

Electrical and  
Electronic Industry

# THE ELECTRICAL AND ELECTRONIC INDUSTRY DRIVING THE GREEN ECONOMY AND THE SUSTAINABILITY

INDUSTRY MEETING FOR SUSTAINABILITY



Associação Brasileira da  
Indústria Elétrica e Eletrônica



## **CNI – NATIONAL CONFEDERATION OF INDUSTRY – BRAZIL**

*Robson Braga de Andrade*  
President

## **EDUCATION AND TECHNOLOGY BOARD – DIRET**

*Rafael Esmeraldo Lucchesi Ramacciotti*  
Director of Education and Technology

## **BRAZILIAN ELECTRICAL AND ELECTRONICS INDUSTRY ASSOCIATION – ABINEE**

*Humberto Barbato*  
President

*Newton José Leme Duarte (Siemens)*  
1º Vice-President

*Paulo Gomes Castelo Branco (Nec)*  
2º Vice-President

*Antonio Hugo Valério Júnior (Hewlett Packard)*  
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*José Mariano Filho (Panasonic)*  
Socioenvironmental Vice-Director

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DRIVING THE GREEN ECONOMY AND THE SUSTAINABILITY**

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2012

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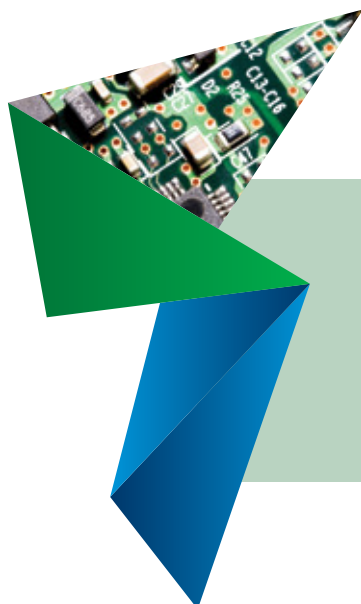
**Head Office**

Setor Bancário Norte  
Quadra 1 – Bloco C  
Edifício Roberto Simonsen  
70040-903 – Brasília – DF, Brazil  
Tel.: 55 (61) 3317-9000  
Fax: 55 (61) 3317-9994  
[www.cni.org.br](http://www.cni.org.br)

**ABINEE**

Brazilian Electrical and  
Electronics Industry Association

Avenida Paulista, 1313 – 7º andar  
01311-923 – São Paulo – SP, Brazil  
Tel.: 55 (11) 2175-0000  
Fax: 55 (11) 2175-0900  
[www.abinee.org.br](http://www.abinee.org.br)



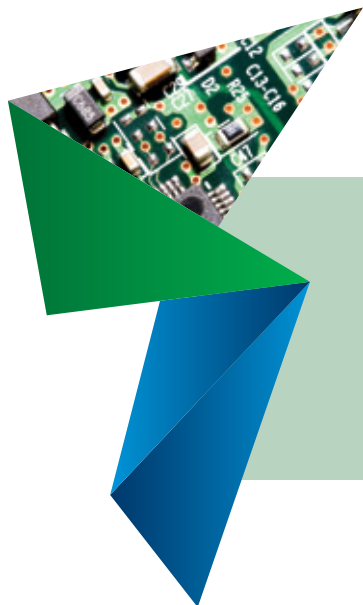
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## CNI PRESENTATION

The diversity of the national industry and the significant availability of natural resources reveal excellent opportunities for the sustainable development of Brazil, combining economic growth, social inclusion and environmental conservation. The materialization of concerns related to sustainability in the strategic agenda of enterprises and governments is a reality. Apart from isolated cases of success, the consequences of this attitude are felt in entire sectors of the economy. Further advances are still needed, but the path has already been identified and going back is impossible.

After coordinating an unprecedented critical thinking process on sustainability with 16 industry associations, the National Industry Confederation (CNI) delivers to the Brazilian society a wide range of information on progress, challenges and opportunities yet to come. The results presented here may not portray the significance of the discussion process experienced by the industry in preparing these documents. Developments on the process will be beyond the Rio +20 Conference, and are definitely incorporated on the daily lives of companies.

The subject of sustainability is inserted differently in each of the industrial sectors. However, some elements are common to all. The continuous pursuit for efficiency in use of resources and the need to increase industrial competitiveness are on the agenda of all the sectors. Encouraging innovation and scientific and technological development is strategic on the transition to more sustainable patterns of production.

Strategies to intensify actions coordinated internally in the industrial sectors and with governments and civil society organizations are no less important. The dissemination of sustainable practices by means of the supply chain and incentives for companies to undertake the role of integrated management of the territories are powerful tools.

The sectorial volumes developed by industry associations are valuable contributions to addressing subjects such as sustainability and competitiveness of domestic industry. One of the most representative results of this process will certainly be the strengthening of structured programs of action with a focus on promoting sustainability in the

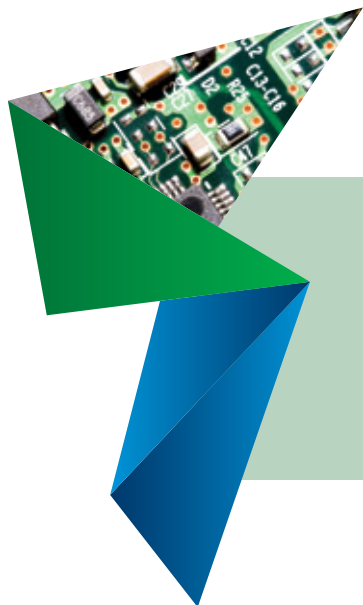
production. These initiatives will act as raw materials so that the industries involved and CNI are able to systematically publish documents presenting the national industry's developments towards the goals of sustainable production.

The documents presented here are intended to be a valuable contribution to enhance the debate on sustainability. Each of the sectorial associations is to be congratulated for their efforts.

**Robson Braga de Andrade**

President of the National Confederation of Industry – Brazil





## SECTORIAL PRESENTATION

The present document has been developed by the Brazilian Electrical and Electronics Industry Association (Abinee) for the Conference Rio+20. The aim of this fascicle is to show the concern of the electrical and electronic industrial sector about sustainability. Actions inside and outside the factories are being taken by the sectors' companies aiming at driving the green economy.

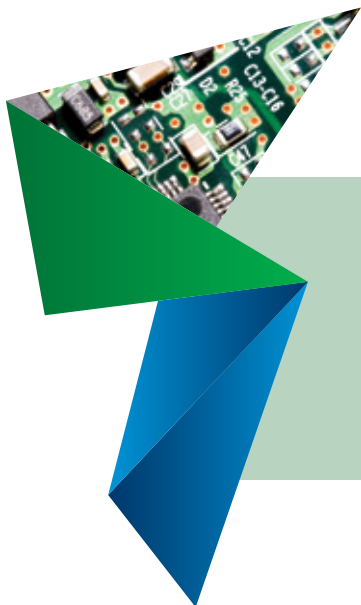
The participation of the society and other industry's sectors are fundamental to the success of these actions. The Conference Rio+20 gives the opportunity for this task to be done, involving industry, public authorities and society in order that, together, these actors can make the difference for a better future in environmental, economic and social fields.

