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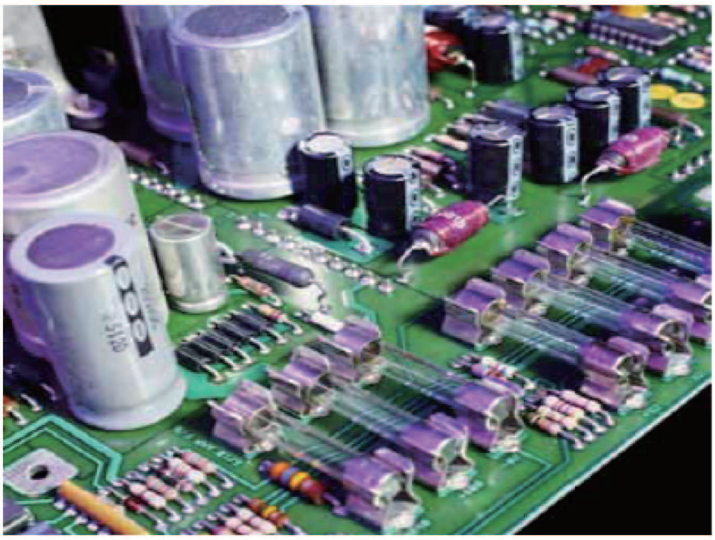
IMPROVING ENVIRONMENTAL AND SAFETY PERFORMANCE IN THE ELECTRICAL & ELECTRONICS INDUSTRY IN CHINA

Guidelines on Eco-Efficiency, Occupational Health & Safety and Corporate Social Responsibility



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The SWITCH-Asia project “Improving Environmental and Safety Performance in the Electrical and Electronics Industry in China” aims to improve the Eco-efficiency, Occupational Health and Safety (OHS) and Corporate Social Responsibility (CSR) practice of China’s electrical and electronics industry.

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1. Introduction

This Guideline is a guidance document for the EU SWITCH-Asia program—“Improving Environmental and Safety Performance in the Electrical and Electronics Industry in China”. The SWITCH-Asia program aims at promoting sustainable production and consumption (SCP) in Asia. Against the backdrop of the SWITCH-Asia program, the project “Improving Environmental and Safety Performance in the Electrical and Electronics Industry in China” is dedicated to improve the performance of Chinese electrical and electronics SMEs in terms of Eco-efficiency, Occupational Health and Safety (OHS), and Corporate Social Responsibility (CSR), and to help SMEs to improve their corresponding management and execution ability. This Guideline provides the necessary guidance and assistance for enterprises to improve their environmental and safety performance. By studying the Guideline, enterprises will obtain a comprehensive understanding of the national, regional and international laws, regulations and standards relevant to the environmental and safety performance of the electrical and electronics industry as well as best practices and typical cases of compliance with and adaptation to these laws, regulations and standards by electrical and electronic enterprises in developed countries. By comparing Chinese electrical and electronics enterprises with enterprises in developed countries in terms of environmental and safety performance and analyzing their gaps, this Guideline aims to help improving the Eco-efficiency, OHS and CSR of Chinese electrical and electronics SMEs.

This Guideline is divided into the following five chapters: Chapter I Introduction; Chapter II Laws, Regulations and Standards in the areas of Eco-efficiency, Environmental Management Systems (EMS), OHS and CSR affecting the Electrical and Electronics Industry; Chapter III International Best Practices; Chapter IV The Electronic and Electrical Industry in China including their gap with developed countries; and Chapter V with a discussion on Measures and Strategies for Improving Environmental and Safety Management.

1.1. Background and objective

The rapid development of the electrical and electronics industry, satisfying and improving people’s living standard, has also brought about serious environmental and safety problems. These electrical and electronic products can cause serious environmental pollution during the production process and after being discarded, the production process can also cause serious OHS problems. For example, the negative impacts on the environment and people’s health caused by discharge of electroplating wastewater, using large amounts of artificially synthesized polymer or plastic, and discharge of wastewater and emission of waste gas containing heavy metals such as lead and mercury, as well as environmental pollution by toxic and harmful substances such as lead, mercury, cadmium, hexavalent chromium, PBB and PBDE due to

improper disposal. Additionally, high energy consumption of electrical and electronic products and their contribution to the worsening of the climate change are also attracting more and more attention from the whole society.

In order to limit and eliminate the above problems, developed regions and countries such as the EU and Japan have successively launched relevant laws, regulations and standards, with the consequence that these environmental and safety requirements relevant to electrical and electronic products may be perceived as trade barriers to the export of Chinese electrical and electronic products. Following a worldwide improvement of environmental protection, some developing countries such as China, with respect to the environmental and resource protection of their own countries, are also gradually bettering the relevant law and regulations system and continue to standardize environmental and safety requirements on electrical and electronic products. Meanwhile, the overall environmental management level and labor standards of an enterprise also directly influences the enterprise's reputation and social responsibility. Concerned about their brand reputation and the effects on the market, some leading enterprises, especially large enterprises, have set internal environmental and safety requirements. These laws, regulations and requirements will not only exert important influence on the manufacturers of electrical and electronic products, but also will exert huge influence on up-stream "suppliers" and down-stream "traders" along the supply chain.

Therefore, currently, electrical and electronic enterprises in China should keep up with the green trend and pay attention to and improve their environmental and safety performance in terms of Eco-efficiency, OHS as well as social responsibility.

1.2. Scope of application

The electrical and electronics industry is closely related to people's life, which includes electrical motor manufacturing, power transmission, distribution as well as control equipment manufacturing, electrical material manufacturing, daily-use electrical appliance manufacturing, lighting equipment manufacturing, electrical machinery repairing, telecommunication equipment manufacturing, radar manufacturing, broadcasting and television equipment manufacturing, electronic computer manufacturing, electronic parts and components manufacturing, daily-use electronic appliance manufacturing and electronic equipment and telecommunication equipment repairing etc.

In line with the project research, the scope of the electrical and electronics industry and products involved in this Guideline will be based on the scope defined in the project proposal, mainly including electrical and electronic household appliances, consumer electronics, electronic parts and components as well as the computer and telecommunication industry.

1.3. Overview of the Guideline

In order to improve the environmental and safety performance of electrical and electronics SMEs in China, this Guideline provides producers with the following references: 1) An in-depth introduction of laws, regulations and supporting standards relevant to the environmental and work safety of the electrical and electronics industry in China with a view to assisting enterprises in gaining insights into recent development of relevant Chinese laws, regulations and standards; 2) A comprehensive introduction to laws, regulations and standards that involve environmental and safety requirements on the electrical and electronics industry in developed countries and regions as well as international organizations, in order to help enterprises to keep up with international trends, accompanied by an introduction of best practices and successful cases of how enterprises in developed countries comply with environmental and safety requirements to which Chinese enterprises can refer to; 3) An analysis of existing gaps between China and developed countries through a comparative study, in terms of environmental and safety performance of the electrical and electronics industry; 4) An introduction on counter-measures and solutions for improving the environmental and safety performance of electrical and electronics SMEs in China. Trainings and evaluations will contribute to improving and upgrading the environmental and safety performance of selected enterprises.

Enterprises may follow the following steps in using this Guideline:

The first step is to become familiar with relevant laws and regulations, which is a critical step. This Guideline highlights laws, regulations and departmental rules that electrical and electronics enterprises need to know and understand. These include higher level laws that those enterprises shall pay more attention to, such as: *the Circular Economy Promotion Law, the Clean Production Law, the Energy Conservation Law* and *Law on Prevention of Solid Waste Pollution*; as for the State Council ordinances and regulations, enterprises shall focus on understanding *the Measures for Administration of Energy labeling, The Regulation* for the *Administration of the Recovery* and *Disposal of Waste Electric and Electronic Products, theTechnical Policy for Pollution Prevention and Control of Waste Household Appliances and Electric Products,* the Measures for Administration of the Pollution Control of Electronic Information Products. At the same time, this Guideline introduces laws and regulations relevant to the electrical and electronics industry in developed countries and regions such as the EU. During this stage, enterprises shall focus their attention on four EU directives: *the EUP/ErP Directive*, *the REACH Directive, the RoHS Directive* and the *WEEE Directive*.

The second step is to examine the supporting standards. The major characteristic in launching laws and regulations in China is: legislation will be applied first, followed closely by launching detailed rules for implementation supporting the law, and then the final implementation is carried out through standards. The standards provided in

this Guideline, which enterprises shall focus on for their understanding, include: *the Implementing Rule for Energy-efficiency standard* and the implementing of a series of rules for products in the applicable scope of this Guideline, *the General Rules for Product Eco-Design*, the *Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products*, *the Series Standard for Environmental Management System*, and *the Specification for the Occupational Health and Safety Management*. Besides, the related standards that the EU and international organizations have launched mainly include *the EU Minimum Energy Performance Standard*, *the ISO14000 Environmental Management Series Standards*, *the IEC IEC62474 Material Declaration for Electrical and Electronic Equipment*, *the IEC 62430 Environmentally Conscious Design of Electrical and Electronic Products and Systems*, and *the IEC 62321 Electrotechnical Products–Determination of Levels of Six Regulated Substances*, among others.

The third step is to “compare”, which is a necessary step for an enterprise to improve its environmental and safety performance. From the Chinese and overseas laws and standards that have been launched, we can see that they correspond to each other and are interchangeable. Especially in the export business, producers and suppliers shall compare the characteristics of domestic and overseas laws and standards so that they can take necessary counter-measures within the enterprises.

The fourth step is to “implement”, which is a practical step for enterprises to improve their environmental and safety performance. Enterprises shall formulate environmental and safety strategies and guidelines. On the one hand, enterprises shall follow the requirements of laws, regulations and standards; on the other hand, they shall realize the environmental management objectives based on products’ lifecycle step by step and strive for market competitive advantage. At present, enterprises shall at least carry out environmental and safety works in the following aspects: “control and eliminate hazardous substances in products”, “reduce energy consumption”, “develop new energy”, “reduce emission of ‘three wastes’”, “efficiently utilize resources”, “establish a whole lifecycle environmental and OHS management system”, “do green marketing”, and “recycle and reuse waste products”, among others. Meanwhile, through active participation in various activities of this project, especially adopting the conformity model for validation and certification of their products and production processes, market competitiveness can be improved and market opportunities can be created.

1.4. Recommendations for implementation

1.4.1. The Importance of Eco-efficiency

The concept of Eco-efficiency was put forward first in 1992 in the report “World Business Council for Sustainable Development” (WBCSD), submitted to the UN Conference on Environment and Development “*Changing Course: A global business perspective on development and the environment”,* held in Rio de Janeiro. The

WBCSD defined Eco-efficiency as following: “Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource consumption intensity throughout the life-cycle to a level at least in line with the Earth’s estimated carrying capacity.”

The OECD refers to Eco-efficiency as “efficiency of ecological resources to meet human needs”, which may be regarded as the ratio of output/input, where “output” refers to the value of products and services provided by an enterprise, industry or a whole economic body, and “input” refers to the environmental pressure caused by the enterprise, industry or economic body.

Eco-efficiency can also be directly expressed as follows: the value of products or services/ecological impact = the value increase/increase of environmental impact, among which ecological impact means the use of resources and energy and emission of wastes etc.

This Guideline requires that enterprises consider Eco-efficiency as an important development strategy and put it into practice. When paying attention to energy-efficiency and eco-design to improve the overall Eco-efficiency of the enterprise, the following areas shall be focused on: paying attention to energy consumption of production processes and products and implementing the energy labeling system; considering the selection of materials in product design and minimize the use of toxic and hazardous substances; considering energy-saving and environmentally friendly design, material saving design, reusing, recycling, design that facilitates disposal of discarded products; consider the detachability of products in design to improve the reusing rate of products; eco-friendly and reduced product packaging, among others.

1.4.2. Improving the level of Occupational Health and Safety

China issued and implemented the Occupational Health and Safety Management Series Standards in 2002, another important management system following the Quality Management Series and the Environmental Management Series. They are collectively known as the Three Major Management Series, which are effective technical standardization measures for strengthening enterprises’ corresponding management work and improving enterprises’ level of management modernization.

Occupational Health and Safety (OHS) is related to human safety, involving the immediate interests of society, families and individuals. Once an accident occurs, property loss and moderate personal impairment may result if it is a minor incident, and group casualties and major loss of social property may result if it is a big one. Therefore, compared with quality management and environmental management,

OHS management is of more specific and important significance. The OHS management system is a set of systemized and standardized advanced methods. It particularly emphasises accident prevention, which means, all potential dangers and hidden troubles are identified systematically in advance; technical and management measures are adopted accordingly to eliminate or control dangers and hidden troubles in time, so that production and work are always maintained at a fairly safe state. Meanwhile, it also emphasises preparation for all contingencies, which includes making emergency response preparations for accidents and strengthen of emergency response through rehearsal in order to ensure that personal damage and property loss resulting from accidents are minimized in case of an accident. This Guideline requires that enterprises establish an internal health and safety system and improve employees' awareness of it.

1.4.3. Strengthening Corporate Social Responsibility

Corporate Social Responsibility (CSR) refers to the responsibility that an enterprise shall undertake for the stakeholders in its business operation. The concept of CSR is based on the idea that business operation must comply with sustainable development. Besides considering its own financial and operational conditions, enterprises should also join the assessment of the impact they cause on social and natural environment. The core activities of CSR are: "To create economic value and earn profits for their shareholders and investors on one hand; and on the other hand, to create social value, which is not only to pay taxes according to the law, but also to protect the environment, safeguard labor rights and interests and to participate enthusiastically in charity, public welfare and community participation".

CSR originated from the UN Global Compact, which mainly requires that all enterprises shall comply with, support and implement a set of nine basic principles about human rights, labor standards and environment within their respective scope of influence:

In terms of human rights: 1) Businesses should support and respect the protection of internationally proclaimed human rights; 2) make sure that they are not complicit in human rights abuses;
In terms of labor standards: 3) Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining; 4) the elimination of all forms of forced and compulsory labor; 5) the effective abolition of child labor; and 6) the elimination of discrimination in respect of employment and occupation.
In terms of environment: 7) Businesses are asked to support a precautionary approach to environmental challenges; 8) undertake initiatives to promote greater environmental responsibility; and 9) encourage the development and diffusion of environmentally friendly technologies.

2. Laws, Regulations and Standards regarding Eco-efficiency, EMS, OHS and CSR in the Electrical and Electronics Industry

2.1. Laws, regulations and standards of China

2.1.1. Relevant laws and regulations

Over many years, China has enacted many relevant laws and regulations related to fields of Eco-efficiency, EMS, OHS and CSR, which have played an important instructive role in guiding and regulating the Eco-efficiency management in the electrical and electronics industry in China, regulating the use of toxic and hazardous substances, strengthening the managing of recycling waste electrical and electronic equipment and promoting product eco-design, and have also exerted far-reaching influence on the formation of the idea and awareness of CSR. This section lists laws and regulations concerning Eco-efficiency, EMS, OHS and CSR that are related to the electrical and electronics industry in China (see Table 1), and gives explanation to the latest laws and regulations that may have impact on the electrical and electronic industry.

