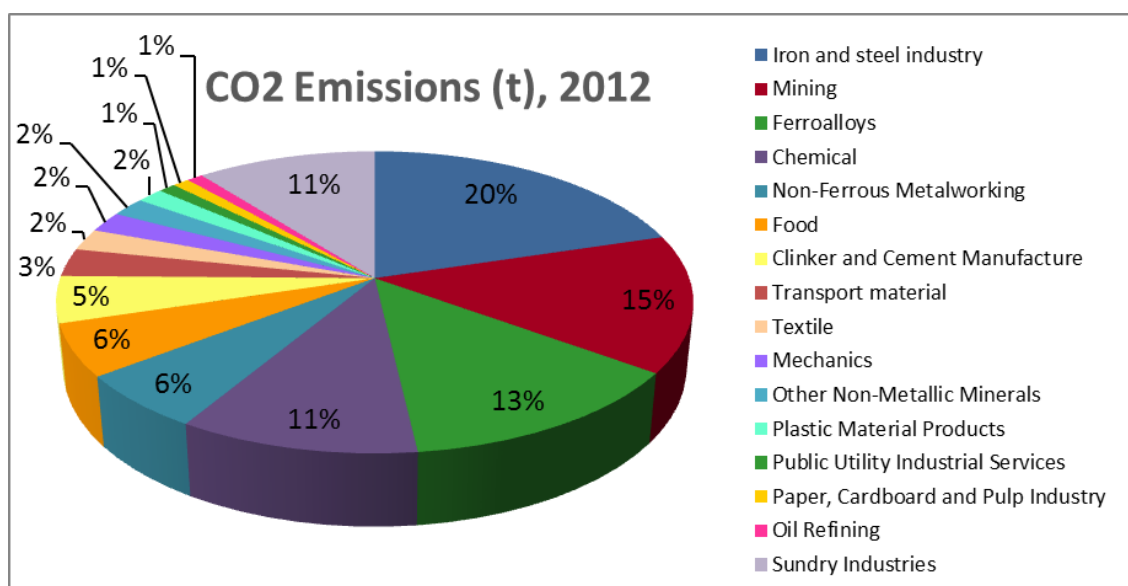


Figure 7: Chart showing CO<sub>2</sub> emission % by Industrial Class in 2012.

## 6. Total Emissions

The table below shows emissions broken down by company (tCO<sub>2</sub>e). It can be seen that Cemig GT and Cemig D represent 77% of total Scope 1 emissions, chiefly caused by fossil fuel consumption by the Igarapé Thermal Power Plant at Cemig GT and the vehicle fleet at Cemig D. Regarding Scope 2 emissions, Cemig D is responsible for 99.7% of total emissions, stemming from distribution system losses.

**Table 4: Emissions broken down by company (tCO<sub>2</sub>e)**

GHG emissions (t CO <sub>2</sub> e)	Scope 1					Scope 2
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	SF <sub>6</sub>	Total (tCO <sub>2</sub> e)	CO <sub>2</sub>
Cemig Geração e Trans. S.A.	25,180	202	414	1,554	27,350	701
Cemig Distribuição S.A.	11,174	15	44	2,396	13,630	435,575
Rosal Energia S.A. <sup>1</sup>	6	0	0	0	6	0
Sá Carvalho S.A. <sup>1</sup>	8	0	0	0	8	0
Efficientia S.A. <sup>2</sup>	4	0	0	0	4	0
Cemig Serviços S.A. <sup>2</sup>	111	0	1	0	113	0
Usina Térmica Ipatinga S.A. <sup>1</sup>	0	0	0	0	0	0
Usina Térmica do Barreiro S.A. <sup>1</sup>	12,434	5	7	0	12,446	0
Cemig Telecomunicações S.A.	10	0	0	0	10	472
<b>Total</b>	<b>48,928</b>	<b>222</b>	<b>467</b>	<b>3,950</b>	<b>53,567</b>	<b>436,750</b>

<sup>1</sup>These plants consume the electric energy they generate themselves.

<sup>2</sup>They use the facilities of Cemig Distribuição S.A.

## 7. Direct GHG emissions, quantified separately for each GHG in tons of CO<sub>2</sub>e

The table below shows the GHG Scope 1 emissions by greenhouse gas effect (t) and in metric tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e). It can be seen that CO<sub>2</sub> is the gas emitted in greater quantity due mainly to the consumption of fossil fuels by vehicles and thermal power plants.