Abinee is compromised with sustainability and feels honored to take part in the Conference Rio+20. One of the sector's commitments is to cooperate to the growth of the country. Today, the only way to make it possible is by taking concrete actions on sustainability.

**Humberto Barbato**

President of Brazilian Electrical and  
Electronics Industry Association – ABINEE





# 1 INTRODUCTION

## 1.1 Scenario: challenges and opportunities

This report is an initiative from Abinee, Brazilian Electrical and Electronics Industry Association, which will be 50 years in 2013, and answers to the request of National Confederation of Industry (CNI), involving Brazilian industry's preparation to an active participation in the Conference Rio+20.

Being the main representative entity of the electrical and electronic sector in Brazil, Abinee gathers 600 members – including the most important international players in this industrial sector, beyond also gathers many small and medium-sized companies.

Industrial automation, electrical and electronic components, industrial equipments, electronic security equipments, generation, transmission and distribution of electrical energy, computers, electrical material for installations, electronics manufacturing service, telecommunications and household appliances are some of the expertise of the companies in Abinee.

Electro-electronics sector has fundamental importance in almost all industrial sectors. Electronic percentage in final products increases every year. It also happens in supply chain and in capital goods sector. In this context, the sector of electrical and electronic components is the heart of the system. It is the technological improvement of these components that ensures innovation and competitiveness to the machines, equipments, systems and also to the final products – computers, mobile phones, appliance, audio equipments, motors, transformers and many others.

Despite of its exceptional importance in economy, innovation and even as an instrument for driving the green economy, the electro-electronics sector does not receive from the country the priority deserved. This is the reason why the importation of these components is becoming more and more common, what reduces substantially the earned value in the national products. Increasingly, the final products carry more components with high earned value. It is essential to invert this process and adopt an industrial policy which privileges the national production and electronic components.

Each year, Abinee and the electrical and electronic sector are more involved in the sustainable economy environment. To provide structure and organization to the work in this area, Abinee has created the Socioenvironmental Responsibility Department, which is responsible for promoting the sustainable economy in a broad-based way.

For Abinee and the electrical and electronic sector, the moment the world is facing is an opportunity for promoting, in new bases, the competitiveness of industry and companies of all economic areas. The companies of the sector believe sustainability is a mission and a strategic aim. And also they realize this new moment opens a promising field for new business.

The electrical and electronic industry in Brazil expects the Conference Rio+20 to represent a great improvement to achieve the sustainability and the green economy.

Maybe the greatest challenge of electro-electronic industry and all people involved in this subject is to reach the minds and the hearts about the amazing opportunity nature gives human beings to learn, change attitudes, guarantee good jobs and respect the unbridgeable limits of the Earth, the only planet where human beings can live.

The electro-electronic industry follows the sustainable concept and practices in planning the management of its production and administration processes. Besides, this industry induces sustainability in almost all sectors of manufacturing and processes industry, as well as in areas such as transportation, building and commercial automation.

With products and innovative technological solutions, the electro-electronic industry decisively contribute to increase the energetic efficiency, productivity, flexibility and sustainability in industries and companies of almost all areas. This is the main contribution of the sector to build a new age in which human beings and the planet live in balance.

There are huge challenges concerning reverse logistics, to collect and give the adequate final destination to products such as computers, mobile phones and household appliances which useful life has ended. To overcome this challenge, government, industry, wholesalers, retailers and consumers will have to work together. Sharing responsibilities is the only way to find a solution for this potential matter.

Irregular importation of electro-electronic products is another challenge for the sector. Many of these products do not meet the requirements of Brazilian legislation, differently from the national products, which have to strictly follow the rules. Apart from representing a clear unfair competition, this kind of importation leaves significant environmental liabilities, for which no entity is responsible, nor public or private. These are called the “orphan products”, part of the called “grey market”<sup>1</sup>, that no one wants to care.

Both challenges show the importance of governance structures involving the main actors: government, companies and society. Governance in this context means the axis of sustainability in the plans of business, politic, economic and social. To create a sustainable world, it is necessary the cooperation of all these actors. For this, it is essential to find improved ways of participation so that the rules and laws have acceptance and efficiency, having the sustainability as the principle of the new age.

The electrical and electronic industry is prepared to participate and contribute, through its representative entities, to achieve in a near future green, friendly and sustainable solutions, considering environmental, economic and social concerns.

## 1.2 Transversal action and sustainability

The electrical and electronic sector in Brazil works transversally, to the beginning until the end of the production process – from the heavy industry to the final consumer. The sector produces equipment and services for infrastructure, mainly for electrical energy (generation, transmission and distribution), telecommunications (that interconnect all the country), equipment and industrial automation (which benefits almost all industrial sectors).

The electro-electronic sector has an important role together to the secondary and tertiary sector, which need products and services from electrical energy, telecommunications, information technology, industrial and building automation, industrial motors, electrical installations, components and others. The electro-electronic sector is responsible for meeting this demand.

The electrical and electronic sector also develop and make many kinds of products available for consumers: from computers to mobile phones, tablets, laptops, from stoves and refrigerators to microwave ovens, televisions and audio equipments, electric motors, transformers and generators, plugs, switches and sockets, and many other products.

The electro-electronic industry is a symbol of Information and Knowledge Age and an ally of sustainable concepts and practices. For being innovative, transversal and for supporting sustainability and green economy, the sector is placed ahead in the frontier of the new moment world is facing.

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<sup>1</sup> The name given to the electrical and electronic products which arrive illegally to the market, through illegal importation, local installation or other ways.

The shortage of natural resources requires changes in the production model. The three pillar of sustainability form the basis of green economy. Facing the shortage of natural resources, it is necessary to use intelligence and knowledge to make a new economy, where human beings and nature are at the center. The electro-electronic industry is an active part of this new economy.

CHART 1. DATA FROM ELECTRO-ELECTRONIC SECTOR IN 2011	
Sales in R\$	R\$ 135 billion
Sales in US\$	US\$ 80 billion
Participation in GDP	3,5%
Employment	180 thousand

Source: Abinee.



## 2 ECONOMIC AND SOCIOENVIRONMENTAL CHARACTERIZATION OF THE SECTOR

### 2.1 Growth and social sustainability

Electrical and electronic industry in Brazil gathers around 4.000 companies – 80% of them are small-sized companies and have less than 100 employees. Medium and large-sized companies, with international operation, are also part of the sector. The main players of the sector are present in Brazil.