Table 1: Important Laws and Regulations Regarding Eco-efficiency, EMS, OHS and CSR Influencing the Electrical and Electronics Industry in China

Type	Title	Date of issuing	Date of implementation	Issuing department
Eco-efficiency	Energy Conservation Law of the People's Republic of China	2007-10-28	2008-04-01	National People's Congress
	Circular Economy Promotion Law of the People's Republic of China	2008-08-29	2009-01-01	National People's Congress
	Law of the People's Republic of China on Promoting Clean Production	2002-06-29	2003-01-01	National People's Congress
	Renewable Energy Law of the	2005-02-28	2006-01-01	National People's

	People’s Republic of China			Congress
	Measures for the Administration of Energy Efficiency Labels	2004-08-13	2005-03-01	National Development and Reform Commission and General Administration for Quality Supervision, Inspection and Quarantine
	Implementing Rules for Energy Performance Standards			
	Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products	2008-08-20	2011-01-01	State Council
	Technical Policy of Pollution Control of Waste Household, Electrical Appliances and Electronic Product	2006-08		General Administration of Environmental Protection, Ministry of Science and Technology, Ministry of Information Industry and Ministry of Commerce
	Measures for the Administration of Recycling of Renewable Resources	2007-03-27	2007-05-01	Jointly issued by the Ministry of Commerce, National Development and Reform Commission, Ministry of Public Security, State Administration for Industry and Commerce and General Administration of Environmental Protection
EMS	Environmental Protection Law of the People’s Republic of China	2000-4-29	2000-4-29	National People’s Congress
	Law of the People's Republic of China on the Prevention and Control	2000-4-29	2000-4-29	National People’s Congress

	of Atmospheric Pollution (revised in 2000)			
	Law of the People's Republic of China on the Prevention and Control of Water Pollution	1996-5-15	1996-5-15	National People's Congress
	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes	1995-10-30	1996-4-1	National People's Congress
	Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise Pollution	1996-10-29	1997-3-1	National People's Congress
	Law of the People's Republic of China on the Prevention and Control of Water Pollution	2000-3-20	2000-3-20	National People's Congress
	Detailed Rules for Implementing the Law of the People's Republic of China on Prevention and Control of Atmospheric Pollution	1989-07-12	1989-07-12	National People's Congress
	Measures for the Control of Pollution from Electronic Information Products	2006-02-28	2007-03-27	Former Ministry of Information Industry
OHS	Labor Law of the People's Republic of China	1994-07-05		
	Law of the People's Republic of China on the Prevention and Treatment of Occupational Diseases			
	Production Safety Law of the People's Republic of China	2002-06-29	2002-11-01	National People's Congress
	Fire Control Law of the People's Republic of China	2008-10-28	2009-05-01	National People's Congress
	Regulations of the People's Republic of China on Administration of Chemicals Subjected to Supervision and Control	1995-12-27	1995-12-27	State Council
	Detailed Rules for Implementing the Regulations of the People's Republic of China on the Administration of Chemicals Subjected to Supervision and	1997-03-10	1997-03-10	Ministry of Chemical Industry

	Control.			
	Regulations on the Safety Administration of Dangerous Chemicals	2002-01-09	2002-03-15	State Council
	Regulations on Labor Protection in Workplaces Where Toxic Substances Are Used	2002-04-30	2002-04-30	State Council
	Work-Related Injury Insurance Regulations	2003-04-16	2004-01-01	State Council
	Regulations on Minimum Salaries	2004-01-20	2004-03-01	Ministry of Labor and Social Securities
	Regulation on Forbidding the Use of Child Labor	2002-09-18	2002-12-01	State Council
CSR	Company Law of the People's Republic of China	2005-10-27	2006-01-01	National People's Congress
	Labor Union Law of the People's Republic of China	2003-01-09	2003-07-09	Supreme People's Court
	Law of the People's Republic of China on Protection of the Rights and Interests of the Consumers	1993-10-31	1994-01-10	National People's Congress
	Law of the People's Republic of China on Citizens' Unemployment			
	Law of the People's Republic of China on Foreign-Funded Operation and Joint Venture			
	Law of the People's Republic of China on Donations for Public Welfare	1999-06-28	1999-09-01	National People's Congress
	Anti-Unfair Competition Law of the People's Republic of China	1993-09-02	1993-12-01	National People's Congress

- **Measures for the Administration of Energy Efficiency Labels and Implementing Rules for Energy Performance Standards**

Energy labeling refers to the information labeled on energy-using products, mainly used to indicate the energy performance of products (generally in terms of amount of energy consumption, energy-efficiency or energy cost), to provide the necessary information for consumers when they purchase products. To strengthen energy conservation management, encourage the innovation of energy conservation technology and improve energy-efficiency, the National Development and Reform

Commission and the General Administration for Quality Supervision, Inspection and Quarantine issued *the Measures for the Administration of Energy Efficiency Labels* (No. 17 Decree of the National Development and Reform Commission and the General Administration for Quality Supervision, Inspection and Quarantine) on August 13, 2004.

According to *the Measures for Administration of Energy Efficiency Labels*, China has enacted 15 *Implementing Rules on the Energy Performance Standards*, among which 14 involve electrical and electronic products, including: household refrigerators, room air-conditioners, electric washing machines, unitary air-conditioners, self-ballasted fluorescent lamps, high pressure sodium lamps, small and medium-sized three-phase asynchronous motors, variable speed room air-conditioners, household instantaneous gas water heaters and gas -and water heating stoves, household induction cookers, VRF air-conditioner (heat pump) units, storage type electric water heaters, computer monitors and copy machines.

- **Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products**

In order to standardize the recycling of waste electrical and electronic equipment, promote comprehensive utilization of resources and development of circular economy, protect the environment and safeguard human health in accordance with *the Law of the People's Republic of China on Promoting Clean Production* and *the Regulations on Administration of the Recovery and Disposal of Waste Electrical and Electronic Products* were adopted at the 23rd Standing Meeting of the State Council on August 20th, 2008, which will be formally implemented as of January 1st, 2011. The Regulations will consist of five chapters and 35 articles, listing *the Catalogue of Waste Electrical and Electronic Equipment for Treatment*, clarifying that the State shall carry out multi-channel recycling and concentrate treatment of waste electrical and electronic equipment as well as implementing a qualification license system for treatment of waste electrical and electronic equipment stipulating that the State shall establish a fund for treating waste electrical, for the purchase of electronic equipment, and in order to subsidize recycling and treatment of waste electrical appliances and electronic products.

- **Technical Policy for Pollution Control of Household, Electrical Appliances and Electronic Product Waste**

In order to control the amount of waste caused by households and by electrical appliances and electronic products, as well as the need for control of the environmental pollution during recycling, the State Administration of Environmental Protection, Ministry of Science and Technology, Ministry of Information Industry and Ministry of Commerce jointly issued *the Technical Policy of Pollution Control of Waste Household, Electrical Appliances and Electronic Product*. This policy provides a

guideline for the prevention of pollution of waste electrical and electronic equipment, three objectives of pollution prevention, requirements on environment friendly product design and a labelling system informing about toxic and hazardous substances. The issuance of *the Technical Policy* will play an important future guiding role in the treatment and disposal of waste electrical and electronic equipment in China. Firstly, it provides important guidance for enacting related state laws, regulations and standards, especially standards concerning environmentally friendly design for electrical and electronic products, and technical specifications on pollution control technology for dismantling, reuse and disposal of waste products. Secondly, it provides processes and technologies that can be selected and applied to the future treatment of waste electrical and electronic products.

- **Measures for the Control of Pollution from Electronic Information Products**

In order to strengthen administration of pollution prevention of electronic information products at the source, reduce the environmental pollution and other public nuisances caused by discarded electronic information products, realize clean production of products and sustainable development of the industry, safeguard human health and property safety and improve the resource utilization efficiency, the former Ministry of Information Industry of the People's Republic of China issued *the Measures for the Control of Pollution from Electronic Information Products* on February 28th, 2006. The Document consists of four chapters and 25 articles, involving pollution prevention, supervision and management of electronic information products. The issuance of these measures provides an effective guidance for pollution prevention of electronic information products in China. The measures are the basis for improving enterprises' level of pollution prevention of electronic information products and furthermore aneffective tool for strengthening the participation in international trade and cooperation.

The Ministry of Industry and Information Technology (MIIT) was founded during the institutional reform of China in 2008. At present, MIIT is upgrading Chinese ROHS to a management regulation of the State Council. Once this is done, many electromechanical productions may be included in the Key Management Directory. MIIT published the first list of products to be included in the Directory (see table below) on October 9, 2009.

Table 2: Key Management Directory of the Control of Pollution from Electronic Information Products (First Batch)

No.	Customs HS Code	Category	Restricted toxic and hazardous substances or elements	Parts or components in which the use of toxic and hazardous substances or elements is not restricted for the time being (wt % stands for weight percentage)	Date of Enforcement

1	85171210	Mobile user terminals	Proportions of Pb, Hg, Cd, Cr VI, Polybrominated biphenyl, and Polybrominated Diphenyl Ethers shall meet requirements in SJ/T11363-2006 standard.	1) –Pb in glass of electronic components; 2) –Pb and Cd in optical glass and filter glass; 3) –Pb in ceramics of electronic ceramic components; 4) –Pb in steel alloys as an alloying constituent with a proportion no greater than 0.35wt%; 5) –Pb in aluminum alloys as an alloying constituent with a proportion no greater than 0.4wt%; 6) –Pb in copper alloys as an alloying constituent with a proportion no greater than 4wt%; 7) –Pb in high-temperature welding flux with a proportion no less than 85wt%; 8) –Pb in pins of microprocessors and welding flux used for encapsulation & connection, with a proportion between 80-85wt%; 9) –Pb in internal adhesion welding flux for encapsulation of upside-down chips of integrated circuits. 10) –Pb in the surface treatment of fine pitch components & parts (excluding connectors) with pitches no greater than 0.65mm and with ferronickel lead frames or copper lead frames	10 months after this Directory is officially published
2	85171100 85171800	Telephone sets (including fixed telephone terminals and cordless telephone terminals)			
3	84433211 84433212 84433213 84433214 84433219	Printing devices connected to computers			

2.1.2. National standards

As a net importer of energy, China is presently constrained by its energy supply. In a context of unsustainable energy consumption growth, eco-efficiency is rapidly becoming a key factor in decoupling economic development from energy consumption. Meanwhile, a large amount of energy consumption has also resulted in putting great pressure on China's natural environment. Therefore, the Chinese government pays more attention to energy conservation, and issued a series of energy conservation policies to promote energy-efficiency of equipment with high energy consumption, including studying and issuing a series of compulsory energy performance standards on energy-using products. By 2009, China has issued and implemented 36 energy performance standards which amongst other things state the maximum allowable values of energy consumption and energy-efficiency grades for household refrigerators, the maximum allowable values of energy consumption and

energy-efficiency grades for room air-conditioners and the minimum allowable values of energy-efficiency and the energy-efficiency grades for small and medium three-phase asynchronous motors. In addition, the energy performance standards for office equipment such as printers, fax machines, set-top boxes and desktop computers, and electrical household appliances such as microwave cookers, kitchen ventilators, exhaust fans and water dispensers will also be completed in 2010.

Besides, standards related to environment and safety in eco-design and recycling of waste electrical and electronic products such as *the General principle and requirements of eco-design for products, the minimum allowable values of product recycling rate and target value Part I air-conditioners and refrigerators, the General technical specifications of recovering for waste electrical and electronic equipment and the Labelfor recycling of products and parts and components* have also been formulated and will be issued.

In terms of EMS, with an increasing awareness of global environmental protection, countries around the world have successively adopted measures of standardization to regulate their environmental management activities. The International Standardization Organization established the ISO/TC207 Environmental Management Standardization Technical Committee in 1996, and successively issued the ISO14000 Environmental Management Series Standards. Since 1998, China has adopted 14 ISO14000 Series International Standards and 2 technical reports by equation as national standards.

In terms of OHS, with the acceleration of economic globalization, the OHS problem, closely related to the production process has drawn wide attention from the international community. Laws and regulations on OHS are becoming more and more strict, increasingly emphasizing the protection of personnel safety. Demands by parties regarding the working place and working conditions are also continuously on the rise. In 1999, several famous international certification organizations including the British Standards Institute (BSI) and the Det Norske Veritas (DNV) etc. jointly launched the Occupational Health and Safety Assessment Series (OHSAS) Standard. On November 12th, 2001, China formally adopted the OHSAS Standard by equation as a national standard, and issued two national standards, GB/T28001 and GB/T28002.

In terms of CSR, the world's most outstanding enterprises are increasingly aware of the responsibility that they should take for their business operations' stakeholders (all individuals or groups that may influence or be influenced by the decision making and actions of the enterprises). Besides considering their own financial and operating conditions, enterprises should consider its impact on the social and natural environments. Business stakeholders include, but are not limited to: employees, customers, suppliers, communities, mother companies or subsidiaries, partners, investors and shareholders. Developed countries have formulated standards on CSR, but so far China has not formulated a national standard in this respect.

Table 3: Important Standards in Terms of Eco-efficiency, EMS, OHS and CSR Affecting the Electrical and Electronics Industry in China

Type	Name of national standard	Date of issuance	Date of implementation	Promulgating department
ECO-efficiency	GB 12021.2-2008 The maximum allowable values of the energy consumption and energy-efficiency grades for household refrigerators	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 12021.3-2010 The minimum allowable values of the energy-efficiency and energy-efficiency grades for room air conditioners	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 12021.4-2004 The minimum allowable values of the energy-consumption and energy-efficiency grades for electric washing machines	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 12021.6-2008 Minimum allowable values of energy efficiency and energy efficiency grades for automatic electric rice cookers	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 12021.7-2005 Limited values of energy-efficiency and evaluating values of energy conservation for color television broadcasting receivers (newly promulgated)	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 12021.9-2008 Minimum allowable values of energy efficiency and energy efficiency grades of AC electric fans	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 17896-1999 Limited values of energy efficiency and evaluating values of energy conservation of ballasts for tubular fluorescent lamps	1989-12-25	1990-12-01	AQSIQ and SAC

	GB 18613-2006 The minimum allowable values of energy-efficiency and the energy-efficiency grades for small and medium three-phase asynchronous motors	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19043-2003 Limited values of energy-efficiency and rating criteria of double-capped fluorescent lamps for general lighting service	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19044-2003 Limited values of energy-efficiency and rating criteria of self-ballasted fluorescent lamps for general lighting service	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19153-2009 Minimum allowable values of energy efficiency and energy efficiency grades for displacement air compressors	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19415-2003 Limited values of energy-efficiency and evaluating values of energy conservation for single-capped fluorescent lamps	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19573-2004 Limited values of energy-efficiency and rating criteria for high-pressure sodium vapor lamps	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19574-2004 Limited values of energy efficiency and evaluating values of energy conservation of ballast for high-pressure sodium lamps	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19576-2004 The minimum allowable values of the energy-efficiency and energy-efficiency grades for unitary air conditioners	1989-12-25	1990-12-01	AQSIQ and SAC
	GB 19761-2009 Minimum allowable values of energy efficiency and energy efficiency grades for fan (newly promulgated)	1989-12-25	1990-12-01	AQSIQ and SAC

	GB/T 23685-2009 General technical specifications of recovering for waste electrical and electronic equipment	2009-10	2009-10	AQSIQ and SAC
	GB/T 24256-2009 General principle and requirements of eco-design for products	2009-10	2009-10	AQSIQ and SAC
	The minimum allowable values of product recycling rate and target value Part I air-conditioners and refrigerators	2009-10	2009-10	AQSIQ and SAC
	Label for recycling of products and parts and components	2009-10	2009-10	AQSIQ and SAC
EMS	GB/T 24001-2004 Environmental management systems Requirements with guidance for use	2004-10	2004-10	AQSIQ and SAC
	GB/T 2400-2004 Environmental management systems-General guidelines on principles, systems and supporting techniques	2004-10	2004-10	AQSIQ and SAC
	GB/T 24021-2001 Environmental management--Environmental labels and declarations--Self-declared environmental claims(Type Ⅱ environmental labelling)	2001-01-10	2001-08-01	AQSIQ and SAC
	GB/T24024-2001 Environmental management--Environmental labels and declarations--Type Ⅰ environmental labelling--Principles and procedures	2001-01-10	2001-08-01	AQSIQ and SAC
	GB/T24025-2009 Environmental management--Environmental labels and declarations--Type III environmental declarations--Principles and procedures	2009-10	2009-10	AQSIQ and SAC
	GB/T 24031-2001 Environmental management—Environmental performance evaluation—Guidelines	2001-02-28	2002-11-01	AQSIQ and SAC
	GB/T 24032 Environmental management—Environmental performance assessment applications	2009-10	2009-10	AQSIQ and SAC

	GB/T 24040-2008 Environmental management—Life cycle assessment—Principles and frameworks	2008-08	2008-08	AQSIQ and SAC
	GB/T 24044-2008 Environmental management - Life cycle assessment - Requirements and guidelines	2008-08	2008-08	AQSIQ and SAC
	GB/T 24050-2004 Environmental management--Vocabulary	2000-02-01	2000-10-01	AQSIQ and SAC
	GB/T 24062-2006 Environmental management - Integrating environmental aspects into product design and development	2009-10	2009-10	AQSIQ and SAC
	GB/T 24064.1 Greenhouse gas Part I Regulation and guidance for the quantification and report of emission and elimination of greenhouse gas on the organizational level	2009-10	2009-10	AQSIQ and SAC
	GB/T 24064.2 Greenhouse gas Part II Regulation and guidance for the quantification, monitoring and reporting of the emission reduction or eliminating increase on the project level	2009-10	2009-10	AQSIQ and SAC
	GB/T 24064.3 Greenhouse gas Part III Regulation and guidance for examination and verification of declaration of greenhouse gas	2009-10	2009-10	AQSIQ and SAC
OHS	GB/T 28001-2001 Occupational Health and Safety management system--Specification	2001-11-12	2002-01-01	AQSIQ and SAC
	GB/T 28002-2002 Occupational Health and Safety management system-Guidance	2001-11-12	2002-01-01	AQSIQ and SAC

2.1.3. Standards adapted to Chinese RoHS

In order to coordinate with the implementation of Chinese RoHS, MIIT (former Ministry of Information Industry) of the People's Republic of China has successively issued 6 ministerial-level standards. Detailed names of these standards are listed below:

SJ/Z 11388-2009 General guidelines of environment-friendly use period of electronic information products

SJ/T 11389-2009 Soldering Flux for Lead-free Welding

SJ/T 11390-2009	Testing Methods for Lead-free Welding Flux
SJ/T 11186-2009	General Specifications for Tin Soldering Paste
SJ/T 11391-2009	Tin Alloy Powder for Welding of Electronic Products
SJ/T 11392-2009	Lead-free Welding Flux: Chemical Constitution and Form

2.2. Laws, regulations and standards of developed countries and international organizations

2.2.1. Relevant laws and regulations

- **The EU**

With respect to managing limits of hazardous substances in electrical and electronic equipment, environmentally conscious design of energy-using products and the need for chemical safety management, the European Parliament and the European Council issued the RoHS (Restriction of Hazardous Substances) Directive in January 2003, that is, the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations. This Directive solved problems at the product design stage and its main purpose is to restrict hazardous substances in electrical and electronic equipment so as to protect people's health and ensure reasonable recycling of waste to protect the environment.