**Table 5: GHG emission in tons of GHG and in metric tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e).**

GHG	In metric tons for each gas	Potential for Global Warming	In metric tons of CO <sub>2</sub> equivalent (t CO <sub>2</sub> e)
CO <sub>2</sub>	48,928	1	48,928
CH <sub>4</sub>	10,59	21	222
N <sub>2</sub> O	1,50	310	467
HFCs	0	140 – 11,700	0
PFCs	0	6,500 – 9,200	0
SF <sub>6</sub>	0.16	23,900	3,950
<b>Total</b>		-	<b>53,567</b>

<sup>1</sup>Source: IPCC Second AR (1995)



## **8. GHG emissions from biomass**

The GHG Protocol and the IPCC (2006) recommend that emissions from burning biomass be related and that the emission be considered neutral. For fossil fuels, with biofuels added, the values indicated by the National Petroleum Agency (ANP) and compiled in the Brazil GHG Protocol Program Tool have been adopted. In 2012 the average addition of ethanol to gasoline marketed in Brazil was 20% and 5% of biodiesel in Diesel. In 2012 Scope 1 and Scope 3 emissions from biomass were 818 t CO<sub>2</sub> and 1.142 t CO<sub>2</sub> respectively.

## **9. Removals of GHG**

Cemig carried a series of actions with a view to helping remove GHG, but chose not to quantify them.

The Riparian Reforestation Program is an action of cooperation between the company, the rural owners of the areas surrounding reservoirs considered Permanent Protection Areas (APP) and the Justice Department. The owners are encouraged by Cemig to preserve their areas and further riparian reforestation with the Company supplying the seedlings and bearing the implementation costs, while the owners make the areas available and commit to their proper upkeep. Consummation of these partnerships resulted in 74.2 hectares of vegetation being planted around eight of the Company's plants' reservoirs.

The Company runs two forest nurseries at the Itutinga and Volta Grande environmental stations and a seed laboratory in Belo Horizonte producing seedlings for urban tree planting. 371,894 native tree seedlings and 14,497 urban tree planting seedlings were produced, a total of 386,391 seedlings.

3,540 kg of fruit were collected. After processing and beneficiation, they resulted in 1,49 kg of seeds that were distributed among the Company nurseries and also given to City Halls and partner projects such as: Fundação Zoobotânica, EPAMIG Oratórios and Pitangui, Instituto Terra, Congresso Brasileiro de Arborização Urbana, UFLA, ARPAD, ARPA, UFMG, EMBRAPA, CRIDES, Floresta Nacional de Passa Quatro, Associação do Rio Pará,

EMATER Carvalhos, FESP – Passos, Horto Municipal de Três Corações, UFV, Viveiro Júlio Terra – Curvelo and Projeto Manuelzão.

### **10.Exclusions from the inventory**

The inventory sought to account for all the main sources of scope 1 and scope 2 emissions. The destination of solid residues (organic matter) and of effluents from operations were not accounted for as they are treated and disposed of by third parties.

### **11.Recalculation of the inventory**

The inventories for 2008, 2009, 2010 and 2011 were recalculated because of a methodology change in the Brazilian GHG Program Protocol – “Ferramenta v2012.0.1”

### **12.Inventory uncertainties**

Cemig used the most recent and reliable calculation and emission factor methodologies (example: The Greenhouse Gas Protocol Specifications of the Brazil GHG Program Protocol and IPCC Guidelines for GHG Inventories), which ensures other Brazilian and international companies are comparable.

The inventory data drawn up was mostly gathered from records on the ERP system and verified by a third party, making for its greater reliability.

Cemig’s management systems are based on ISO 9001, 14001 and OHSAS 18001 norms. The standards ensuring critical analyses, information treatment and management are carried out, as well as the normative requirement to ensure more reliable results are described in the Management Systems Manual and General Procedures produced and approved at corporate level. The areas identified as issuing or managing information about Greenhouse Gases are certified in at least one ISO norm and, therefore, are periodically audited internally and externally.

Furthermore, part of the information used to produce the emissions inventory is checked annually in the scope of the Annual Sustainability Report audit.

To estimate the uncertainty of Cemig's GHG inventory, the GHG Protocol Short Guidance for Calculating Measurement and Estimation Uncertainty for GHG Emissions was used, which is a brief guide on the GHG protocol for calculating the measurement and estimation of uncertainty regarding GHG emissions), the uncertainty level being +/- 3.5%.

### **13. Programs or strategies for reducing/managing GHG**

Cemig considers the issues relating to climate changes important. Using the "10 Initiatives for the Climate" is proof of its strategy to mitigate, adapt and publicize the subject-matter to society.

<http://www.cemig.com.br/Sustentabilidade/MudancasClimaticas/Documents/CircularMudancasClimaticas.pdf>

The Company's aim in preparing for and committing to a low carbon economy is to align its business based on the assessment of climate-related risks and opportunities, and informing society and its investors about the lines of action adopted by it.