It is a sector of intensive capital which generates 180 thousand jobs. In 2011, the average of money earned by each employee corresponded to 437 thousand dollars. In the same year, the sale reached 80 billion dollars – around 3,5% of the Gross Domestic Product (GDP).

Between 2003 and 2011, the sector registered growth of 110% in its sales. It means the sale has doubled in the period, though with increasing importations of components and final products, coming especially from China and other Asian countries.

The recent boost of electrical and electronic industry answered to the increasing demand of domestic market through the last decade, thanks to the growth of employment and payroll. Credit supply was another important factor, having raised from 23% to 45% of the GDP in 10 years (until 2010). Because of this positive impact, more than 30 million Brazilians ascended to the middle class named “class B” and “class C”, demanding more consuming products such as refrigerators, mobile phones, computers and many others.

Six in ten Brazilians belong to the middle class, according to Datafolha Institute of Researches. Studies published by Brazilian press, in January 2012, show that, for the first time, the E class, the base of the social pyramid, represents less than 1% of the 49 million homes in the country. It means that 10 million people left the extreme poverty condition. In 1998, class E represented 13% of the residences. Another research showed that class E had a total of 17,3 million people. Last year, this number was reduced to 7 million.

One of the criteria to measure Brazilians income is the access to consumer goods. The numbers from electro-electronic industry confirm the data previously showed. The production of mobile phones in Brazil increased 125% in seven years (from 2003 to 2010), from 27 million to 61 million units each year. Today, there are more mobile phones being used than Brazilian citizens. There are more than 240 million mobile phones for 191 million Brazilians – which means more than one cell phone per person, apart from the 62 million telephones lines in houses and companies.

Information technology grew even faster, particularly computers production. From 2003 to 2010, the annual production of these equipments increased 337%, from 3,2 million to 14 million unit per year. And the demand will probably continue high, changing the life of millions of Brazilians through the access to technology and digital tools.

As a result of this period of exceptional growth, Brazil climbed one position in the international ranking, overtaking the United Kingdom and becoming the sixth biggest economy in the world, according to studies of international specialists published in the end of 2011.

Brazil's position is even better if taken into consideration the population investments in electro-electronic consumer goods. The country is the fifth in the world in portable computers, moving 4,5 billion dollars in 2010.

Brazil is the fourth country in television market, in which 11 billion dollars were invested in 2010. The country occupies the third position when considering refrigerators and freezers sales – 4,8 billion dollars, behind China and the United States (USA) only. Buying mobile phones, in 2010, Brazilians have invested 10 billion dollars, bringing the country to the fourth world position. It is estimated that in 10 years Brazil will be in the second world position in purchase of these gadgets (Exame Magazine, edition 1008, 2012-01-25).

**THIS FRAMEWORK MAKES CLEAR THAT ELECTRO-ELECTRONIC  
SECTOR IS AN INDISPENSABLE ALLY TO BRAZIL AND BRAZILIAN  
SOCIETY IN THE TASK OF ERADICATING POVERTY AND IMPROVING  
THE QUALITY OF LIFE OF BRAZILIAN POPULATION.**

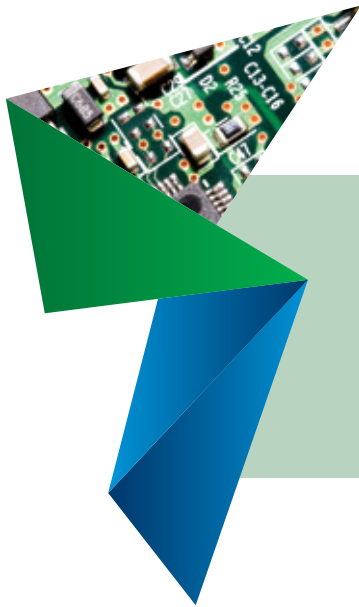


In the social context of sustainability, the function of electrical and electronic industry is to make accessible to the low-income citizens the products that are indispensable to modern life, contributing to digital inclusion of millions of people that were apart from the Information Age. Another action is to facilitate the access of poor people to products which provide quality of life and do everything according to sustainability concepts and practices.

CHART 2. PRODUCTION OF COMPUTERS AND MOBILE PHONES (IN THOUSANDS)		
Year	Computers	Mobile Phones
2003	3.200	27.000
2004	4.074	42.000
2005	5.635	65.000
2006	8.225	66.000
2007	9.983	68.000
2008	12.000	73.000
2009	12.000	62.000
2010	14.000	61.000

Source: Abinee.





## 3 BUSINESS PRACTICES FOR SUSTAINABLE DEVELOPMENT

### 3.1 Main transformation on technology, innovation and management incorporated by the sector in production

#### 3.1.1 Innovation for green economy

Another unique characteristic from electrical and electronic industry is its decisive acting in the advanced frontier of innovation. A known example of this peculiar condition is the development and the production of semiconductors and integrated circuits, which are later incorporated in computers and a vast equipment chain.

Having innovation as the origin and end of its activity, electro-electronic industry develops and produces new gadgets and services which decisively help the companies of other sectors to be more productive and effective, and also more economic when concerning the use of natural resources.

The final consumers are also benefited through the access to low power consumption products which allow them to have more quality of life, using fewer natural resources.

It is also important to talk about the power of electro-electronic industry in producing innovation that can boost the green economy. It is true both for the infrastructure sector and the secondary and tertiary sectors.

In infrastructure, the electrical and electronic sector aims at producing equipments which make more efficient the production of electrical energy, reducing the losses in transmission and making distribution more rationally. This is possible using new technological tools, such as smart grids for electricity distribution.

Nowadays, products and services from the sector are used in smart buildings, which demand less energy and water consumption, in building automation systems, in more economic refrigerators, in computers and information technology systems, used in almost all parts of green economy.

## **3.2 Initiatives for spread information and transparency about Socioenvironmental development of the sector**

### **3.2.1 Communication and environmental education**

Each and every program aiming at sustainability must be supported in professional strategies of communication and marketing. The efficiency of these actions and programs will be measured by the mobilization of society, production sector, companies' collaborators, governments, environmental agencies and all the actors who are involved in life in society.

Industries from electro-electronic sector have been promoting many actions to reach and mobilize their collaborators. The large companies, with international operation, involve their teams in international programs concerning the 3R Policies (Reduce, Reuse and Recycle).

These programs involve the reduction of water consumption in the production and administration sites, the reduction of electric power consumption and the introduction of sustainable concepts and practices. It is a permanent action, composing the strategy of the main companies of the sector.

The biggest challenge is to transcend the limits of the factories and reach all electro-electronic sector and, yonder, the society as a whole. Following this direction, Abinee, the most important entity of the sector, created, in 2010, the Socioenvironmental Responsibility Department.