On July 6th, 2005, the European Parliament and the European Council issued the EuP/ErP (Energy-using Products) Directive, that is, the "Eco-design Directive for Energy-using Products 2005/32/EC". The objectives of this directive are to create a consistent and integrated legal framework for prescribing environmentally friendly design requirements on energy-using products so that such products can be freely circulated within the European Union; to improve the overall environmental performance of products in order to protect the environment; to guarantee energy supply safety and improve the competitiveness of the EU economy; and to safeguard the interests of the industry and consumers. The EuP/ErP Directive is a framework directive, which does not prescribe requirements on specific products. On the 21th October 2009, there was a recast of this directive, named now Energy-related Products directive, 2009/125/EC, changes are minor: extension of scope (more than only energy-using products, but all electrical and electronic equipment was and remains in the scope). According to the related provisions in the EuP/ErP Directive, the EU recruited the "implementing measures" to further formulate directives relating to product requirements. Now there are already 9 implementing measures enforced, (http://ec.europa.eu/enterprise/policies/sustainable-business/sustainable-product-policy/ecodesign/product-groups/index_en.htm) which include calculators, electric motors, refrigerators and Freezers, televisions, external power supplies, lighting products in the domestic and tertiary sectors, simple set-top boxes, standby and off mode electric power consumption of household and office equipment.

On December 18th, 2006, the European Parliament and the EU Council formally issued the REACH (Registration, Evaluation and Authorization of Chemicals) Directive, which was implemented in an all-round manner on June 1st, 2007. REACH is a centralized monitoring and management system for chemicals that will be established by the EU for protecting human health and environmental safety on the long term, and also for improving the competitiveness of the chemical industry in the EU and pursuing sustainable development. The REACH Directive mainly manages the registration, evaluation, license and limitation of over 30 thousand chemicals and their downstream textile, light industry and pharmaceutical products. The Directive will replace the 40 existing EU Directives and regulations on chemicals, involving quite a broad scope.

Another very important directive is the WEEE (Waste Electrical & Electronic Equipment) Directive issued by the European Parliament and the European Council in January 2003. This Directive optimizes the process of e-waste treatment and solves the environmental problems at the product End of Life (EOL) stage, so as to reduce waste of natural resources and prevent pollution. Its main purposes are to prevent the production of wastes from electrical and electronic equipment, to promote the reuse, cyclic utilization and recycling in other forms of waste equipment and components, and to improve the performance of operators (including manufacturers, traders and recycling companies) in the product lifecycle.

From June to October 2004, several manufacturers of electronic products (including Celestica, Dell, Flextronics, HP, IBM, Jabil, Sanmina SCI and Solectron) jointly drafted and issued the Electronic Industry Code of Conduct (EICC), and listed various standards to ensure the safety of the working environment in the supply chain of the electronic industry, where workers are treated with respect and dignity. The EICC also ensures that production processes are environmentally friendly.

In terms of energy-efficiency, as a first step the European Commission concluded in 1997 a negotiated agreement with individual consumer electronic manufacturers and the EU trade association EACEM to reduce the stand-by losses of TVs and VCRs. Later on in year 2000 a second agreement for reducing the stand-by losses of audio equipment was concluded. In the year 2003 a new agreement for TVs and DVDs was concluded. In 1999 a Commission Communication to the Council and the European Parliament on Policy Instruments to Reduce Stand-by Losses of Consumer Electronic Equipment set the political frame for further actions in this field. As a result of the Council Conclusions on the Communication two Codes of Conducts, for External Power Supplies and for Digital TV Services, were introduced. Another important piece of the Commission and EU strategy is the Energy Star Agreement for office equipment between the EU and the USA.

In addition, the EU has issued a framework directive on mandatory performance labelling of electrical household appliances and 8 implementing directives.

Products involved in the energy performance labelling directive include refridgerators and freezers, washing machines, drying machines, dishwashers, ovens, water heaters and hot water storage equipment, household lighting and household air-conditioners. The directive of the EU energy performance labelling stipulates that all governments of all member countries must comply with this directive and convert it into a national law. Only after being converted into a national law, the energy performance labelling requirement can become a compulsory requirement of all member countries. The directive also requires that the implementation should ensure that all manufacturers and distributors fulfill their obligations, and ensure that in the course of implementing the labelling plan, educational and promotional information activities are carried out to encourage consumers to use energy reasonably.

- **Japan's energy conservation policy, laws and regulations**

The Energy Conservation Law was adopted in 1979, and was amended in 1998. *The Energy Conservation Law* specifies requirements on energy performance standards and energy performance labelling. The management mode of "government + market" is adopted for energy management in Japan, which means that energy management is regulated and controlled by the government and complemented by market regulation.

Table 4 lists laws and regulations on environment and safety of electrical and electronic products issued by the EU, Japan and other developed countries as well as international organizations.

Table 4: Important Laws and Regulations on Electrical and Electronic Products Issued by Developed Countries and International Organizations

Region	Name of law and regulation	Issuing date	Implementing date	Promulgating department
EU	EUP/ErP Directive "Directive on Eco-design Requirements for Energy-using /-related Products"	2005-07-06		European Parliament and European Council
	REACH Directive "Registration, Evaluation and Authorization of Chemicals"	2006-12-18	2007-06-01	European Parliament and European Council
	RoHS Directive "Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations"	2003-01	2006-07-01	European Parliament and European Council
	WEEE Directive "Waste Electrical & Electronic	2003-01	2003-01	European Parliament and

	Equipment”			European Council
	Electronics Industry Citizenship Coalition	2004-06 to 2004-10	2004-10	Jointly by Celestica, Dell, Flextronics, HP and IBM
	EU Voluntary Agreements for Energy-efficiency			EU
	EU Directive on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products. See:http://ec.europa.eu/energy/efficiency/labelling/energy_labelling_en.htm for relevant implementing measures			EU
Japan	*Energy Conservation Law of Japan*	1998-2005		Japan
	Law on Recycling of Household Electrical Appliances			Japan
	Green Purchasing			Japan
	Basic Law on Promotion of Formation of a Circular Society			Japan
	Law on Waste Treatment			Ministry of Environmental Protection
	Law on Promoting Effective Use of Resources			Ministry of Economy, Trade and Industry
	Manual on Evaluation of Electrical Household Appliances			Japan
	Law on Recycling of Electrical Household Appliances			Japan
Germany	*Regulations on Recycling of Package Wastes*			Germany
	Law on Circular Economy Recycling and Waste Management			Germany
	Regulations on Recycling of Waste Electronic Products			Germany
	Regulation on Recycling of Waste Batteries			Germany

2.2.2. International standards and advanced standards in developed countries

We have deliberately decided to leave Product Carbon Footprint standards out of this chapter and of the Standards Guidelines in general in consideration of the very early stage of development of such a concept in China. We acknowledge however that it is currently gaining importance and recognition: PAS 2050, ISO 14067, WBSCD/WRI Greenhouse Gas Protocol initiative. Indeed the trend towards product carbon footprints is likely to foster the broad implementation of product life cycle thinking, therefore highly relevant for eco-efficiency promotion in the EE industry of China. Detailed information about product carbon footprint anticipated requirements will be provided to Chinese SMEs in the training materials developed by the SWITCH-Asia project.

- **EU energy performance standards**

EU member countries carried out energy-efficiency standards very early. The earliest energy performance standard was the minimum value of energy performance standard for refrigerators formulated by France in the 1960s. Currently, the EU has issued and implemented 3 compulsory standards on the minimum value of energy performance now covered under the EuP/ErP directive. In the meantime these standards/directives are covered under the EuP/ErP. Products involved in energy-efficiency standards include: household gas or fuel hot water system, refrigerators and freezers, and fluorescent lamp ballasts.

- **US EPEAT system**

EPEAT (www.epeat.net) is a system that helps purchasers evaluate, compare and select electronic products based on their environmental attributes. The system currently covers desktop and laptop computers, thin clients, workstations and computer monitors. Desktops, laptops and monitors that meet 23 required environmental performance criteria may be registered in EPEAT by their manufacturers in 40 countries worldwide. Registered products are rated Gold, Silver or Bronze depending on the percentage of 28 optional criteria they meet above the baseline criteria. EPEAT's environmental criteria are contained in a public standard, IEEE 1680. EPEAT operates an ongoing verification program to assure the credibility of the registry.

- **ISO14000 Environmental Management Series Standards**

In 1996, ISO/TC207 officially launched the ISO14000 series of international standards, covering many focal problems in the international environmental field such as environmental management system, environmental assessment, environmental

labelling, environmental behavior evaluation and lifecycle assessment. Those standards are aiming to establish environmental management systems, improving the impacts of production and operation activities on the environment, reducing pollution, reducing and eliminating trade barriers caused by environmental problems, and effectively facilitating international trade. At present, the ISO14000 series standards include 15 international standards (ISO14001, ISO14004, ISO19011, ISO14020, ISO14021, ISO14024, ISO14025, ISO14031, ISO14040, ISO14044. ISO14050, ISO14063 and ISO14064. 1—3), 6 technical reports (ISO/TR14032, ISO/TR14062, ISO/TR14061, ISO/TR14047, ISO/TR1404 and ISO/TR14049) and GUIDE64.

- **ISO 26000 CSR international standards**

In 2004, the ISO established the “ISO Working Group for Social Responsibility” (ISO/TMB/WGSR) directly affiliated to the ISO/TMB, and started the course of formulating the ISO Social Responsibility International Standard (ISO 26000), which is a guidance document applicable to all social organizations, and is not to be used for third party certification or commercial purposes and not to be taken as a management system. This guidance document was issued in the hope that organizations will attach importance to ethics, morality, labor rights, supplier management, consumer rights and interests, environment, community participation and responsibility to stakeholders, and help organizations to reach mutual trust by improving behavior regarding social responsibility. ISO 26000 will form a Draft International Standard (DIS) in October 2009, and will be published in September 2010. The main objectives of the ISO 26000 standard include: to assist organizations in fulfilling their social responsibility; to provide pracical guidance to all organizations in order to impel organizations to effectively fulfill social responsibility internally, to help organizations identify their stakeholders and coordinate with them; to improve the credibility of social responsibility reports and statements. This standard covers various topics, such as environment, human rights, labor practices, organizational management, fair business practices, community connection and social development as well as consumer issues, amongst others.

- **Standards of the IEC (International Electrotechnical Commission) /TC111**

The IEC/TC111 for environmental standardization for electrical and electronic products and systems was established in October 2004. The three working groups under TC111 and related international standards are:

WG1: Material Declaration (US)—IEC 62474 Material Declaration of electrical and electronic products;

WG2: Environmentally Conscious Design (Japan)—IEC 62430 Environmentally Conscious Design of electrical and electronic products;

WG3: Detecting Methods of Toxic Substances (Germany)—IEC 62321

Determination of concentration of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers) used in electrical and electronic products.

- **Japan's energy-efficiency standards**

In 1979, Japan first formulated energy-use efficiency standards for vehicles, air-conditioners and refrigerators. After the amendment of *the Energy Conservation Law* in 1998, the Top Runner Project was adopted. By 2005, the Top Runner Project had covered 18 kinds of products, including passenger vehicles, air-conditioners, fluorescent lamps, TV sets, VCRs, copy machines, computers, disk drives, freight vehicles, refrigerators, central heating equipment, gas stoves, gas water heaters, fuel water heaters, toilets, vending machines and transformers etc.

- **Australia's energy-efficiency standard**

In 1995, Australia started to formulate mandatory standards for the minimum energy-efficiency values for refrigerators, freezers and storage type electric water heaters. These standards became effective in October, 1999. Currently, the products covered by the energy-efficiency standards include refrigerators, freezers, storage electrical water heaters, three-phase air-conditioners (to 65 kW), three-phase machines (0.73kW-185kW), tubular fluorescent lamp ballasts, commercial-use refrigerators, tubular fluorescent lamps, substation transformers and single-phase air-conditioners.

Additionally, the list of products in need of further consideration on the implementation of energy label and energy-efficiency standards include: air compressors, air-conditioners, electrical machines, gas products, electrical household appliances (TVs, VCRs, audio and visual products and related entertainment products) and office equipment (computers and related equipment, copy machines, fax machines etc.), lighting products (lamps and ballasts), one-piece boilers, cold storage equipment (for domestic and commercial use), stoves, substation transformers and water heaters etc.

- **OHSAS18000 Standards** (Occupational Health and Safety Assessment Series)

OHSAS18000 is the OHS series standards put forward by 13 international organizations including the British Standards Institute (BSI), the DNV and others. OHSAS 18000 aims to raise organizations' social concern and their sense of responsibility, effectively improving the overall quality of organizations, help them to control their OHS risks, and improving their OHS performance; improve their image and employees' sense of belonging, avoiding unexpected losses, optimize the production operating activities and improve labor productivity. OHSAS18000 mainly includes two standards, OHSAS18001 *Occupational Health and Safety Management*

System Specification and OHSAS18002 *Occupational Health and Safety Management System Guideline for Implementation*.

- **SA8000 standard of the United States**

Among the many CSR standards, SA8000 is being increasingly widely accepted. SA8000 is a CSR standard formulated by the CEPAA of the United States of America in October 1997, which is revised once every four years. A Certification Guideline gets published two years after the issuance of a new standard. SA8000 is formulated according to international conventions such as *the Charter of the International Labor Organization, the Convention on the Rights of the Children*, and *the Universal Declaration of Human Rights.* The CSR in the SA standard stipulates that besides making profits, enterprises must take their responsibility towards the environment, society and stakeholders.

The SA8000's main contents are: child labor, forced labor, health and safety, freedom of association and right to collective bargaining, discrimination, disciplinary measures, labor time, salary and management system etc… It must meet the minimum requirements on CSR in terms of labor and social security, human rights protection and management system, among which employees' interest is the primary and most direct focus in CSR, different from the technical indicators as assessed in the ISO series.

Table 5 lists the related international standards formulated by international organizations as well as advanced standards in developed countries and regions.