Cemig's main actions to reduce GHG emissions are:

#### Scope 1

- Revitalizing the Igarapé Thermal Power Plant with an average expected efficiency increase of 1.407% compared to the average for 2007-2008;
- Optimizing management of the vehicle fleet resulting in definitive reduction of the entire fleet by 151 vehicles and in the plan to replace fuel for biodiesel which provides for the change in over 270 vehicles in 2013;
- Adopting new fuel consumption management systems, resulting in a 9% drop compared to 2011. There was a cumulative reduction of 29.3% over the last five years, that is, the Company saved more than two million liters of fuel as a result of ongoing measures to control the use of fuel.
- Remaining committed to giving preference renewable sources when identifying new power generation business opportunities.

- Investing in training, equipment, changing methodology and processes focusing on mitigating SF6 losses, by eliminating leakages and maintenance process losses.

Furthermore, it should be stressed that Cemig assesses the risk of increased carbon emissions at its energy matrix by performing environmental due diligence to acquire and merge new assets, or taking it into account on calculating the technical and economic feasibility of new projects by conducting sensitivity analyses. This initiative has aided the Company in its decision-making, bearing in mind its business expansion strategy regarding the climate.

### Scope 2

- Establishing electric energy consumption goals for Cemig
- Making investments in the region of R\$ 500 million to reduce technical and non-technical losses. For further details on Cemig's actions, please consult the Loss Management item in the Annual Sustainability Report

### Scope 3

Conducting power efficiency projects, with low purchasing power communities, the hospital sector, not-for-profit public, educational and social assistance institutions as public priorities as public priorities. In 2012 investment was R\$ 48.9 million with a reduction in power consumption of 46,979 MWh/year and a reduction in peak demand<sup>7</sup> of 10,011 kW in the residential and commercial sectors attended to by the program. This is equals avoided emission of 3.222 tCO<sub>2</sub>eq. For further details access the Power Efficiency Programs item in the Annual Sustainability Report.

To attend to its non-residential public, Cemig's wholly-owned subsidiary, Efficientia, an Energy Conservation Services Company (ESCO) whose job is to develop and enable technological solutions to foster the efficient use of energy and the resulting reduction in greenhouse gas emissions at the facilities of medium and large sized commercial, industrial and service sector companies.

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<sup>7</sup> Reduction of the National Interconnected System maximum demand at peak hours. The electric energy is then commercialized later as clocks are adjusted 1 hour forward.

At the end of 2011 accrued power saved as a result of implementing the projects managed by Efficientia and that are still fully operating totaled 166,000 MWh/year, an annual reduction of 11.385 tCO<sub>2</sub>eq.

Cemig identifies the main risks and opportunities for its business arising from climate changes and works up monitoring and control measures. For further details, reading Cemig's replies to the Carbon Disclosure Project – CDP is recommended

**14. Responsible for this report**

<b>Date:</b> April 16, 2013
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## VERIFICATION STATEMENT

O Bureau Veritas Certification, base on the processes and procedures described in its Verification Report, adopting a reasonable level of assurance, states that the *Greenhouse Gases Inventory - 2012*, from CEMIG - Companhia Energética de Minas Gerais:

- is accurate, reliable and free from material discrepancy, error or misrepresentation and is a fair representation of GHG data and information on the reference period (base-year);
- was prepared in accordance with *ISO 14064:2007 Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals* and also the specifications of the Brazilian GHG Protocol – Accounting, Quantification and Publication of Corporate GHG Inventories – 2nd Edition;
- presents information in a clear, understandable and accessible way, which allows to the reader to form a balanced opinion on the performance and status for the base- year considered for CEMIG - Companhia Energética de Minas Gerais for the defined scope.

CEMIG - Companhia Energética de Minas Gerais, considering the scope defined in its *Greenhouse Gases Inventory - 2012*, has established appropriate systems to implement the principles of ISO 14064:2007 Parte 1, as follows:

- *Relevance*: select the GHG sources, GHG sinks, GHG reservoirs, data and methodologies appropriate to the needs of the intended user;
- *Completeness*: include all relevant GHG emissions and removals;
- *Consistency*: enable meaningful comparisons in GHG related information;
- *Accuracy*: reduce bias and uncertainty as far as practical;
- *Transparency*: disclose sufficient and appropriate GHG related information to allow intended users to make decisions with reasonable confidence.

This VERIFICATION STATEMENT issued by Bureau Veritas Certification, on the quality and accuracy of the *Greenhouse Gases Inventory - 2012* information in the systems, processes and their controls is based on information that has been made available and conditioned to what is defined and presented in the Verification Report.

03/05/2013

Karina Polido  
GHG Lead Verifier

Cláudia Freitas  
Local Product Manager