The mission of the new Department is to promote coordinated actions in order to gather the companies and the sector as a whole, making good use and exchanging experiences about the good actions carried out by the companies that are ahead in the process.

The sector believes that environmental education is also necessary in the companies. We cannot expect the public agencies to take all the initiatives. The production sector can and must be involved in programs of dissemination of sustainable concepts and practices to the whole electro-electronic production chain.

Environmental education is even important to the National Policy on Solid Waste to be effective. A document from the Environment Ministry about this Policy says that “the success in the implementation of the National Policy on Solid Waste, a fundamental tool in public policy in this area, requires new knowledge, views and attitudes from the society”.

The document continues: “To adequate solutions to be developed, matching the objectives of socio-economic development, preservation of the environmental quality and promoting the social inclusion, it is necessary a process of organization and democratization of information. This process is important to mobilize the participation and support of all publics”.

The electro-electronic industry has another important function. Apart from the internal actions, focused on the sector itself, the industry propagates communication and relationship actions due to the products that this industry provides, such as computers, mobile phones and other gadgets which allow human beings to join networks, being connected to thousands, millions of people.

### **3.3 Initiatives for certification and self-regulation developed by the sector**

#### **3.3.1 Electrical and electronic industry production process**

The industries from the electrical and electronic sector do not belong to the production sectors included in those ones that damage nature. It is the opposite. The majority part of the sector is composed by companies which activities are little harmful to environment.

Even when there are harmful substances, the companies try to eliminate, replace them or reduce their use substantially. It happens due to legal determinations or voluntary initiative of the companies.

An example of elimination due to legal determination was the CFC (chlorofluorocarbon), a gas used in refrigerators, air conditioners and other products. Since 2010, CFC does not compose any product from electro-electronic sector. Today, the industry is working on specific programs to handle the liability involving the CFC in products that are still in the market.

Some companies of the sector also replaced the solvent methylene chloride, used to clean energy transformers, with a low toxicity and high efficiency substance.

Conformity evaluation processes show the commitment of the companies of the electro-electronic sector to sustainability. The main certifications of the sector are ISO 14.001, that regulates the environmental management with standards aiming at the development of an efficient Environmental Management System to soften the environmental impacts; and NBR 18.801, that establishes guidelines to work safely and healthily, showing how companies are worried about their collaborators integrity. The sectors' companies are alert and applying the requirements of these standards.

More than 50% of the sectors' companies have these certifications. ISO 50.001, published in June 2011, is the new standard concerning energetic power management, focused on the improvement of the system. This standard follows "Plan-Do-Check-Act" Cycle. However, it does not set goals.

The companies have important actions on sustainability. There are hundreds of programs spread through several industries. An example involves a program, focused on women, that stimulates the entrepreneurship.

## 3.4 Social responsibility

### 3.4.1 Industry supports women on income generation

Industries from the electro-electronic sector develop an important social role, which is one of the three pillars of sustainability. Considering the woman the main part of family support, in 2000, one of the companies from this sector created a program to help low-income women to find ways and opportunities to generate income and, as a consequence, improve their quality of life. Nowadays, the program is led by the "Instituto Consulado da Mulher" (Woman Consulate Institute), present in Rio Claro (SP), Joinville (SC), Manaus (AM) and São Paulo (SP), where there are free workshops on craft, cooking, beauty and social inclusion. Besides, the teams from the institute help by giving advice to small popular enterprises.

There are two programs, both present in the four cities where the institute is placed. One of the programs aims at helping low-income women to generate income from small enterprises. The assistance includes building partnerships to help in specific learning. The program focuses on improving the enterprise through the women specialization, so that the final result is the income generation.

The other program aims at strengthening the partnerships among institutions and small enterprises. Giving products for the new enterprises is also part of the program. This is a way to encourage the new entrepreneurs who, most of the times, would have not enough money to invest in this equipments.

According to a research from the "Instituto Consulado da Mulher", in 2009, a third of the women said they started their enterprise with actions from the Institute and 83% of them believed the institute helps to improve their business.

## 3.5 Initiatives coordinated by the sector Association/Institution

### 3.5.1 Governance and sustainability

Winning the challenge of governance is vital to sustainability. Here, governance has a wide meaning. It involves integrated actions in a unique industrial sector, inside the industry as a whole, within several production sectors, in many social groups and including government in all levels – municipal, state and federal.

The electrical and electronic sector is doing its task concerning sustainability. And have already started many actions for the mobilization of companies on sustainability programs.

The inter-sectorial governance is part of this global movement. The presence of representative entities is fundamental for the creation of extensive programs which are put into practice for the whole sector. This is the function of entities such as Abinee, through programs and actions involving the whole sector.

Other actions must be initiated so that the issue goes beyond the frontiers of the most advanced companies, especially to the small and medium-sized ones. This is the purpose of electro-electronic industry – to involve the small and medium-sized companies in sustainability concepts and practices.

These entities are very important for promoting the dialogue with other sectors and public and governmental agencies. Attitudes like this one are particularly important in a moment of discussion of new environmental laws. The efficiency of these laws and standards from public agencies depends on the wide acceptance of production sector and the main society agents.

Therefore, the participation of civil entities and sectors' representatives will be decisive for them to act for mobilizing companies and promoting actions and programs which result reaches far.

The sectorial governance is important, but not enough. It is necessary other governance structures, involving especially government and public agencies, to be present showing their capability for dialogue and for interacting with production sector and society. Civil entities, government and society must have the same aims and follow the same issues.

It is absolutely impossible to talk about reverse logistic, for instance, while the country allows the commerce of products which do not have any control concerning the sustainability standards. Many of these products do not follow any rule and pull the three pillar of sustainability down.

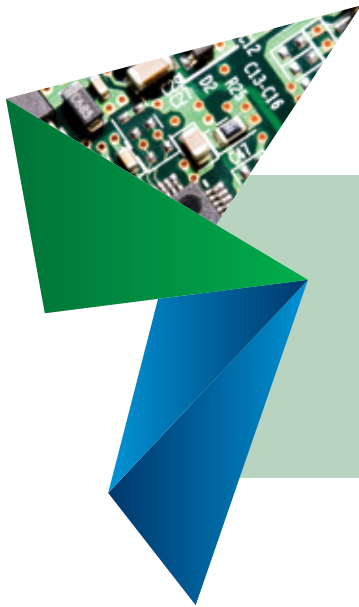
### 3.5.2 Regional and global governance

To promote sustainability and drive the green economy, it will be necessary to drive regional and global forums of governance, involving government, researches and international agencies. Sustainability will only be effective during the next decades if it involves all the countries, people, companies, civil entities, governments, society and nations.

The attitude of well-intentioned countries is important, but it is not enough for the whole process to move as expected. The good attitudes can be weakened if important nations insist in carelessly explore the natural resources.