Table 5: International Standards and Advanced Standards of Developed Countries

Region or organization	**Title of national standards**	**Issuing date**	**Implementing date**	**Promulgating department**
EU	EU Energy-efficiency standards			EU
ISO	ISO14000 Environmental Management Series Standards	2004-08	2004-08	ISO/TC207
	ISO26000 Corporate Social Responsibility International Standard	2010-09	2010-09	ISO
	IEC IE C62474 Material Declaration for Electrical and Electronic Products			IEC/TC111

IEC	IEC 62430 Environmentally Conscious Design of Electrical and Electronic Products			IEC/TC111
	IEC 62321 Electrotechnical products - Determination of levels of six regulated substances			IEC/TC111
Japan	Energy-efficiency Standards	1979		Japan
Australia	Energy-efficiency Standards	1995	1999-10	Australia
The UK and Norway etc.	OHSAS18000 Standard			The UK
The US	SA8000 Standard	1997-10	1997-10	The US

3. International best practices and case studies

This section focuses on introducing best practices of Eco-efficiency, environmental and OHS management as well as CSR carried out in the developed countries and regions such as the EU and Japan, which also serves as study and reference material for Chinese enterprises.

3.1. The EU practice

3.1.1. Eco labelling

The EU Eco Labelling Program started in 1992, where the EUEB Committee, formed by representatives from different countries, is in charge of executing and managing the labelling program which came into effect in 2000. It aims to promote the development of products with minimum harm on the environment, and nine aspects of environmental performance are included in the scope of assessment: energy conservation, rate of hazardous substances, product design, user operation guidance, packaging, labelling, noise, life span of products and recycling. Besides EU countries, this program has also been accepted by non-EU countries such as Norway, Switzerland, Ireland and Liechtenstein.

At present, the Eco Labelling Program has established eco-standards for many different product categories. Also, hundreds of products have already been labeled with the “EU Flower” logo. This standard is reviewed about once every three years. As the EuP/ErP Directive accepts the criteria of Eco-Labelling in terms of eco-design for products, all the international brands regard the certificate of Eco-Label as a path for compliance with the EU EuP/ErP Directive.

3.1.2. Corporate Social Responsibility

The EU believes that CSR is related to sustainable development of the society and economy, and that social responsibility should be a long-term concern for enterprises. The European Commission presented the *European Union Green Paper on CSR* to the European Parliament in 2001, and established the “CSR EMS Forum” in 2002, where representatives of various social strata participated, in order to establish a dialogue and an information communication mechanism on CSR in Europe.

All members of the EU have formulated the strategy for CSR, which is supported by the domestic industry, stakeholders and non-governmental organizations of all member countries. The EU compiled the first official policy report on CSR in 2002. In March 2006, the EU released a new CSR policy, where CSR was defined as ‘to pay attention to social and environmental problems beyond the basis requirements of law’; the strategic goal of CSR is to contribute to economic growth and sustainable development and to create job opportunities. Some areas that need to be focused on are: to strengthen relationships with other countries, to develop CSR on an international level, to raise awareness and to implement international tools for CSR, etc.

In addition, the EU continued to implement CSR in SMEs and put forward a range of new CSR proposals for large companies, SMEs and their stakeholders, accompanied by strong government support. In line with current European SME conditions, CSR EUROPE has also developed an online tool for SMEs to implement CSR—the SME Key, in the hope that SMEs, their allies and other sponsors will cooperate in order to improve their understanding and practical experience of CSR. Another target is to to encourage SMEs to take corporate responsibility and to help “opening the door to CSR” through sharing experience among nations and even Europe-wide cooperation between enterprises

Recently, the EU has launched the “European Alliance for Corporate Social Responsibility” in Brussels, which sees CSR as a “win-win business opportunity” for improving competitiveness of the EU. CSR is an integral part of the Swedish government program, where promoting CSR, supporting and protecting the sustainable development of economy and society has become part of the national strategy. In 1998, the British government supported the establishment of the “Ethical Trading Initiative”, where businesses, labor- and non-governmental organizations jointly discussed working condition standards and monitoring methods along the supply chain. In March 2001, the UK issued the *CSR Government Report* for the first time and laid out the governments’ CSR’s work plan. In Germany, the Ministry of Economic Cooperation and Development is the main official organization responsible for carrying out CSR. Most of their spendings related to the promotion of CSR comes from the government. The main activitiy is the management and organization of

related stakeholders of the society in order to discuss obstacles in implementing CSR. Another objective is to promote industry associations and enterprises to formulated CSR standards and performance CSR according to the standards of the International Labor Organization and the national laws and regulations. France actively promotes the CSR strategy, and has established a national conference system, analyzes, puts policies into practice and invests in social responsibility initiatives. The related government departments have formulated policies to encourage cooperation among partners for mutual benefits, and provide financial support to encourage enterprises to put these policies about sustainable development into practice. Other European countries such as Italy, Denmark and Ireland have also adopted many measures to actively promote the CSR movement.

3.2. Japan

3.2.1. Top Runner Program

In 1998, the Japanese government amended the Energy Conservation Law and launched the Top Runner Program. The energy-efficiency standards set up in this law are the average performance standard targets of the same kinds of products, instead of minimum value of energy-efficiency. That means manufacturers can launch products whose energy efficiencies are lower than the standard values. In that case they should offset the excess by launching other products with higher energy efficiencies so that in the outcome the average efficiency of the same kind of products from the company is higher than the required standard.

The Top Runner Program addresses specific projects and products. A present maximum energy-efficiency objective and time schedule are set up to stipulate that manufacturers must reach the objective within the prescribed period. In general, the period set is 4-8 years, and the objective must be reached by 2010 at the latest. According to this Program, manufacturers shall mark mandatory energy-efficiency information on products, but manufacturers may also choose to indicate their energy conservation performance with the energy labels on the voluntary Energy Labelling & Standards Program ELSP launched by the Japanese Industrial Standards (JIS).

The Top Runner Program includes energy-efficiency guiding standards for 13 kinds of electrical appliances including air-conditioners, refrigerators and electrical machines, which are all formulated according to the most advanced level of this kind of products at present. The value of energy-efficiency will be updated once every 3~5 years. Each kind of products should be compared with the level of top runners and labelled with stars to indicate the gap with top runners and the cost of electricity per year (the testing results are given by the Japanese Center for Energy Conservation). These 13 kinds of electrical appliances are marked with energy conservation labels by distributors when they are on sale.

With the incentive of the “Top Runner” policy, major producers in Japan place the improvement of product energy-efficiency in as top priority in their enterprise development plans, and regard the R & D and application of energy conservation technologies as important measures for improving products’ competitiveness. Consumers can also compare products with energy conservation labelling to choose products that conserve energy and save money. In this way, the products can be selected on markets based on energy conservation. Over the years since the Top Runner Program was first implemented, through manufacturers’ efforts, various kinds of electrical appliances have reached the objectives of energy conservation and efficiency, of which results were better than expected. For example, the automobile industry, by implementing the Top Runner Program, improved the energy consumption efficiency by 22% in 2004 from 1995. According to the original objective, the efficiency would be improved by 23% by 2010. The energy-efficiency of TV sets improved by 25.7% in 2003 from 1997, the energy-efficiency of video tape recorders improved by 73.6% in 2003 from 1997; that of air-conditioners improved by 67.8% in 2004 from 1997; that of refrigerators improved by 55.2% in 2004 from 1998; that of electrical ice chests improved by 29% in 2004 from 1998.

3.2.2. Japan’s Eco-design

There are mainly two groups of enterprises engaged in the recycling of the waste household electrical products in Japan. One group includes 21 enterprises represented by Toshiba, Panasonic, JVC, Dakin, and the other group consists of over 20 enterprises represented by Hitachi, Mitsubishi, Sharp, Sony and Sanyo, etc. For better recycling and disposal of waste household electrical appliances, Japan pays attention to eco-design from various aspects.

Hitachi: developing environmental assessment system

Hitachi has mainly defined two types of green products: 1) environmentally conscious products (reducing products’ impact on the environment); 2) environment-friendly products (for example, adopting advanced technology to reduce products’ damage to the environment). In March 1999, Hitachi developed a set of environmental assessment systems applied in each development stage of production. This system summarizes the factors related to environmental performance in the whole course of product development as: reducing weight, prolonging life span, being recyclable, being detachable, easy for disposal, protecting the environment, conservating energy and external communication. Evaluation records are made according to these eight factors, and in the final stage the results of products’ environmental load assessment are obtained. This *Eco-strategy Wheel* is developed to carry out design and development of eco-products.

In September 2001, Hitachi formulated a green manufacturing guideline to regulate the whole supply system, including a questionnaire survey of environmental management and the program of “reducing burdens on the environment in the

production process" (environmentally conscious design). The guideline is also extended to the Supervisory Office for Business Coordination and the Environmental Strategy Office. In February 2002, 820 Hitachi employees and 57 suppliers held a green accessories manufacturing exhibition to showcase green accessories. Before March 2002, Hitachi announced that it had completed a survey on 2,000 suppliers. Currently, Hitachi has established good strategic partnership with suppliers in Japan and other countries and regions.

Ricoh: Recyclable design

Ricoh Group focuses on recyclable design and consolidation of the recycling system. In early 1994, Ricoh put forward with the concept of the "Comet Circle" to help understand the concept of recycling resources to realize their economic value. Later, based on the environmental impact information system, Ricoh developed the Life Cycle Assessment (LCA) and an environmental conscious balance method, which reflect the impacts of products or commercial actions on the environment.

At the end of 1994, Ricoh established the LCA research team for recyclable design, for example, design that reduces time and costs for dismantling parts and components and that classifies substances after collection. The LCA data were published on the Ricoh official website in 2000.

Since 2001, the Ricoh Recycling Label (type II) includes five forms. First, product information such as GPL (green purchasing) units was submitted to the government, with detailed description of the process of green manufacturing of products. Later, Ricoh announced to establish partnership with suppliers supporting the environmental management system (EMS) and its suppliers must meet the requirements of ISO14001 and the materials they select must reduce environmental impact. Ricoh's production guideline, which is called the "green manufacturing system", includes Auditing Guideline and Supplier Operation Manual. The focus of the document lies on the environmental management system. In business outlets of Japan, the US, France, the UK and China there are auditing personnel supervising suppliers and giving suggestions for decision making. Meanwhile, Ricoh organizes green manufacturing symposia for suppliers and shares green technologies and ideas by distributing green manufacturing news.

Sony: Eco-design and the "eQCDS+E" purchase policy

Sony Company has set up a product environment committee to carry out eco-design practice of VHS recorders. This design plan focuses on considering the major parts of products and product lifecycle, for example, composition of parts, assembling method, the panel, PCB content, the standby method, and the disposal after being discarded in order to maximize the reduduction of their environmental impact within the lifecycle.

On this basis, Sony came up with a new design plan for improving product environmental performance, which includes: 1) all parts and components which are made out of one kind of material, in order to facilitate recycling; 2) major parts and components that can be rapidly detached and assembled for maintenance and repair purposes; 3) the energy consumption at the standby state is 1 W or lower; 4) connection with the automoted electronic system can eliminate energy consumption of standby; 5) retrieval through digital network, and able to rapidly update products through updating software; 6) newly designed product can be soon detached in 44 seconds. Compared with other existing products, their overall environmental impact is reduced by 61%.

Besides, with a purchase policy based on “eQCDS+ E” (e=e-commerce ready; Q=ability to continuously supply items that consistently meet quality standards; C=ability to supply items that are cost competitive; D=ability to deliver items on time and in the required quantities, S=ability to meet expectations for the provision of a broad range of services; E=initiatives to reduce the environmental impact of items supplied to protect the global environment: an ability to demonstrate Environmental Quality (http://www.sony.net/SonyInfo/procurementinfo/policy.html), Sony has developed a set of green partner systems, which require that Sony and its business partners establish an environmental management system for risk management and green purchasing and in order to publicize purchasing information. In September 2001, Sony established a green purchase committee affiliated to the Environmental Protection Committee, whose main task is to maintain and develop the Green Partner System (GPS) established in July 2001.

Panasonic: Recycling of Electrical Household Appliances and Environmental Protection

The Panasonic Environmental Protection Technical Center was formally started in April 2001. This center not only provides raw materials for reproduction, but also is responsible to verify whether products which are designed according to the previous environmental protection ideas are still considered environmentally friendly. Afterwards the center, together with the recycling department, gives a feedback to the R & D department on how to design and development environmental friendly products, including their recycling. Besides electrical appliances produced by Panasonic themselves, the center also deals with electronic products from about 20 other companies. Meanwhile, this center is an ideal place for education on environmental protection for ordinary, especially younger people. This center mainly has four waste household electrical appliance treatment lines for disposed TV sets, washing machines, refrigerators and air-conditioners.

Treatment of disposed TV sets: The key point is to recycle glass, which accounts for 57% of the product’s total weight. The shell of a TV set may be recycled as plastic after being detached. The Cathode Ray Tube (CRT) kinoscopic display with glass of

different purities and the funnel-shaped part behind are cut up, cleaned and crushed separately. The glass granules separated may be reused to make a kinescope.

Treatment of waste washing machines: after a washing machine is crushed, iron, copper and plastic are separated using magnetic force and wind force. After several separations and selections, various types of plastic are classified and recycled.

Treatment of waste refrigerators: plastic parts inside a refrigerator are taken out, the hydrochlorofluorocarbons (HCFCs) also known as Freon will be extracted out of the compressor, and then the shell whose main component is iron is put into a pulverizer. As the heat insulation materials inside the refrigerator also contains Freon, the crushing and separation equipment of refrigerators will be stopped at this step. At the production line, workers cut the power line manually, take down the door seal, and take out the separation bars inside the refrigerator. At this time, the PP and PS inside the plastic parts should be put in the hanging basket moving above. The terminal of the hanging basket is a special pulverizer, which crushes them into granules, to be reused as high grade raw materials.

Treatment of waste air-conditioners: the Freon inside the compressor is absorbed with a special apparatus, and then the heat exchanger and compressor are put into pulverizers separately, for extracting the copper, aluminum and iron. There are many types of metal in an air-conditioner, accounting for about 70% of the total weight. Small plastic parts account for about 15%. Some parts such as the heat exchanger use aluminum and copper with high purity, so their value is high. The heat exchangers taken off from the outdoor set and the indoor set are put into a closed crushing room to for processing, making them a mixture of metals. Then iron gets seperated using magnetic force. The remaining mixed pieces are screened, and copper and aluminum are separated from the mixed metal pieces according to their different specific gravity.

3.2.3. Japan’s practices in the Occupational Health and Safety Management System

The Occupational Health & Safety Management System (OHSMS) drafted by the Japan Industrial Safety and Health Association (JISHA) is the highest level OHSMS standard in Japan. This guideline helps employers to establish and develop OSHMS, in order to ensure workers’ safety and health. Its basic ideas include the following two aspects:

A. Employer self-restraint OHS management. Employers should identify potential dangerous factors such as operating machines and equipments, and raw materials. The requirements of related laws and regulations state that employers have the responsibility to take necessary action.
B. Guarantor for system implementation and record keeping. In order to ensure that employers organize production according to OHSMS requirements, work

regulations and standards, operating procedure and other relevant documents must be formulated. There are two sorts of documents, one of them are “standardization forms”, into which the personnel responsible for the safety and health program should record the action results, and the other sort are “single event records” which are distributed to relevant workers and used to record the decided actions and action results for future review and certification.

OHSMS elaborated in this guideline include 20 factors: (1) company policies; (2) departmental guidelines; (3) OHS management procedure; (4) OHS management manual; (5) organizational system of OHS management; (6) OHS committee; (7) providing guidance and assistance to sub-contractors with respect to contracting conditions; (8) OHS education; (9) OHS daily activities; (10) machine and equipment safety; (11) chemical safety; (12) working environment; (13) work management; (14) sanitary supervision; (15) promotion of psychological and physiological health; (16) comfortable working site; (17) providing corresponding measures to special groups; (18) employees’ transportation safety; (19) accident analysis; (20) emergency response.

The above factors fall into two categories: On one hand the consideration for global social conditions and the particular conditions in Japan. On the other hand the consideration of all the contents ranging from the legal system, social background to corporate culture. The management system formed by the 20 factors above fully reflects a “Deming Cycle” also known as “PDCA” which is a iterative four-step problem-solving process and an abbreviation which describes the for steps as “plan”, “do”, “check” and “act”.