This global strength can reduce substantially the commerce of illegal products, which do not respect the principles of economic, social and environmental sustainability. Predator countries produce products which are harmful for nature and human being. If this level of governance is reached in global scale, the effects will be extremely positives in Brazil and in every other country, strengthening the actions of sustainable and responsible companies.





## 4 CHALLENGES AND OPPORTUNITIES FOR THE SECTOR TOWARDS SUSTAINABILITY

### 4.1 Main international tendencies for the sector on sustainability

#### 4.1.1 Clean energy, green economy

Until 2030, the global electricity consumption will probably double in relation to the current level, 20 billion kWh. This is the reason why it is so important to generate electrical energy reliably and efficiently, respecting the environment.

Brazil is far ahead in electricity production, distribution and consumption when comparing to other countries. Considering the use of renewable and non-renewable sources, the country is also far ahead. From all consumed power in Brazil, 47% comes from renewable sources. In a world average, the fossil fuels represent 82% of the electrical energy consumption.

The main advantage in Brazil is hydro-generation. Almost 70% of the electric energy come from hydro-generation. It means clean and renewable energy. The electrical and electronic industry had and still has an important role in this process. The sector is responsible for the growth of electricity production in the country, once its main clients are hydroelectric plants, transmission lines and utilities for electric power distribution.

In the last 25 years, the annual rate average of growth of electrical energy generation in Brazil was 4,2%. The country has more than 2.000 hydroelectric plants in operation, with capacity of 103 thousand MW (megawatts). Twenty-five of them, with capacity of 1.000 MW each, are responsible for more than 70% of the total capacity. There are 750 new plants expected – many of them have already been installed.

To meet this demand, there are many products which transform the water strength into electrical energy, conduct it through interconnected grids for thousands of kilometers, distribute it to many cities and regions so that it reaches the consumer houses and all the companies.

This list of products includes generators, reactors, turbines, transformers, capacitors, insulators, spacers, materials for grounding and many others, apart from the systems and software that operate all the system. There is permanent investment in this sector. The current hydro-generation turbines are about 15% more efficient than the ones from 10 years ago, because of technology innovations in design and materials used for producing the turbines.

Another Brazilian difference is the National Interconnected System (SIN), the only system with this size and characteristics in the world. Electrical energy generation and transmission in Brazil are made through a large-sized hydrothermal system, where the hydroelectric plants are predominant and have many owners. Almost the whole country is part of this system – only 3,4% of electricity generation capacity is out of SIN.

SIN puts Brazil ahead in energetic sustainability. Through the National Operator of Electrical System (ONS), the country can send large amounts of hydroelectric power from one region to another, meeting the demand of those regions where there is not enough rain in some moments.

ONS makes a real-time register of hydroelectric potential of each regional system. This leads to water and power economy where there is less volume and promotes rational use of water potential in the whole country. To have a system like the Brazilian one many countries will take two decades of strong investments.

Electro-electronic industry provides all technical support and equipments to make SIN become reality. The industrial estate in this sector is one of the most modern in the world, with laboratories for national production of technology. The main companies in the world also operate in Brazil.



## PHOTOVOLTAIC ENERGY

### **Improvement requires support measures**

Brazil has all the requirements to use the solar power intensively in the next decades. The country has high levels of solar irradiation, particularly in the Northeast and Midwest, where the levels reach 6.100 Wh/m<sup>2</sup>, according to data from Aneel (National Electrical Energy Agency). However, there are a lot to be done for photovoltaic electrical energy to be used in Brazil. It is necessary to invest in local technology and innovation for the production of solar cells. Investments in materials engineering are also needed. These actions have just one aim: to reduce the implementation and generation cost of this kind of power.

The electro-electronic sector is mobilized to contribute. It gathers manufacturers of cable, inverters, batteries, solar panels and integrators of photovoltaic solutions.

In this field, Brazil has an advantage for having a great capacity for producing silicon, what is the essential raw material for solar electrical energy production.

Electro-electronic industry wants a Brazilian program for the photovoltaic sector. It is also important to allow the interconnection between photovoltaic sources and the interconnected system, connected in low and medium voltage. In the world, 95% of these generation sources are connected to the electricity grid. In Brazil, they are still isolated.

The advantages of solar power are well-known. It is renewable, clean, does not emit greenhouse gases and, therefore, does not contribute for global warming.

After setting the regulatory framework and the incentive programs, electrical and electronic industry will be leading the innovations to make solar power a significant part of Brazilian energy matrix.



## WIND ENERGY

### **Future energies in the present**

Energy supply is a way for green economy, especially if this energy comes from clean and renewable sources, causing low impact on the planet. This is why alternative sources, such as wind energy and biomass, are so important. It is estimated that the identified potential of wind energy generation in Brazil is 140 thousand MW, concentrated particularly in South and Northeast regions.

Electro-electronic sector qualifies itself and promote investments in several areas to provide equipment and solutions to enable wind power generation.

Another resource of great potential is ethanol, which comes from sugar cane, as fuel and also for electricity generation by burning sugar cane bagasse.

## BIOMASS

The electricity generation is also possible by using the residues from agro-industrial processes. The sugar cane bagasse, which was discarded in ethanol or sugar production process, is an example of residue that can be used for generating electrical energy. The same way, rice and beans husk can become energy. Companies from the electro-electronic sector bring solutions from the usage of biomass.

## FOSSIL FUEL POWER GENERATION

### More efficient and less polluting

In light of the worldwide growing demand for electrical energy, it is not possible to give up fossil fuels as power sources in the following decades, especially oil and gas. Because of this, it is important to develop equipments and systems which reduce or even eliminate the emission of polluting gases those can cause acid rain, greenhouse and harm the ozone layer, apart from other effects.

Electrical and electronic industry is investing money and human intelligence to develop equipments and solutions for electrical energy generation by fossil fuels, expecting to have more productive and less harmful systems. One of the aims of industry is to reduce emissions, through the modernization and replacement of systems and equipments for more efficient ones. The process of washing the gases in thermal power plants is an example of this.



## URBAN MOBILITY

### The challenge of megacities

The concentration of world's population in cities and especially in megacities is a known phenomenon that tends to be intensified during this century. In Brazil, 80% of the people already live in cities. The challenge is to create fast and efficient

transportation systems, which must be ready to transport thousands of people from one region to another in metropolises.

The solution goes through the construction of large systems. Among them, are the subways, hybrid buses systems (which use electrical energy and diesel), light vehicles on rails and similar alternatives. To run this transport network, is essential the supply and distribution of large amounts of power, in grids and interconnected and complex systems.

Brazilian companies from electro-electronic sector participate in the main systems of urban mobility, particularly providing large electrical energy and telecommunication systems. It does already happen, for instance, in São Paulo and Rio de Janeiro subway lines, which the total extension is 115 km. Both subways transport more than four million passengers every day.

The participation of the companies from electrical and electronic sector can be noticed in the electrification of subway lines, in the ventilation and communication systems and in the automation and control systems. The most recent innovation in this area is used by São Paulo subway: the smart compositions, which do not need drivers and are controlled by computerized systems.

## ENERGY CASE

### Electrical energy transmission in Amazonia

The construction of the first transmission line that will cross Amazon forest is an example of audacity and competence of the companies of this sector. With 1.800 kilometers long, the new line will integrate Tucuruí, Manaus and Macapá. The construction has technical, environmental and logistic challenges. There are many sections where the line will run over the treetops. Another section will require the construction of two towers, which will be higher than Eiffel Tower to allow navigation on Amazon River. The construction will be developed using most of the equipments produced in Brazil and aims at reaching the maximum efficiency with low environmental impact. The line will be constructed by one of the most respected companies of this sector that has international operations.



## SHOWER CASE

### Hybrid is more efficient

The hybrid shower is more economic in everything in comparison to others solutions. It is a genuinely Brazilian solution. A bath in the hybrid shower takes an average of three liters of water, against eight liters in a solar heating shower and nine liters in a gas heating one. This data are from a research from Polytechnic School of University of São Paulo (USP). When considering energy consumption, the

hybrid shower is also more efficient. It is an improvement in common electric shower, which efficiency is already more than 95%.

In hybrid shower, the electrical energy plays a complementary role and just acts when there is not enough sun to heat the water to the desired temperature. In a country where there is much sun light in the majority of regions, the hybrid shower is the most efficient alternative when considering electrical energy consumption. Because of this, it is part of the housing program “Minha casa, minha vida”, from Federal Government, and of programs from São Paulo government.

The hybrid shower derives from electric shower – a genuinely Brazilian invention, created by Italian immigrants who founded Lorenzetti, in São Paulo. Eugênio Lorenzetti, chemical and industrial engineer, graduated from Milan School, arrived in Brazil in 1924 carrying 40 liras in the luggage, followed by his brother, Lorenzo, surveyor technical. Together, they joined their father, Alessandro, to continue the precision screws factory, created in 1923. Slowly, Lorenzetti enlarged its product line, with a lot of creativity, launching products which would make history, such as the automatic electric shower, a company's patent created by Lorenzo, that became the company's flagship since the 1950's.

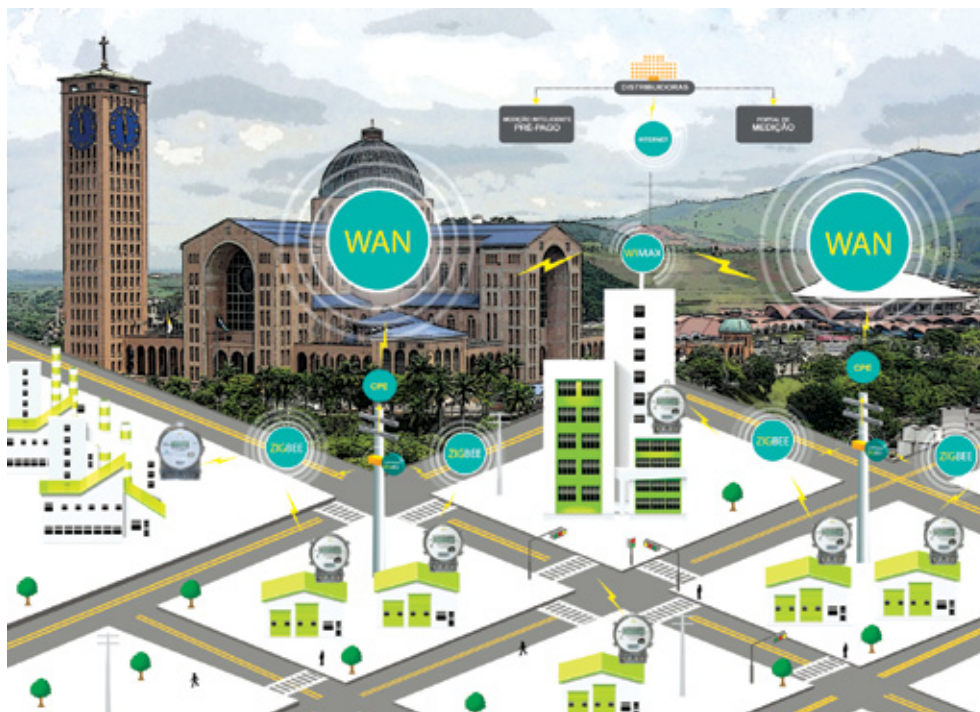
## SMART GRID CASE

### Energy distributed with intelligence

Brazil is very efficient in power generation and transmission, but still has a lot to improve in the final step of distribution. Systematic investments must be done to distribution sector to reach the wanted level. It is estimated that 15% of the total electrical energy generated in Brazil are wasted during distribution. One of the reasons is energy theft through illegal connections.

To reduce losses and give more efficiency to the system, the country starts to discuss the implementation of Smart Grid, a concept that incorporates the smart systems to distribution and consumption of electrical energy. New measuring instruments, installed in houses and companies, interconnected to the grid and the centrals managed by software and interconnected systems will allow the management of the grid and the energy consumption of each house to be more efficient.

The Smart Grid also transmits data and integrates all users to the internet. In Brazil, the electricity grid reaches 99% of the houses and companies. Thus, if it is also used as data network, it will be able to reach almost all the population. There is undoubtedly a long way to travel until the complete replacement of the 65 million conventional measuring instruments to smart ones, connected to Smart Grid. However, there are already some Brazilian cities facing this process, through project of which companies of electro-electronic sector are part of.





## 4.1.2 Responsible consumption

Appliance companies, which produce refrigerators, stoves and freezers and image and sound devices are part of the electro-electronic sector. The sector also gathers the companies which compose the information and communication technology (ICT). These companies produce hundreds of items, such as computers, laptops, netbooks, tablets, smartphones and mobile phones of all kinds.

It is an international industry. The main world's players are present in Brazil. The sector is characterized by fierce competition and technological dispute without truce. Innovation here is a way of evaluation. Companies and products which meet the expectations and dreams of consumers gain market and consumers preference.

In addition to the technological innovation, the industry of this sector looks for developing high energetic efficiency and low consumption products. The products must also have the characteristics of not demanding natural resources extraction nor leaving environmental liabilities.



### ENERGY EFFICIENCY LABELS

#### Low energetic consumption appliance

Procel is the National Program on Electric Power Conservation. In 1993, Procel implemented Procel Seal, fostering the innovation in household appliances and other items of popular consumption, such as refrigerators, stoves, freezers, washing machines, televisions, air conditioners and many others, such as electric motor and solar heating systems.