3.2.4. CSR in Japan

In the times of rapid economic growth in Japan, the social and environmental conditions were increasingly deteriorated, which led to increasingly serious criticism on enterprises by the public. In consequence this undoubtedly promoted Japanese enterprises to consider their social responsibility from a different perspective. Meanwhile, with the market competition becoming increasingly fierce, the enhancement of the public’s awareness to protect their rights, Japanese entrepreneurs came to realize that performance of social responsibility would become an important standard for judging an enterprise.

An enterprise should protect employees’ personal interests and pay attention to meet employees’ needs, and regard enterprises’ responsibility towards employees as a fundamental objective of the enterprise. The efforts of General Manager Tanaka Hiroshi from Fuji Film Image Machine Co., Ltd. in Suzhou promoted the establishment of CSR, which started by improving the working environment, for example by equiping the workers’ lounge with a sofa and starting by a dialogue with ordinary employees and managers in the middle management level. To Tanaka, this is the base for establishing relationship based on trust, an important method for improving factory

management, and finally a way to express respect to all employees.

Japanese enterprises strive to provide more environmentally friendly and high-quality products and services to the public. For example Hitachi focuses on the development of energy conservation and environmentally friendly products and wants to become an environmentally friendly enterprise. From the very start of its establishment, Hitachi regarded CSR as an important part for enterprise survival and development. In the course of realizing the enterprise's objective, it is important to involve the employees in all related fields such as design, manufacturing, finance and operation, to name just a few,in order to create understanding for the enterprise's environmental protection guidelines, product philosophy, high-efficiency in the production process, and demand for reasonable re-utilization of materials.

Canon Company and the UNEP have jointly sponsored the "UNEP International Photographic Competition on the Environment" for several consecutive years under the theme of "Focus on Your World", which displayed a true image of the world through "photos" and transmit the idea of environmental protection into peopless minds.

In July 2008, the US *News Week* launched an evaluation on the top 500 global enterprises that place CSR and enterprise profit on the same position. Olympus Company of Japan ranked the 154th with a score of 15 points in environment (full score) in the assessment of CSR, becoming the only "green" electronic enterprise. Olympus company has been making unremitting efforts in caring about the impact of the enterprises' production process on the environment. For instance they proposed "the final landfill amount of waste being less than 1% of the total discharge of waste" as the standard of reaching zero emissions, and took strict measures on greenhouse gas emissions, as well as on the conservation and the recycling of resources and the control of chemical raw materials. Olympus advocates the "Social IN" concept, which calls for active INvolvement in society, developing INsight to social needs through the sharing of values, and providing INspiration to society through the proposal of new values. Besides their actions in environmental protection, the company also makes further efforts, such as donating to earthquake stricken areas as well as long-term support in reconstruction as happened for the Wenchuan region in 2008.

3.3 Greenpeace' Guide to Greener Electronics

Geenpeace first released the 'Guide to Greener Electronics' in August 2006. The guide ranks the 18 top manufacturers of personal computers, mobile phones, TVs and games consoles according to their policies on toxic chemicals, recycling and climate change. The 'Guide to Greener Electronics' aims to clean up the electronics sector and get manufacturers to take responsibility for the full life cycle of their products, including the electronic waste that their products generate. The guide does not rank companies on labour standards, mining, or any other issues, but recognises that these are important in the production and use of electronics products.

The ranking criteria reflect the demands of the Toxic Tech campaign to the electronics companies. Greenpeace' three demands are that companies should:

- Clean up their products by eliminating hazardous substances.
- Takeback and recycle their products responsibly once they become obsolete.
- Reduce the climate impacts of their operations and products.

The use of harmful chemicals in electronics prevents their safe recycling when the products are discarded. Companies scored marks out of 51 this has then been calculated to a mark out of 10 for simplicity.

More information can be found at:

http://www.greenpeace.org/international/campaigns/toxics/electronics/how-the-companies-line-up

4. The Electronic and Electrical Industry in China

4.1. Performance regarding Eco-efficiency, Eco-design, EMS, OHS and CSR

4.1.1. Eco-efficiency

Currently, the average energy-efficiency of energy-using equipment and products in China is about 60%, with huge potentials for savings. To improve the energy-using efficiency of terminal energy-using equipment and products such as electrical household appliances, office equipment, industrial equipment and buildings, it is of great importance to save energy and alleviate the problem of climate change. Meanwhile, energy-efficiency standards and labelling has always been important energy conservation measures for countries all over the world to improve the terminal energy-using efficiency. Energy-efficiency standards can limit the production, distribution and import of products with high energy consumption, and finally eliminate them out of the market. Energy labelling can urge consumers to purchase high-quality products with low energy consumption and high energy-efficiency, and increase their market shares.

In recent years, China has implemented energy-efficiency standards and labelling, resulting in considerable energy savings, also bringing substantial environmental, economic and social benefits. Through developing and promoting energy-efficiency standards and implementing energy label, the expected use of electricity by urban and rural residents' in their life in the future 20 years will be reduced by nearly 85%. By 2010, the accumulated amount of electricity saved by standards will reach 558TWh, equivalent to 256 million ton standard coal when converted into primary energy, and the accumulated amount of electricity saved by labelling will reach 70.1

TWh, equivalent to 28 million ton standard coal when converted into primary energy; by 2020, the accumulated amount of electricity saved by standards will reach 2657TWh, equivalent to 1.29 billion ton standard coal when converted into primary energy, and the accumulated amount of electricity saved by standards will reach 258TWh, equivalent to 98 million ton standard coal when converted into primary energy.

Due to reduction of energy consumption, the air pollutants emitted in the course of electricity generation and energy consumption will also be controlled. By 2020, the implementation of energy-efficiency standards and labelling will contribute to the reduction of carbon emission amounting to over 104 million ton, equivalent to about the carbon emission of over 4.5 million medium-sized passenger vehicles, and the reduction of atmospheric particulates will reach 9.64 million. The obvious emission reduction of such air pollutants will obviously alleviate the environmental problems such as greenhouse effect, photochemical smog and acid rain, which will play a very important role in improving environmental quality and people's living standard.

Besides, China started to implement the energy conservation product certification system in 1998. By now, energy conservation certifications for 17 kinds of products have been carried out, including electrical household appliances, lighting products, mechanical products, electrical products, and water saving products, which include household refrigerators, room air-conditioners, tubular fluorescent lamp ballasts, electrical wave trappers, medium- and small electrical motors and water saving toilets etc. 347 types of products produced by 35 manufacturers have received energy conservation certificates and been approved to use the authoritative energy conservation labelling in China.

In terms of the record of energy labels, by March 2, 2008, 1,265 enterprises and 50,305 products had been recorded. Table 6 lists enterprises and different types of products that have been recorded.

Table 6: Enterprises and Different Types of Products that Have Been Recorded

Product type	Amount of enterprises that have been recorded	Amount of products that have been recorded
Household electrical refrigerators	257	11,989
Room air-conditioner	94	11,088
Electrical washing machine	341	6,043
Unitary air-conditioner	31	2,057
Self-ballasted fluorescent lamp	139	4,039

High voltage sodium lamp	19	163
Medium and small-sized three-phase asynchronous motor	89	7,056
Chiller	37	2,718
Household gas quick water heater and gas heating and hot-water stove	167	3,136
Rotate speed controllable room air-conditioner	21	559
Multi-connected air-conditioner (hot pump) unit	7	257
Water storing electrical water heater	12	298
Household electromagnetic stove	9	234
Computer monitor	40	629
Copy machine	2	39

Overall, the efforts for implementing energy-efficiency standards in China are still insufficient China has issued over 10 energy-efficiency standards, but the implementation efforts of these standards are small. China has not launched a compulsory elimination mechanism for high energy consumption products and other corresponding energy-efficiency standard supervision measures, so that energy-consuming products that not comply with the requirements of standards are still circulated and traded in the market, which affects the overall implementation of the standards and the role that they should play.

4.1.2. Eco-design

Eco-design has been proven to be one of the most effective ways to improve the environment and safety management skills of electrical and electronic enterprises in developed countries. According to statistics, over 80% of the products' environmental impacts are related to the design of products. As a result, the Energy Using Products (EuP) Directive of the EU was adopted. On the one hand, product eco-design promotes the consideration of products' environmental impacts in product design and advocates reduction of resources at source, saving resources in the course of production, reducing environmental pollution and destruction in product recycling, and reducing products' negative environmental impact to a minimum. Firstly, the reduction of resource inputat source level refers to direct saving of resources. Furthermore this reduction will also result in lower production cost by saving resources in the production process and reducing consumption of intermediate products. In consequence the environmental impact such as external effects and discharged

pollutants can be decreased. This kind of integrated approach of environmental protection meanwhile saves a large amount of manpower and financial expenses which otherwise would emerge by additional processes of treating pollutants.

Compared with internationally advanced regions, China's eco-design has only just started. Eco-design is still in the conceptual stage in the electrical and electronic industry of China. The domestic manufacturers are still focusing on how to pass the entrance restriction of the EU market according to the requirements of EU directives such as WEEE and RoHS. Manpower and capital are mainly concentrated on the reconstruction and updating of production lines. They don't have much experience in product eco-design of source control, nor do they put much into it. Many Chinese SMEs, propelled by directives and social demands, are confronted with pressure of updating their products and technology, which provides an opportunity to apply eco-design. Besides, at the State level, there is no policy focusing on eco-design of electrical and electronic products or requirements on enterprises to conduct eco-design. In addition, no research institute for product design has been set up. At the enterprise level, the absolute majority of enterprises have not formulated any definite eco-design strategies or objectives to implement.

4.1.3. EMS and OHS

Implementing an EMS is a method for realizing good environmental management and environmental performance, and also a systematic method for assuring environmental responsibility and improving environmental performance of stakeholders. An EMS provides a framework to comply with the laws, regulations and administrative measures on important environmental factors.

In June 2000, the Norwegian Agency for Development and Cooperation and the Ministry of Foreign Trade and Economic Cooperation signed the agreement on the program of "Construction of China's Ability in Implementing the ISO14000 Environmental Management System" in accordance with the Sino-Norwegian Bilateral Environmental Cooperation. The program's implementation time lasted from January 2001 to April 2004 and was carried out in four provinces, Beijing, Shanxi, Hubei and Jiangsu, and mainly in three industries, i.e., tourism industry, electronic and electrical industry, and automobile industry. *Furthermore the Guideline for Implementing the Environmental Management System in the Electrical and Electronic Industry in China* was compiled. Chinese and Norwegian experts have checked the baselines of 30 enterprises and helped enterprises establish and improve their environmental management systems.

With respect to the EU's RoHS directive, the Ministry of Information Industry of China formulated the *Measures for the Control of Pollution from Electronic Information Products*, according to *the Law of the People's Republic of China on Promoting Clean Production* and the *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes*, which was formally implemented

on January 1st, 1996. *The Measures for the Control of Pollution from Electronic Information Products* stipulates that from July 1st, 2006, electronic information products listed in the category of key electronic information products for pollution prevention may not include lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers or any other toxic and hazardous substances. Before, until July 1st, 2006, the Chinese government required manufacturers of electronic information products to reduce the restricted substances and to find substitutes.

4.1.4. CSR

With China's accession to the World Trade Organization, transnational corporations put forward with requirements on labor during the production process of Chinese commodities through their supply chain management, which has drawn close attention from China's export-oriented enterprises to the shouldering of CSR. 73 Chinese enterprises have successively joined the UN "Global Compact", and commit themselves to take CSR. Over a 100.000 export-oriented enterprises have carried out labor management required in SA8000. On September 7th, 2005, at the Sino-European CSR Beijing International Forum, ten Chinese enterprises represented by large-scale -and state-owned enterprises such as Haier, Chang'an and Hongdou issued the *Beijing Declaration on Corporate Social Responsibility*, actively advocating enterprises' CSR performance. During this period, the State Power Grid Corporation of China issued the first CSR report in China, explaining the understanding of CSR and efforts made in terms of the State, employees, customers, environment and socialist new countryside, and reported its understanding and performance from the perspectives of strategy and action. On March 27th, 2006, the Executive Committee of Foreign Investment Companies issued the "Beijing Declaration on Corporate Social Responsibility", making commitment on CSR, and calling for establishing a harmonious society while developing the business in the right way complying with requirements on CSR. This declaration was signed by 66 foreign-funded enterprises including Siemens, Motorola, Microsoft, IBM, Volkswagen and General Electric etc. So far, 114 enterprises have published CSR reports in China, and 29 foreign-funded enterprises have issued Chinese versions of CSR reports or sustainable development reports.

A survey on enterprises' motives for taking CSR shows that the main motive of SMEs' CSR performance is to "obtain government recognition". For some large-scale enterprises at a relatively mature stage, their motives for taking CSR performance are mostly "improving enterprise's brand reputation", "establishing continuous competitive advantage" and "contributing to social development". This shows that SMEs' basic understanding of and attitude to the CSR performance are directly related to the growth and maturity degree of their business.

Major practices of CSR in China include: charity, public welfare and poverty alleviation by industries, improving the supply chain practices, and publishing CSR reports etc.

At present, people have a new understanding of the nature and role of enterprises, as well as their relationship with the society. Enterprise operators generally accept that “excellent entrepreneurs must have a strong sense of social responsibility”, that is, besides making profits, enterprises must also create social wealth and promote the whole nation’s development.

4.2. Barriers regarding management and technical aspects

4.2.1. Energy-efficiency

(1) Weaknesses in Research of energy-efficiency standards and labelling.

This can be reflected mainly in two aspects. Firstly, there are certain difficulties in data collection. Due to differences in managemental responsibilities among different departments, no uniform and complete methods of data collection, storage, statistics, inquiry and analysis exists in China. Secondly, China still falls behind in research and analytical methods. The statistical methods adopted in China have certain gaps from the engineering economic analytical methods adopted by the developed countries in the world. Besides, research and development for standardization cannot be organically combined with the formulation of standards. The basic research of standardization is backward, which, to some extent, affects the effectiveness of energy-efficiency standards.

(2) Improvements in the management system to energy-efficiency standards and labelling.

It is not easy for the current energy conservation management system in China to bring various social forces into play to participate and support energy-efficiency standardization work.

Besides, due to structural reforms and adjustments etc., China has not formally launched an energy-efficiency information labelling system, and the implementation and supervision mechanism for energy labelling has not been established. How to implement this effectively and further expand its influence is still to be studied carefully.

(3) Insufficient capacity building and serious shortage in standardization work funds

Over the years, the fund for formulating and amending national standards has mainly come from government financial allocation, and quite a number of secretariats of the National Standardization Technical Committees or secretariats of sub-committees have been set in research institutes. After the reform, these research institutes have entered enterprise groups or become enterprises. Many units, without sufficient financial support from the State, are no longer willing to continue the standardization

work which is mainly for social benefits.
Meanwhile, with the development of market economy, the demand for making more standards to regulate industry has increased, whereas the fund for standardization work has not. Moreover, participation in international standardization activities and adoption of international standards and advanced overseas standards are also affected by this fund deficiency.

4.2.2. EMS

Although many Chinese enterprises have implemented the ISO14001 system, the question on how to systematically evaluate their performance and analyze changes in the overall performance is still an issue that deserves discussion. Studies on this issue have just started. Firstly, a systematic performance evaluation index system has not been set up yet. Secondly, performance evaluation is separated from fund assessment, which does not meet enterprises' business strategy. Besides, the lack of an information collection method of performance evaluation, only one single indicator is used for an assessment, and no comprehensive index system has been set up for evaluation of the overall performance. The performance changes and its root causes after enterprises' implementation of the ISO 14001 system still are in need of research.

4.2.3. OHS management

Although many enterprises have established the OHS management system, and have achieved good results, it cannot be maintained for a long time. Practice has proven that the main reason for failure to maintain production safety on a long-term basis lies in the management.

(1) Management work is not standardized

Safety work is not managed according to regulations and procedure, but it is taken as temporary work. During ordinary working hours, when schedules are tight, people tend to forget safety. When an accident occurs, some remedial measures are taken. In time of major safety checks or for activities arranged by the higher authorities, they will be busy for a while and take stopgap measures. These problems can directly lead to various accidents.