The industries started to conduct studies and researches which would lead to the production of high energetic efficient products, what happened gradually, involving several product chains.

In 2010, Procel Seal was granted to 3.778 models of equipments, divided into 31 categories, involving 206 producers. As a result, there was an economy of 6.131 million of kWh, from which one third came from refrigerators and freezers. These data are from an official estimative from the program.

A refrigerator produced today, in Brazil, consumes 60% less electrical energy than one fabricated 10 years ago. Freezers, air conditioners, computers and electric motors also had significant reductions. The Brazilian Labeling Program is an example of success since its conception and implementation that had the voluntary participation of producers and the decisive participation of Eletrobras e Petrobras. In 2001, the program started to be compulsory, with law number 10.295/01 and Decree number 4.059/01 that regulated the law.

The impact has been so important that many electricity utilities replace the old refrigerators of their clients by new ones, which are high energetic efficient. And the clients do not have to pay anything for the replacement.

## 4.2 Challenges for the sector on sustainable development (trade, technology, regulation)

### 4.2.1 Reverse logistics, industry commitment

The National Policy on Solid Waste (PNRS) was established through law number 12.305/10 and has direct implications on electro-electronic sector. One of the five mandatory items is batteries. The item 5 mentions “the electro-electronic products and their components”, what means the whole electrical and electronic industry.

The sector recognizes the importance of the new legislation and is compromised in giving it the major efficiency, doing whatever possible. Electro-electronic industry believes that reverse logistics is more than a legal requirement, it is a commitment with sustainability and green economy.

It is noteworthy the public compromise of electrical and electronic industry, presented in May 2010 in the document “Electro-electronic industry in 2020 – a development strategy”, coordinated by Abinee (Brazilian Electrical and Electronics Industry Association).

The text says: “The future industrialization standard will move towards the wide respect to environment. Guidelines focused on production sustainability, commercialization, environmental education and products disposal, aiming at the reduction of carbon emission and solutions that result in reverse logistics, sharing responsibilities, will be aspects present on everyday life of society”.

It is unquestionable that products have limited life cycle. In some moment, the product life cycle closes. Brazil produces about 2,6 kilos of electro-electronic waste per inhabitant every year. This waste may contain lead, cadmium, arsenic, mercury and other harmful substances.

So what must be done with the products that are not used anymore? To deal with this liability, Brazil adopted the PNRS (National Policy on Solid Waste) in August 2010. The new legislation is a result of the active and democratic participation of the main involved actors. PNRS established the principle of “shared responsibility”, where all participants of production chain are responsible for gathering and giving the appropriate destination to the products that closed their life cycle: consumers, distributors/traders, producers/importers and public agencies. It was undoubtedly a great progress.

Once this legal framework is established, now all market and government agents must give effectiveness to the plan. The orphan products, that ones that come illegally to the country, are probably the most difficult task of this process. There are millions of cell phones, computers, batteries and all kinds of electro-electronics. No one takes responsibility for their gathering and appropriate final destination.



There are many examples that prove this harmful situation involving the electrical and electronic sector. The best known one involves computers sector. Until 2005, the gray market occupied 70% of the market, remaining only 30% for the legal producers. It means that from each 10 computers sold in Brazil, 7 had illegal origin.



By implementing the “Lei do Bem” (Law number 11.196/05), federal governmental instituted special taxes which encourage innovation and local equipment production and relieve products manufactured here. The result was price reduction and increasing in the number of computers produced and commercialized in Brazil. Today, 73% of the computers sold in the country come from legal ways, meeting all the legal requirements.

Electro-electronic sector believes to be not responsible for illegal products commercialized in the country. The responsibility for these products is from the government, because its omission allowed the products to enter the country.

A recent difficulty for the sector is the municipal laws concerning the same issue. These laws establish restricted rules or even rules which conflict federal legislation. As many of the companies have national operations, it is impracticable to implement different reverse logistics actions in each city. Abinee has been contacting municipal representatives and suggesting that they wait for the federal discussion to finish. Abinee has also contacted the Environment Ministry. The only way for the companies to have uniform actions and reach all the country is by having a unique law, with federal scope.

An obstacle for reverse logistics, identified in GIA Report (Global Intelligence Alliance), ordered by the electro-electronic sector in 2011, is the low number of recycling companies which are able to process electro-electronics and are present in several regions of the country. There were only 16 recycling companies which contact electrical and electronic industry for recycling activities.

The research did not identify companies in Brazil which have technology to recycle printed circuit board, monitors, CRT TVs (cathode ray tubes) and other components. The majority of the companies only separate the materials to resell them abroad. The less earned value materials, such as plastic and glass, stay in the country.

Concerning batteries, however, the sector has always done well its task. In 2003, four years after the specific requirement of these products was created – Conama Resolutions 257 and 263, which limit the amount of dangerous metal in the composition –, the sector had already eliminated mercury and cadmium from common batteries and reduced lead utilization, meeting the resolution requirements.

The sector also acts gathering and giving the environmentally appropriate destination for products which have closed their life cycle. An example of this is the program “Abinee Recebe Pilhas” (Abinee Receives Batteries).



## BATTERIES

### The first step for the appropriate destination

Reverse logistics is in implementation phase across the sector, but it has already been applied for producers and importer of household batteries, meeting the requirements of Conama Resolution 401/08. Eleven companies joined, with support from Abinee – representative entity of the sector –, the program Abinee Receives Batteries, which aims at receiving, transporting, storing and giving the environmentally appropriate destinations for batteries of household use.

For the program to work, as well as the reverse logistics, it is fundamental that everyone takes the responsibilities. Consumers must take the batteries to the collection sites. Today, with Abinee's program, there are more than 1.000 sites in the whole country. On the other hand, the shop which receives the batteries must store them in appropriate places and take them to the receiving stations.

From these stations, the batteries go to the logistics operator base, in São Paulo. The material, then, is weighted, separate by brand, stored and, in the end they have the environmentally appropriate destination. The batteries transportation is done by a specialized company, individually hired by each producer or importer.

The program started in 2010 and, until November 2011, completing one year, it had collected 112 tons of batteries. The biggest challenge is that about one third of the collected material is formed by batteries from more than 200 brands which are commercialized and discarded and their representatives do not take any responsibility. It is estimated that the illegal products represent 40% of the market.

For “Abinee Recebe Pilhas” to be successful, it is essential the participation of the consumers, retailers and public agencies, who must take effective measures to enforce the companies that commercialize these materials to take the responsibilities provided by law.

The irresponsible commercialization of batteries and other materials unfairly and disproportionately overtaxes the producers and importers who comply with the legislation. This kind of operation is also dangerous for the environment. Because of this, electro-electronic sector assumes the cost for the environmentally appropriate destination of the batteries which come illegally to Brazilian market.