(2) Laws, regulations and regulatory systems are not properly implemented

Many national, industrial, local laws and regulations on production safety have been issued, but they are often not implemented properly. This does not only lead to frequent occurrence of one of the"three kinds of violations", but also is also an important factor for the failure of long-term maintenance of production safety.

(3) The safety management level is not high

Safety management is an important component in enterprise management. Just like

enterprise management gradually solves problems that occur with the need to adapt to the demands of market economy, similar problems in safety management should also be improved accordingly. Firstly, the production safety responsibility system is not properly implemented. The main administrative principal of an enterprise is the primary principal for production safety, the production safety responsibility of each department and level should be assigned to all people at the same level and to all levels. Such a production safety responsibility system has not been truly recruited in some enterprises. Secondly, training and education on the production safety is not up to quality and the staff can not meet the requirements of implementing a safe production. The three degree safety education when new workers enter factory, post safety education for employees changing their post, and employees' daily safety education are not implemented according to requirements. The staff's overall quality and safety consciousness are in need of improvement. Thirdly, enterprises are not clear about the basic factors for risks. Neither a rectification plan nor effective preventive measures are available for hidden causes for major accidents. Fourthly, equipment maintenance is not up to date and safety equipment is not perfect. Production equipment is one of the fundamental resources for an enterprise, and equipments meeting all the safe requirements are the major content for guaranteeing enterprise safety. Still quite a number of enterprises adopt the method of maintaining old equipment and putting together equipment for immediate economic benefits.

(4) Affected by passive management mode

Traditional mode of safety management usually includes prior arrangement, regular examination in the middle, in addition to remediation after an accident. This mode is often managed according to orders from the higher authorities and official documents. Under this mode, fewer requirements for production safety are put forward with according regulations and standardized procedures, which inevitably will result in being less active and more passive about coping with resolutions. Work safety is always driven by external forces, and an effective mechanism that functions in a self-restraining and self-improving manner, has not been set up, which has become a fundamental cause for failure of long-term maintenance of production safety in enterprises.

4.2.4. CSR

At present, there are the following major technical and management barriers for Chinese enterprises to take CSR.

1) In terms of the social responsibility taken by enterprises and the government, the social responsibility of enterprises is too large, and the scope is not clear. State-owned enterprises assume a large amount of social welfare burden. Although China has intensified reform efforts in this aspect, some local state-owned enterprises haven't got rid of these burdens yet.

2) Only few enterprises give consideration to environmental problems. In China, environmental problems such as air pollution, water pollution, urban solid wastes, discharge of industrial solid wastes, water loss soil, erosion and sandstorms have

become prominent problems that should be solved with major efforts in economic and social development.
3) Chinese enterprises lack correct awareness of business operation ideas in the performance of CSR. In this respect, some enterprises' behavior such as corporate dishonesty and fraud against the community greatly increase trading cost in economic life, corrupt the business climate and market environment and affect the economic development of an enterprise as well as the country's economic development.
4) The social responsibility system established in Chinese enterprises is not perfect yet. Some enterprises are still unfamiliar with CRS and its content.

4.3. Analysis of gap and demand

4.3.1. Energy-efficiency

Countries and regions such as the US, the EU and its member countries, Canada, Australia, New Zealand, South Korea, Japan, the Philippines and Thailand have successfully implemented energy-efficiency standards and labelling and achieved considerable economic and social benefits. For example, in the US, there are energy-efficiency standards for many electrical appliances and equipments such as refrigerators, household air-conditioners, central air-conditioning and heating pumps, stoves and boilers, water heaters, direct-fired heaters, washing machines, drying machines, dishwashers, cooking ranges and ovens, swimming pool heaters, ballast of fluorescent lamps, TV sets, fluorescent lamps, electric motors, transformers and Human Interface Devices (HID). According to scientific estimates implementing energy-efficiency standards will result in energy savings of about 8% of the estimated total amount of consumed electricity in 2020, and 4% of the total primary energy, while the reduction of peak demand will be about 10%. Meanwhile, the energy label in the US is widely applied for household electrical appliances, office-, commercial- and industrial equipment, influencing consumers' purchasing and consumption behaviour. In particular, the "Energy Star" program has become an internationalized energy label program.
Compared to developed countries, the effect of energy-savings through implementating energy-efficiency standards and labelling in China is still very limited, mainly due to the following reasons:

1) The scope of products which are required to implement energy-efficiency standards and labelling in China is still narrow, and the products involved in energy-efficiency standards and labelling program are concentrated on major household electrical appliances such as refrigerators, air-conditioners and washing machines, and a few lighting and industrial equipments, and no energy-efficiency standards have been formulated for many energy-use electrical appliances and equipments that are widely in use. The guarantee labelling that has been implemented only covers part of the energy-using products and manufacturers; while energy-efficiency information labelling is still at the stage of research, and has not been implemented on all

energy-use products.
2) The minimum allowances of energy efficiency values and indexes for energy conservation evaluation, as stipulated in the energy-efficiency standards, are quite low. As the current energy-efficiency standards, which take about half a year from issuance to implementation and which are still present-status standards in which only some terms are compulsory, leave a relatively short response time for manufacturers to meet the requirementsby improving production. The level set up for energy-efficiency indexes is on the low side, which is not conducive for promoting and guiding the improvement of the energy-efficiency of energy-using products.
3) China lacks effective implementing measures and an incentive mechanism for energy-efficiency standardization and labelling, while the general public is quite indifferent about energy-efficiency standards and labelling

Comparative analysis of international experiences, deficiencies and problems in China's implementation of energy-efficiency standards and labelling, shows that the following demands on energy-efficiency improvement should be taken into consideration in China:

1) Further formulation of energy-efficiency standards for general electrical household appliances and commercial equipment as well as expanding the scope of energy-efficiency standardization and labelling.
2) Improvement of the energy-efficiency standard level. The energy-efficiency standards formulated in China are generally implemented six months after issuance. A small timespan for enterprises to make adjustments to the minimum allowable values of energy-efficiency causes the elimination of 5% - 10% of the lowest efficient products Those minimum allowable values are lower than the average energy-efficiency level of products in the current market. Such standards are present-status standards, mainly used to limit the production and distribution of products with high energy consumption in the current period. The energy conservation evaluation values as a basis of energy conservation product certification are also on the low side. To better guide enterprises' energy conservation work and guarantee the implementation effect of labelling, the minimum allowable values set in the energy-efficiency standards at present should be raised effectively in the future.
3) Amending energy-efficiency standards at regular intervals so that the indexes for the standards can reflect technological progress in time and stimulate the upgrade of products.

4.3.2. Eco-design

Product eco-design has drawn widespread attention from the international industry. In Europe and the US, a large amount of eco-design companies have been established within a short period. Eco-design has become a hot subject and technology in the 21st century. Some renowned large enterprises in the world have done or are doing a large amount of eco-design, while some contents in the series of regulations and directives of the EU and Japan are formulated on the basis of eco-design practices of leading

enterprises. Since the launching of EuP, some international brands have carried out in-depth studies of this directive. For example, Philips' eco-design is R & D in exact accordance with the EuP Directive. The attitude of most other foreign-funded enterprises is to actively cope with it. South Korea based companies Samsung and LG also target the EU as an important strategic market. Samsung Electronics has established a responsibility system running throughout the product life cycle to ensure products' environmental protection requirements. Starting from product R & D, resource saving, energy saving and popularization of environment-friendly materials are realized through four stages, that is, eco-design process, eco-partner certification, eco-labelling certificate and global recycling system. Since June 2005, Samsung has has been requesting suppliers to meet Samsung's "eco-partners" requirement, ensuring that parts and components provided by suppliers are certified. Therefore, it is necessary to learn from enterprises in developed countries, and to take corresponding actions and measures. The specific demands are analyzed as shown below:

1) At present, eco-design training on electronic enterprises should be improved, especially for the technicians. In order to pile up gradually the experience of conducting eco-design, some pilot enterprises will be selected to conduct research on the eco-design application. The pilot enterprises can be large producers or unions of SMEs.
2) Electrical and electronic enterprises must consider both the internal management system for hazardous substances and management system for the upstream suppliers. It is important to establish a database for the use of toxic and hazardous substances and product test data, which will be conducive to eco-design and supply chain management.

4.3.3. EMS, OHS and CSR

In 1998, China started to work on the GB/T 24001-2004 environmental management system certification. By now, ten thousands of enterprises have obtained the environmental management system certificates. After the GB/T28001 OHS management system standards were issued in 2001, SMEs take active actions through establishing the system and getting the third-party certificates. However, the overall situation of the implementation of the environmental management system and the OHS management system is not satisfactory. Although many enterprises have acquired the environmental management system certificate and OHS management system certificate, their performance in environmental management and OHS management still have not effectively improved, and needs improvement in the following areas:

1) Strengthening of their EMS and OHS management system knowledge in order to avoid systems being established blindly to acquire the certificate, and to ensure actual improvement of management level and management measures.
2) Study and learn from experiences of developed countries, and explore continuous

improvements of management systems. After systems are established and certificates are acquired, they should keep strengthening management in all aspects, making efforts to improve management performance and improve the environmental management and OHS management performance.

3) In terms of CSR, Chinese enterprises should raise awareness of social responsibility and create access to participating in activities such as drafting the "Factory Rules" as common for transnational corporations. Therefore, the establishment of a related social responsibility department is necessary in order to cope with large international enterprises' supervision and review on compliance regarding labor standards for Chinese suppliers and subcontractors.

5. Measures and Strategies for Improving Environmental and Safety Management

5.1. Exploration of methodology

5.1.1. Selection of key laws and regulations

According to the analysis of domestic and overseas laws, regulations and standards on Eco-efficiency, EMS, OHS and CSR above, and with respect to the actual demands in the electrical and electronic industry in China, the following key laws and regulations should be further understood and grasped by enterprises, have been selected. Enterprises should have a comprehensive understanding on the applicable scope and major control contents explained in these laws and regulations (see Table 7). Table 8-Table 11 list the implementing rules of product energy labels and detailed requirements of related EU directives.

Table 7: Key Laws, Regulations and Other Related Requirements that Chinese Small and Medium Electrical and Electronic Enterprises Should Understand.

No.	Title of laws and regulations	Scope of application	Major control contents
1	Measures for the Administration of Energy Efficiency Labels and Implementing Rules for Energy-Efficiency Standards	See Table 8 for the applicable scope of the implementing rules for different product energy-efficiency standards	• Regulation on implementing a uniform and compulsory energy labelling system • Regulation on the energy-efficiency label archival filing system • Regulation on the energy-efficiency label management system • Regulation on implementation of energy labels, including: basic

			contents of labels, forms and specifications, formulation and promulgation • Regulation on energy-efficiency testing • Regulation on printing, use and archival filing of labels • Regulation on supervision, management and punitive provision
2	Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products	Major applicable objects are the “recycling of waste electrical and electronic products and related treatment activities”, that is, dismantling waste electrical and electronic products, recovering substances as raw materials or fuel, using the method of changing the physical and chemical characteristics of waste electrical and electronic products to reduce the amount of waste electrical and electronic products. Reduction or elimination of their hazardous substances, as well as finally placing them in landfills in accordance with the requirements of environmental protection.	• Giving a catalogue of waste electrical and electronic product treatment • The State carries out a multi-channel and concentrated recycling and treatment system on waste electrical and electronic products • The State carries out a qualification license system for treatment of waste electrical and electronic products • The State establishes a fund for treatment of waste electrical and electronic products, to be used for subsidizing the recycling and treatment of waste electrical and electronic products • Responsibilities of related parties, supervision and management as well as relevant legal responsibilities etc.
3	Technical Policies of Pollution Prevention and Control for Household Waste Appliances and Electronic Products	Applicable to the environmental design of electrical household appliances and electronic products as well as the prevention and treatment of environmental pollution in the whole course of collection, transport, storage, reuse and disposal of waste products. It provides technical guidance for the planning, project establishment, design,	• Following the principle of recycling and detoxication of electronic wastes, and the principle of the “polluter being responsible”. • Putting forward with reducing and controlling the use of toxic and hazardous substances in electronic products, improving the recycling rate of electronic products, and regulating the environmental pollution in the course of recycling of electronic wastes • Enhancing the requirement of

		construction, operation and management of the facilities for reuse and disposal of waste electrical household appliances and electrical products, and leads the development of relevant industries.	environmentally friendly design of products, that is, reducing the use of toxic and hazardous substances, prolonging product life, improving re-use and re-utilization characteristics of products, improving the interchangeability of parts (components), and using packing materials reasonably • Putting forward with the information labelling system for toxic and hazardous substances, and producers' obligation to provide the information of toxic and hazardous substances contained in the products and other information affecting product recycling and disposal • Encouraging the reuse of household waste, electrical and electronic products and putting forward with requirements on pollution prevention that should be met • With respect to the parts and components of electronic products containing hazardous substances, applyingthe best feasible treatment process and technology at the present state, and corresponding requirements on prevention control • Technologies and equipment encouraged to be used in the future • To promote that the State state should launch other measures, for example, publishing a catalogue of toxic and hazardous substances in different periods and batches, implementing the green purchase policy for electrical and electronic products, and strengthening the composition of supporting technical laws, regulations and standards
4	Measures for the Control of Pollution	Including electronic telecommunication products,	• Defining concepts such as classification of electronic

	from Electronic Information Products	computers, electronic household products, electronic measuring instruments and products, electronic products for special use, electronic parts and components, electronic application products and electronic material products. All the regulations are applicable not only to domestic enterprises and individuals, but also to producers and individuals of imported electronic information products.	information products, major actions causing pollution and products' safe lifetime for usage, and clarifying the responsibilities of all levels of departments in charge of information industry for the prevention and control of pollution of electronic information products • Giving detailed specifications on product design, production and manufacturing, product description and product packing • From July 1st, 2006, the electronic information products listed into the catalogue of major electronic information products for pollution control may not include lead, hydrargyrum (mercury), cadmium, hexavalent chromium, PBB and PBDE or other toxic and hazardous substances • For toxic and hazardous substances that cannot be completely substituted, the contents of toxic and hazardous substances may not exceed the relevant regulated amounts in the national standards on pollution control of electronic information products • Requiring that electronic information products sold in Chinese market must mark the names, contents, recycling labels and timespan for safe usage of toxic and hazardous substances • Products must be subject to tests in a domestic authorized laboratory before entering market
5	Regulations on the Safety Administration of Dangerous Chemicals	Hazardous chemicals include: explosives, compressed gas and liquidified gas, flammable liquid, flammable solid, self-igniting articles as well as flammable articles when wet,	Stipulating the related requirements that must be met for producing, operating, storing, transporting and using hazardous chemicals as well as the disposing of waste from hazardous chemicals

		oxidizer and organic oxidizer, toxic substances and corrosives.	
6	Work-Related Injury Insurance Regulations	Various kinds of enterprises and private businesses with employees within the territory of the People's Republic of China	• Enterprises and private businesses with employees should participate in work-related injury insurance and pay work-related insurance premiums for all employees within their units • In case a work-related injury occurs involving an employee without work-related injury insurance, the employing unit should make payment according to the work-related insurance treatment and standard stipulated in this Regulation
7	EuP/ErP Directive "Directive on the Eco-design Requirements for Energy Using/related Products"	All electrical and electronic equipments	• The EU has formulated further directives on the requirements on products according to the relevant provision of the EuP directive, which are called "implementing measures". In the meantime there was a recast of this directive, named now Energy-related Products directive, 2009/125/EC. All electrical and electronic equipment remains within the scope. Now there are already 9 implementing measures enforced, which include calculators, electric motors, refrigerators and freezers, television sets, external power supplies, lighting products in the domestic and tertiary sectors, simple set-top boxes and standby and off mode electric power consumption of household and office equipment. The whole product lifecycle should be considered whereas the product performance must not be affected, and products must not have adverse impact on health and safety, must not have obvious negative impact on consumers, and particularly must

			not exert overly negative impact on the purchasing power of consumers and the cost arising throughout the product lifecycle.
8	REACH Directive Registration, Evaluation and Authorization of Chemicals		• In this regulation, the registration has the greatest impact on enterprises. For new substances over 1 ton, producers and importers should complete registration 60 days after the new regulation takes effect. • The European Chemicals Agency (ECHA) has formally included the 15 substances certified as substances of very high concern (SVHC) into the list of candidate list of substances authorized for use (Table 9) • If a commodity contains a substance listed in the “candidate list”, the content of which exceeds 0.1%, the suppliers of the commodity should provide the safe use information of the commodity to customers and consumers. Besides, from June 1, 2011, producers and importers of such products, under certain circumstances, will be responsible for reporting to the ECHA. Suppliers of the listed substances must provide a safety data sheet (SDS) to customers.
9	RoHS Directive “Restriction of the use of certain hazardous substances in electrical and electronic equipment”	Applicable to all equipments whose working voltage is 1000VAC or 1500VDC, included in the eight major product list, including bulbs and household lighting facilities. At present, there is no restriction on medical facilities and monitoring equipment. Major equipment types include: large electrical household appliances, small electrical household	• From July 1, 2006, all equipments which are included in the eight major product lists and that are entering the EU market must comply with the regulation attached to this Directive and must state that they do not have any of the substances mentioned in the regulation or otherwise ensure that the applicable scope of the equipments meet the regulation of the Directive. • Equipment producers should include their suppliers of parts and raw

		appliances, information technology and telecommunication equipment, consumer equipment, lighting equipment, electrical and electronic tools, toys, recreational- and sporting equipment, vending machines etc.	materials into the assessment procedure • From July 1, 2006, most products are not allowed to use solder containing lead. Therefore, producers and suppliers must gradually improve their welding process to ensure that their equipment meets new requirements. • A recast of the RoHS directive is currently under development, and a revision is expected to be adopted later in 2010
10	WEEE Directive “Waste Electrical and Electronic Equipment Directive"	It covers all equipment with a working voltage up to 1000VAC or 1500VDC, summarized in a list of ten major classes of products; household lighting equipment, filament and bulb as well as photoelectrical products (for example, solar panels) are included into the scope of administration of the WEEE Directive.	• The methodof a weight percentage (%) allowance is used to stipulate the average targets of recycling, reuse and circular use of each type of equipments. All EU member countries must observe the regulation. • Producers shall be responsible for cost for the collection, treatment and recycling. If producers are located outside the EU, the importers or distributors should share the corresponding costs. • Products entering the EU market after August 13th, 2005 must be marked with the WEEE label. Within one year after each launch of a new type of electrical and electronic equipment, producers must provide relevant information on maintenance, treatment and reuse of the equipment. • If substances hazardous to the human body or environment are contained, producers should provide users with corresponding information on recycling and recycling venues, as well as the meaning of the WEEE symbol. Manufactures must ensure that the design of such equipment facilitates

			detaching and meet all indexes for recycling, reuse and circular use in the Directive. • In 2008, the EU struck Decabromodiphenyl ether (Deca-BDE) off the exemption list. From July 1st, 2008, Deca-BDE is forbidden in products imported by the EU.
11	Electronic Industry Code of Conduct	The electrical industry referred to in this code includes Original Equipment Manufacturer (OEMs), Electronic Manufacturing Services (EMSs) and Original Design Manufacturer (ODMs), as well as contracting labors providing design, distribution, manufacturing and/or commodities and services for producing electronic products. Any enterprise in the electronic industry may voluntarily adopt this code and apply it to its supply chain and subcontractors.	• Basic principle: All enterprise activities must comply with the laws and regulations according to its location. This code encourages participators to actively refer to international recognized standards to take more social and environmental responsibilities besides complying with the law • This code is formed by five parts. Parts A, B and C summarize standards on labor, health and safety, and environment respectively. Part D summarizes the factors needed for appropriate management system complying with this code. Part E provides extra standards on commercial ethics.

Table 8: Applicable Scopes for Implementing Rules of Different Product Energy-Efficiency Standards in China

No.	Title	Applicable Scope
1	Implementing Rules of China Energy Label for Household Refrigerators	This rule is applicable for use, archival filing and announcement of energy labelling for household refrigerators with motor compressor (including refrigerators above 500 L). Not applicable to embedded refrigerator products, refrigerators with transparent door for exhibition or refrigerators for other special use.
2	Implementing Rules for China Energy Label for Room Air Conditioners	This rule is applicable for use, archival filing and announcement of energy labelling for air cooling condensators and air-conditioners with closed motor-compressors, whose cooling capacity is 14000W or less, and climate type is T1. Not applicable to mobile, frequency-conversion and multi-connected air-conditioning unit.
3	Implementing Rules of China Energy Label	This rule is applicable for use, archival filing and announcement of energy labelling for household electrical washing machines which

	for Electric Washers	rated washing capacity ranges from 1 kg to 13 kg. Not applicable to agitator washing machines or single container washing machines without spinning function.
4	Implementing Rules of China Energy Label for Unit Air Conditioners	This rule is applicable for use, archival filing and announcement of energy labelling of unitary air-conditioners, duct air distributing and rooftop air-conditioning sets whose nominal cooling capacity is more than 7100W, adopting motor-driven compressors. Not applicable to multi-connected (hot pump) units and frequency conversion air-conditioners.
5	Implementing Rules of China Energy Label for Self-ballast flourescent lamp	This rule is applicable for use, archival filing and announcement of energy labelling of self-ballast fluorescent lamps integrating starting control and stabilizing ignition point used in household and similar occasions, with screw socket or bayonet cap, using AC power with a rated voltage of 220V and 50Hz frequency, and whose nominal power is 5W-60W. Not applicable to self-ballast fluorescent lamps with cover.
6	Implementing Rules of China Energy Label for High Voltage Sodium Lamps	This rule is applicable for use, archival filing and announcement of energy labelling of ordinary high voltage sodium lamps whose rated power is 50W, 70W, 100W, 150W, 250W, 400W or 1000W and is used for indoor and outdoor lighting and with a transparent glass shell.
7	Implementing Rules of China Energy Label Frequency-conversion Air Conditioner Rotate	This rule is applicable for use, archival filing and announcement of energy labelling of frequency-conversion air conditioners adopting air cooling condensator, closed rotate speed controllable electrical compressor, whose cooling capacity is 14000W or less and whose climate type is T1. Not applicable to mobile air-conditioners fixed speed air-conditioners, multi-connected air-conditioning unit and rotate speed controllable room air-conditioners with wind pipe.
8	Implementing Rules of China Energy Label for Domestic Instantaneous Gas Water Heater and Gas Heater	This rule is applicable for use, archival filing and announcement of energy labelling of household gas water heaters (including condensing water heaters), gas heating and water heating stoves whose heat load is no more than 70kW. Not applicable to gas container water heaters.
9	Implementing Rules of China Energy Label for Electric Water Heater	This rule is applicable for use, archival filing and announcement of energy labelling for electric water heater with one or several heating units (including electric water heater units in combined devices) with the rated power of each heating unit being 700W～2800W. Not applicable to commercial electric water heaters, power frequency electromagnetic stoves or sink water heaters.
10	Implementing Rules of China Energy Label	This rule is applicable for use, archival filing and announcement of energy labeling for independent cathode ray tube (CRT) and liquid

	for Computer Displays	crystal display (LCD) displays used for computers running under regular grid voltage, also applicable to use, archival filing and announcement of energy labelling of display equipment whose main function is computer display with tuner/receiver.
11	Implementing Rules of China Energy Label for Copier	This rule is applicable for use, archival filing and announcement of energy labelling for static copier for ordinary use whose paper format is A3 and less, working under regular grid voltage and for multi-function machines with copying as the basic function (multi-function digital duplicating machines, multi-function printing and duplicating machines and color duplicating machines).

Table 9: List of 15 SVHC Substances of the REACH Directive

Name of substance	CAS No. /EC No.	SVHC Type	Application
Cobalt chloride	7646-79-9 / 231-589-4	Cat.1& 2CMR	Desiccant, for example, silica gel
Sodium dichromate dihydrate	7789-12-0/234-190-3	Cat.1& 2CMR	Metal surface finishing, leather making, textile dyeing and timber antiseptic
Diarsenic pentaoxide	1303-28-2/215-116-9	Cat.1& 2CMR	Germicide and herbicide
Arsenic trioxide	1327-53-3/215-481-4	Cat.1& 2CMR	Herbicide and pesticide
Lead hydrogen arsenate	7784-40-9/232-064-2	Cat.1& 2CMR	Pesticide
Triethyl arsenate	15606-95-8/427-700-2	Cat.1& 2CMR	Timber antiseptic
Dibutyl phthalate (DBP)	84-74-2 /201-557-4	Cat.1& 2CMR	Plasticiser, bond and additive of printing ink
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7/204-211-0	Cat.1& 2CMR	PVC plasticizer, hydraulic fluid and insulator inside capacitors
n-butyl benzyl phthalate (BBP)	85-68-7/201-622-7	Cat.1& 2CMR	Ethenyl foam and plasticizer of fire-resistant bricks and synthetic leather
Anthracene	120-12-7/204-371-1	PBT	Die intermediate, pesticide and timber antiseptic
Tributyltin oxide (TBTO)	56-35-9/200-268-0	PBT	Timber antiseptic
Musk xylol	81-15-2/201-329-4	vPvB	Perfume and cosmetics
Hexabromocyclododecane (HBCDD)	294-62-2/206-33-9	PBT	Flame retardant

Chlorinated hydrocarbon (SCCP)	85535-84-8/287-476-5	PBT	Lubricant in metal processing, rubber and leather costuming and gluewater
Diaminodiphenyl methane (4,4'- DDM)	101-77-9 / 202-974-4	Cat.1& 2CMR	Azo dyes and rubber LCPCA

Table 10: Six Hazardous Substances Restricted by the RoHS Directive

No.	Substance restricted by the Directive	Examples using this substance	Exemption stipulated in the Directive
1	Mercury (hydrargyrum)	Temperature controller, sensor, switch and relay, bulb	Compact fluorescent lamp and straight fluorescent lamp for general use and straight fluorescent lamp for special use whose contents of hydrargyrum may not exceed the stipulated value (5, 8 or 10mg)
2	Lead	Solder, glass, Polyvinyl chloride (PVC) and stabilizer	--CRT, alloy steel in electronic parts and fluorescent tubes, lead <0.35%, alloy aluminum, lead <0.4% , alloy copper, lead <4%
			--Solders for servers and memorizers (by 2010), solder used in network basic equipment, and electronic ceramic
3	Cadmium	Switch, spring, connector, shell and PCB, contact terminals and battery	
4	Chrome (hexavalence)	Metal antiseptic coat of	Absorbing refrigerating system
5	Polybrominated biphenyls (PBB)	Flame retardant, PCB, connector and plastic shell	
6	Polybrominated diphenyl ethers (PBDE)	Flame retardant, PCB, connector and plastic shell	

Table 11: Products Administered by RoHS and WEEE

No.	Product type	Product name

1	Large electrical household appliances	Large refrigerating appliances, refrigerators, freezers and other large appliances used in food refrigerating, refreshment and storage, washing machines, drying machines, dishwashers, electric cookers, electric plate, microwave oven and other large appliances used in food cooking and processing, electric heater, electric radiator and other large appliances used in heating rooms, beds and chairs, electric fans, air-conditioning appliances and other wind blowing devices, ventilation and air-conditioning
2	Small electrical household appliances	Vacuum cleaner, carpet cleaner and other cleaning appliances, appliances used in sewing, knitting and other textile processing, electric iron and clothing ironing, planishing and other clothing appliances, toaster, electric frying pans, muller, coffee machines and appliances used for opening or sealing containers or packages, electric knifes, appliances for hair cutting, hair blowing, teeth brushing, shaving, massaging and other body care, electric clocks, electronic watches and other equipment for measuring, displaying or recording time, and electronic scaling
3	Information and communication equipment	Central data processors, personal computers, printers, copy equipment, electrical and electronic typewriters, desk-top and portable calculators and other products and equipment used for collecting, storing, processing, displaying or transmitting information; user terminal and systems; fax machines; telegraph machines; telephone sets; pay phones; wireless phones; mobile phones; response systems; products or equipment transmitting sound, images or other information through electric information
4	Consumer products	Radios, TV sets, video recorder; audio recorder; high fidelity recorder; power amplifier, music instruments; other products or equipment recording or duplicating sound or images
5	Lighting equipment	Fluorescent lighting equipment (except household lighting equipment); straight fluorescent lamps; compact fluorescents; high luminance discharge lamps, including pressure sodium lamps and metal halogen lamps; low voltage sodium lamps; other lighting equipment used for transmitting or controlling light (except filament bulb)
6	Electrical and electronic tools	Electric drills; electric saws; sewing machines; equipment used for turning, milling, sand grinding, rubbing, sawing, incising, cutting, drilling, punching, folding, bending timber, metal or other materials or similar processing of such materials; tool used for striking rivets, nails or bolts or used to get rid of rivets, nails or bolts; tools used for welding or similar purpose; equipment used to ejecting, transmitting or

		dispersing liquid or gas or other processing; tools used to cut grass or other gardening operations
7	Toys, recreational and sporting equipment	Electric trains or sport cars; portable game consoles; electronic game consoles; measuring apparatus for cycling, diving, running and boating; sporting equipment with electronic or electric parts; slot machines
(8)	Medical equipment (except implanted or infected products)	Radiation therapy; equipment used on the heart; perspective apparatus; lung breathing machines; nuclear medical equipment; laboratory equipment used for diagnosis in glass containers; analyzers; freezing machines; procreation testing equipments; other equipment used for probing, preventing, monitoring, treating or alleviating diseases or pains
(9)	Monitoring and controlling instruments	Smoke detectors; heating modulators; temperature controller; household or laboratory apparatus for measuring, weighing or modulating; other monitoring equipment used in industrial installations (for example, on control panels)
10	Vending machine	Hot drink vending machines; vending machine of bottled or canned hot or cold drinks; vending machines of solid products; bank note vending machines; all apparatus automatically sending out various products

Note: (8) (9) are bracketed, showing that the items are temporarily not restricted by the RoHS Directive

5.1.2. Selection of important standards the fields of Eco-efficiency, OHS and CSR

With respect to actual demands and direction for improvement of small and medium electrical and electronic enterprises at present, the key national standards that should be of concern are further selected, as shown in Table 12. Enterprises should have a comprehensive understanding and grasp on the applicable scope, key control items and key points of these national standards.