The country commercializes 1,2 billion household batteries each year. There is still much to be done so that substantial part of the batteries have the environmentally appropriate destination. It is necessary to work hard to raise awareness to consumers, because if they do not help, the program will not reach the wanted result. The mobilization of other sectors is also important, such as distribution and retail companies, financial institutions and public agencies, what has been already happening.

### **Legislation**

The program “Abinee Recebe Pilhas” aims at meeting the Conama Resolution 401/08, which third article establishes that batteries producers and importers “shall present to the environmental agency a management plan for batteries, including the environmentally appropriate destination, according to this Resolution”. Besides, the shops that commercialize these products must “receive used batteries from consumers, respecting the same active ingredient, to transfer to the respective producers and importers. The reception of other brands is optional”.

## **4.3 Opportunities for the sector on sustainable development**

### **4.3.1 Innovation and sustainability**

Electro-electronic industry is in the center of the main technological and scientific innovation – indirectly, by using equipment and digital systems in researches in all areas, or even directly, by developing new materials and digital structures increasingly smaller.

With the term nanotechnology (a nanometer is one billionth of a meter), these systems are already used in thousands of products. Processors and digital boards already have nanoscopic components. Concerning sustainability, one of the most evident benefits is the low power consumption.

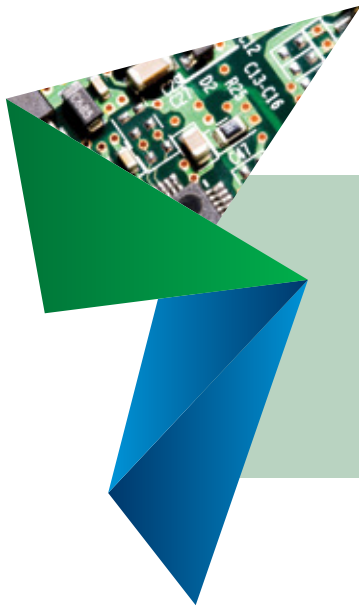
Nanotechnology also enlarges the capacity of information processing, helping researches and scientists to develop their studies faster and more precisely.

There is a vast field to be explored connecting innovation and sustainability. The digital network points to a future where the human work will be done without physical dislocation. People will be able to do their activities wherever they are.

This happens today, especially with the “knowledge workers” – managers, directors and specialists from many areas. It brings a positive consequence for the environment. Who does not need to move everyday to go to work, saves energy, fuel, public transportation service and others.

There is a connection between innovation and sustainability of which the development depends on good governance structures to destine public funds to researches on environmental issues. Electro-electronic industry is part of this process, providing equipment and intelligence to enable improvements in environmental area.





## 5 ECONOMIC AND SOCIOENVIRONMENTAL REGULATIONS

### 5.1 Relevant legislation

The main laws, decrees and resolutions relevant to the electro-electronic sector concerning environmental issues are listed below:

- **Law number 12.305, from August 2<sup>nd</sup>, 2010.** It institutes the National Policy on Solid Waste. In article 4, the law describes that this policy “gathers the principles, aims, instruments, guidelines, marks and actions adopted by the federal government, alone or in cooperation with the states, Federal District, municipalities or privates, aiming at the integrated management and the environmental management appropriate to solid waste”.
- **Decree number 7.404, from December 23<sup>rd</sup>, 2010.** It creates the Interministerial Committee of the National Solid Waste. The article 5 of the Decree defines that “producers, importers, distributors, traders, consumers and public agencies of urban sanitation and solid waste handle are responsible for the products’ life cycle”. The Decree mentions the shared responsibility, in which each actor is responsible for one part of the product’s life cycle – for example producers, traders and consumers.
- **Law number 12.187, from December 29<sup>th</sup>, 2009.** It institutes the National Policy on Climate Change. The law establishes “initiatives and measures to reduce the vulnerability of human and natural systems against the current and expected effects of climate changes” and “technological changes and replacements which reduces the consumption and emission of resources per production unit, as well as to implement measures to reduce greenhouse gases emission and increasing cesspools”.
- **Law number 10.295, from October 17<sup>th</sup>, 2001.** It provides for the National Policy for Conservation and Rational Use of Energy. The law establishes “the maximum levels of power consumption, or the minimum ones for energetic efficiency, of machines and devices which consume electrical energy and are produced or commercialized in the country, as well as the constructed buildings”.

- **Conama Resolution number 401, from November 4<sup>th</sup>, 2008.** “It establishes the maximum limits of lead, cadmium and mercury and the criteria and standards for the environmentally appropriate management of batteries, portable batteries, lead-acid batteries – automotive and industrial ones – and batteries for nickel-cadmium and mercury oxide electrochemical systems”. The article 3 establishes that the batteries producers and importers must “present to the environmental agency a management plan for batteries. The plan includes the environmentally appropriate destination”. Article 4 establishes that the shops which commercialize these products ought to “receive used batteries from consumers, respecting the same active ingredient, to transfer to the respective producers and importers. The reception of other brands is optional”. Every battery received from the shops must have the environmentally adequate destination, according to article 6.
- **Law number 11.196, from 2005.** It is called “Lei do Bem” and encourages innovation and local computers production and relieves taxes from production chain. The result of the application of the law was a drastic reduction in the prices for consumers, the increasing in the demand and production and the reduction of gray market. Nowadays, 73% of local market is under control of legal producers and devices. Until 2005, the legal products represented only one third of the market.
- **Law number 11.077, from 2004.** It is named Information Law and allows IPI (tax for industrialized products) reduction for the companies which produce information products and invest in projects, programs and activities on research and development (P&D). These companies must also meet the Basic Productive Process (PPB). The fact that the information sector must invest part of its sales in P&D, ensures the technological and environmental development of the products that will be commercialized in Brazil. There has already been much progress concerning used materials, efficiency in energy consumption of the products and, more recently, the discard of these materials.



## **CNI – NATIONAL CONFEDERATION OF INDUSTRY – BRASIL**

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*Mônica Messenberg Guimarães*  
Director of Institutional Relations

### **ENVIRONMENT AND SUSTAINABILITY UNIT**

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Executive Manager - Environment and Sustainability Unit

Technical Support  
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*Wanderley Coelho Baptista* (Environment and Sustainability Unit – CNI)  
*Marcelo Fernandes* (Fundação Dom Cabral)

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Communication Director

### **ADVERTISING EXECUTIVE MANAGEMENT – GEXPP**

*Carla Cristine Gonçalves de Souza*  
Executive Manager

*Armando Uema*  
Editorial Production

---

*Em Termos Jornalismo e Comunicação*  
Preparation

*Ademir Brescansin*  
*Abinee's Manager Socioenvironmental Responsibility Department*  
Coordination

*Ademir Brescansin (Abinee)*  
*André Saraiva (Abinee)*  
*Anita Briest Mattern (Abinee)*  
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Normalization

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