Table 12: Important National Standards for Chinese Electrical and Electronic SMEs

No.	Title of national standard	Applicable scope	Key control items and key points
1	GB 12021.2-2003 The maximum allowable values of the energy	Applicable to motor driven compressor household refrigerator of 500L and below	Stipulating the maximum allowable values of the energy consumption,

	consumption and energy-efficiency grade for household refrigerators		determination of energy-efficiency labelling grades, testing method for amount of electricity consumed and inspection rules for household refrigerators
2	GB 12021.3-2010 The minimum allowable value of the energy efficiency and energy efficiency grades for room air conditioners	Applicable to air-conditioners with air cooling condensators and closed motor-compressor, whose cooling capacity is 14000W or less, and whose climate type is T1. Not applicable to mobile, frequency-conversion and multi-connected air-conditioning units.	Stipulating the minimum allowable values of the energy-efficiency, evaluating values of energy conservation, determination of energy-efficiency grades, testing method and inspection rules for room air conditioners
3	GB 12021.4-2004 The maximum allowable values of the energy consumption and Energy efficiency grade for household electric washing machines	Applicable to household electrical washing machines whose rated washing capacity is less than 13 kg. Not applicable to washing machines whose rated washing capacity is under 1 kg and single-container washing machines with no spinning function.	Stipulating the maximum allowable unit consumption, maximum allowable amount of water used, evaluating values of energy conservation and method for determining energy-efficiency grades for electrical washing machines
4	GB 12021.6-2008 Minimum allowable values of energy efficiency and energy efficiency grades for automatic electric rice cookers	Applicable to automatic electric rice cooker whose electric heating element is the heating source with the rated working power less than 2000W under normal pressure.	Stipulating the energy-efficiency grades, limited values of energy-efficiency, evaluating values of energy conservation, energy consumption for standby, energy consumption for heat conservation, testing method and inspection rules of automatic electric rice cooker
5	GB 12021.7-2005 Limited values of energy-efficiency and evaluating values of energy conservation for	Applicable to all color TV sets distributed in China, and the stipulation on energy-efficiency index is applicable to CRT color TV sets, and other types of color	Stipulating the limited values of energy-efficiency and evaluating values of energy conservation, target values, testing method and

	color television and broadcasting receivers (newly promulgated)	TV sets may adopt it for reference.	inspection rules for color television and broadcasting receivers
6	GB 12021.9-2008 Minimum allowable values of energy efficiency and energy efficiency grades of AC electric fans	Desktop fans, stand fans, wall-mounted fans, table and pedestal fans, and ceiling fans driven by single phase AC capacitance-style engine	Stipulating the limited values of electricity consumption, testing method and evaluation principle of electric fans
7	GB 17896-1999 Limited values of energy efficiency and evaluating values of energy conservation of ballasts for tubular fluorescent lamps	Applicable to independent inductance ballast and electronic tubular fluorescent lamp ballasts whose power supply is 220V and 50Hz and whose nominal power is 18W ～ 40W. Not applicable to electronic ballast without advanced ignition.	Stipulating the limited values of energy-efficiency and evaluating values of energy conservation, testing method and inspection rules for tubular fluorescent lamp ballasts.
8	GB 19044-2003 Limited values of energy-efficiency and rating criteria of self-ballasted fluorescent lamps for general lighting services	Applicable to self-ballast fluorescent lamps integrating control start and ignition point stabilizing part used in e.g. in family houses as ordinary lighting, with screw socket or bayonet cap, using AC power with a rated voltage of 220V and 50Hz frequency, and whose nominal power is 60W and below. Not applicable to self-ballast fluorescent lamps with cover.	Stipulating the energy-efficiency grades, limited values of energy-efficiency, evaluating values of energy conservation, testing method and inspection rules for self-ballasted fluorescent lamps for general lighting
9	GB 19415-2003 Limited values of energy-efficiency and evaluating values of energy conservation for single-capped fluorescent lamps	Applicable to single-capped fluorescent lamps with advanced ignition cathode, internal start device or using external start device.	Stipulating the limited values of energy-efficiency, evaluating values of energy conservation, testing method and inspection rules for single-capped fluorescent lamps
10	General technical specifications for recovery of waste electrical and electronic equipment	Applicable to the following seven types of waste electrical and electronic products: computers, telecommunication equipment, AV products and broadcasting and television equipment,	Stipulating the technical requirements and related stipulations on effective resource utilization and pollution control in the course of collecting,

		electrical products for household use or similar uses, instruments, meters and measuring and monitoring products, electric tools and electric line and cable, as well as all parts, components and materials of the products. This standard is not applicable to products such as battery, lighting equipment and medical electrical and electronic equipment.	transporting, storing, treating and disposing of waste electrical and electronic products.
11	General rules for product eco-design	Applicable to personnel directly participating in product design and development, decision-makers and persons responsible for organizing organizational policies and for formulating product standards.	Stipulating the general principle and requirements for product eco-design.
12	The minimum allowable values of product recycling rate and target value Part I air-conditioners and refrigerators	Applicable to room air-conditioners and household refrigerators, including accessories related to product use and excluding product package.	Stipulating the minimum allowable values of the product recycling rate and target value of room air-conditioners and household refrigerators.
13	Label for recycling of products, parts and components	Applicable to producers and importers	Stipulating technical requirements such as recycling label type of products and parts, requirements on product recycling label, labels and recycling labels of plastic parts and components.
14	GB/T 24001-2004 Environmental management systems Requirements with guidance for use	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Stipulating the basic mode and basic requirements for organization establishment and implementation and maintenance of a environmental management system, and clarification of the 17 elements which form the environmental

			management system
15	Environmental management--Environmental labels and declarations--Self-declared environmental claims(Type Ⅱ environmental labelling	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Stipulating 12 environmental statements on product raw material and process control and disposal and use of waste from production to disposal
16	GB/T 24024-2001 Environmental management--Environmental labels and declarations--Type Ⅰ environmental labelling--Principles and procedures	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Stipulating the basic requirements on Type I environmental labelling certification of enterprise products and services according to lifecycle requirements
17	GB/T 24025-2009 Environmental management--Environmental labels and declaration--Type III environmental declaration--principles and procedures	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Stipulating data collection and inspection principles on promulgating environmental information based on lifecycle
18	GB/T 24031-2001 Environmental management—Environmental performance evaluation--Guidelines	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Providing an “environmental performance parameter database” for organizing internal design and implementing environmental performance auditing, and stipulating process mode, planning, data and information use, review and improvement of environmental performance assessment
19	GB/T 24040-2008 Environmental management—Life cycle assessment—Principles and frameworks	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments. The scope of lifecycle assessment	Describing the principle and framework of lifecycle assessment (LCA), including: a) determination of

20	GB/T 24044-2008 Environmental management - Life cycle assessment - Requirements and guidelines	(LCA) research (including system border and degree of detail) is decided by the research objects and application intention. LCA of different purposes may have great differences in their depth and breadth.	purpose and scope of LCA; b) stage of lifecycle inventory (LCI); c) stage of lifecycle impact assessment (LCIA); d) stage of lifecycle explanation; e) report and appraisal review of LCA; f) limitations of LCA; g) relationship between different stages of LCA; and h) Value selection and conditions for application of alternative elements.
21	GB/T 24062-2009 Environmental management - Integrating environmental aspects into product design and development	Used by all personnel participating in product design and development and the decision-making management of an organization, applicable to all products no matter what their organization type, scale, place and complexity are.	Analyzing the purpose and potential interests of introducing environmental factors into product design and development, considering strategies, management and products of an organization, elaborating the whole procedure of product design and development and introducing methods and thoughts on environmental factors for product design and development.
22	GB/T 28001—2001 Occupational health and safety management system--Specification	Applicable to any mode and type of organization and applicable to various geographical, cultural and social environments	Putting forward requirements on the occupational health and safety management system, for the purpose of enabling an organization to control its occupational health and safety risk and improve its performance.
23	GB/T 28002-2002 Occupational Health and	Applicable to any mode and type of organization and applicable to	Providing corresponding implementation guidance

	Safety management system-Guidance	various geographical, cultural and social environments	for the specific requirements in GB/T 28001, explaining the fundamentals of GB/T 28001, and elaborating the intention, typical input, process and typical output of various requirements.

5.1.3. Design of a Conformity Model

In this project, the environmental and safety performance of the whole production cycle of enterprises is expected to be improved through guiding and training on the typical enterprises in the electrical and electronic industry. Enterprises take their social responsibility by implementing the producer extension responsibility system (EPR) in order to realize a high level of eco-efficiency.

How should an enterprise's ecological level and environmental and safety performance be evaluated? In this project, a conformity model will be used. This conformity model will give a comprehensive consideration to the above-mentioned major laws and standards in China and properly include EU laws and regulations and international standards as well as best practices. Ecological standards, enterprise environmental management system standards and information disclosure standards related to the product will be appointed as key standards by the conformity model.

The purpose of the evaluation is to encourage producers and gather their initiatives to improve their environmental management level and eco-efficiency. Meanwhile, evaluation and certification may also urge the Chinese government to attach importance to the manufacturing link and control the environmental and safety problems of electrical and electronic products at source, so as to protect the consumption link to some extent, and establish an "eco-chain" consisting of the government, enterprises and final users..

The preliminary design of the conformity model is composed of 10 parts, and will put forward with requirements on producers from four major aspects, requiring them to provide related information via the network by the method of self-declaration. The evaluation model will finally form four grades. The conformity model will evaluate four aspects, i.e., "enterprise products", "product production process", "product and enterprise eco-information publicity", and "construction of corporate system". Through this conformity model, an eco-performance database of the electrical and electronic industry in China will be established. The specific contents for evaluation are designed as follows:

- Requirements on purchase selection
- Requirements on eco-design

- Requirements on production process
- Requirements on energy conservation
- Requirements on use
- Requirements on discard
- Requirements on regeneration
- Requirements on monitoring and measurement
- Requirements on construction of the corporate system
- Requirements on product packaging materials

5.2. Measures and strategies for improving environment and safety management

5.2.1. Establishing enterprise internal responsibilities for EHS

Practices and experiences of developed countries have proven that with the rising global trend of environmental protection, enterprise environment and safety management is increasingly becoming a competitive advantage. Internationally renowned enterprises all have a dedicated EHS department responsible for environment, health and safety. Establishing a special internal EHS department enables the enterprise to manage its environmental protection and OHS problems in an all-round manner. A special environment and safety department will also help to formulate and implement guidelines for eco-efficiency, eco-design, EMS, OHS and a green supply chain. For those electrical and electronics SMEs of a small size of employees, a dedicated EHS department is not available, it is feasible to designate somebody who takes care part time of EHS matters. The main responsibilities of the internal EHS department or the designated person in charge of EHS are: 1) follow closely and grasp in a timely manner domestic and overseas laws, regulations, policies and standards related to environment and safety 2) participate in formulating the enterprise development policy and guideline, management system, working procedure and implementing plans (particularly those related to environment and safety) 3) to jointly take responsibility for technical work such as environment and safety inspection in the whole course with other departments of the enterprise ; 4) responsible for environment and safety certification of the enterprise; 5) responsible for supervision and statistics in term of environment and safety, including establishing a material declaration standard working procedure of the supply chain; and 6) participation in research of new technology or development of new products etc.

Nowadays, enterprise environment and safety management departments start to pay attention to energy-efficiency and the practicing of eco-design in order to improve their overall eco-efficiency in the following ways: attaching importance to energy consumption of production processes and products as well as consideration of the choice of materials in product design while minimizing the use of toxic and hazardous

substances; considering energy conservation and environmentally friendly design, material saving design, reuse, recycling and design facilitating waste treatment; considering product detachability in design to improve products' reuse rate; eco-design that reduces product package etc.

Another important role of the environment and safety department of large-scale enterprises is to carry out research on new technology or to develop new products. Different enterprises may implement different strategies according to their specific conditions. However, for SMEs, to establish a special environment and safety department will increase product cost to a large extent. Particularly for SMEs in China, a large amount of enterprises of the same type are competing in the same industry and the entrance threshold of these industries is generally very low, resulting in very fierce competition. If price advantages cannot be obtained, an enterprise may go bankrupt. Therefore, it is difficult to establish a separate environment and safety department. A merging with the quality management department may be considered instead.

In addition, in case of large enterprises, which export goods from home or abroad, are confronted with laws, regulations and standards in terms of environment and safety, these enterprises have to watch their product supply chain. Therefore, when they select suppliers of parts and components, price is no longer the most important factor, instead, law requirements, regulations and standards become the one key factor for choosing suppliers. For this reason, SMEs should establish an environment and safety department which suits their requirements, in order to guarantee that their products can meet the demands of downstream enterprises.

5.2.2. Considering environmental factors regarding the product lifecycle

The above-mentioned key laws, regulations and standards related to environment and safety of the electrical and electronic industry should be noted and considered at each stage of lifecycle in the course of enterprise management and production. See Table 13 for details.

Table 13: Laws, Regulations and Standards Applicable to Chinese Electrical and Electronic Enterprises Classified by Stages of Product Life Cycle

PLC stage	Laws and regulations	Standards
Design stage	Measures for the Administration of Energy Efficiency Labels	GB 12021.2-2008 The maximum allowable values of the energy consumption and energy efficiency grades for household refrigerators
	Implementing Rules for Energy Performance	GB 12021.3-2010 The minimum allowable value of the energy

	Standards	efficiency and energy efficiency grades for room air conditioners
	EUP/ErP Directive "Directive on Eco-design Requirements for Energy-using /-related Products" and related implementing measures	GB 12021.4-2004 The maximum allowable values of the energy consumption and energy-efficiency grades for electric washing machines
		GB 12021.6-1989 Minimum allowable values of energy efficiency and energy efficiency grades for automatic electric rice cookers
		GB 12021.7-2005 Limited values of energy-efficiency and evaluating values of energy conservation for color television and broadcasting receivers (newly promulgated)
		GB 12021.9-2008 Minimum allowable values of energy efficiency and energy efficiency grades of AC electric fans
		GB 17896-1999 Limited values of energy efficiency and evaluating values of energy conservation of ballasts for tubular fluorescent lamps
		GB 18613-2006 The minimum allowable values of energy efficiency and the energy efficiency grades for small and medium three-phase asynchronous motors
		GB 19043-2003 Limited values of energy efficiency and rating criteria of double-capped fluorescent lamps for general lighting service
		GB 19044-2003 Limited values of energy efficiency and rating criteria of self-ballasted fluorescent lamps for general lighting service
		GB 19153-2009 Minimum allowable values of energy efficiency and energy efficiency grades for displacement air compressors
		GB 19415-2003 Limited values of energy efficiency and evaluating values of energy conservation for single-capped fluorescent lamps

		GB 19573-2004 Limited values of energy efficiency and rating criteria for high-pressure sodium vapour lamps
		GB 19574-2004 Limited values of energy efficiency and evaluating values of energy conservation of ballast for high-pressure sodium lamps
		GB 19576-2004 The minimum allowable values of the energy effic-iency and energy efficiency grades for unitary air conditioners
		GB 19761-2009 Minimum allowable values of energy efficiency and energy efficiency grades for fan (newly promulgated)
		The Product Minimum Allowable Recycleability Rate and Target Rate Part I Air-Conditioner and Refrigerator
		GB/T 24062 Environmental management - Integrating environmental aspects into product design and development
Manufacturing stage	Regulations on Safety Administration of Hazardous Chemical Products	GB/T 28001-2001 Occupational Health and Safety management system--Specification
	Regulations on Insurance of Work-Related Injuries	GB/T 28002-2002 Occupational Health and Safety management system-Guidance
	“Registration, Evaluation and Authorization of Chemicals”	GB/T 24256-2009 General principle and requirements of eco-design for products
	RoHS Directive “Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations”	
Distribution stage		GB/T 24024-2001 Environmental management--Environmental labels and declarations--Type I environmental labelling--Principles and procedures

		Environmental management--Environmental labels and declarations--Type III environmental labelling--Principles and procedures
		Label for recycling of products and parts and components
		GB/T 24021-2001 Environmental management--Environmental labels and declarations--Self-declared environmental claims (Type Ⅱ environmental labelling)
Disposal and treatment stage	Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products	GB/T 23685-2009 General technical specifications of recovering for waste electrical and electronic equipment
	Technical Policy for Pollution Prevention of Household Waste, Electrical Appliances and Electronic Products	
	Measures for the Administration of Recycling of Renewable Resources	
	WEEE Directive "Waste Electrical & Electronic Equipment"	
	Measures for the Control of Pollution from Electronic Information Products	

In addition, *the Electronics Industry Citizenship Coalition*, GB/T 24031-2001 *Environmental management—Environmental performance evaluation--Guidelines*, GB/T 24040-2008 *Environmental management—Life cycle assessment—Principles and frameworks*, GB/T 24044-2008 *Environmental management - Life cycle assessment - Requirements and guidelines* and GB/T 24001-2004 *Environmental management systems Requirements with guidance for use* are regulations and standards that should be considered in enterprises' establishment of the environment management system and at all stages of the product's lifecycle.

5.2.3. Technical upgrading, raising awareness and building capacity

- **Strengthening technical input for eco-design**

In traditional product design, we need to consider technical and economic factors such as consumption needs, product quality, cost and feasibility of manufacturing technology. The ecological environment factor is not taken as an important indicator for product development and design yet. Product eco-design is a new product design method for designing environmentally friendly products that meet people's demands by using paying comprehensive consideration to the ecological and environmental impacts related to the product at each stage of the product lifecycle. Enterprises are guided by the eco-design method to start with the product design stage to address the environmental problems of the whole lifecycle of their products, from purchase of raw materials, manufacturing and distribution to product retirement and recycling. The principles and methods of product eco-design are applicable not only to the development of new products, but can also be used to redesign existing products.

- **Change of processing techniques and processes**

Production processes can be improved by restricting the use of toxic and hazardous substances, reducing energy consumption of electrical and electronic products and by improving the interchangeability of parts and components etc.

- **Gradually carrying out research in leading energy-efficiency standards**

Most energy-efficiency standards in China are immediately implemented after formulation. It takes about six months for a new standard to become formally effective after a manufacturing enterprise receives the new standard which is a short period for enterprisea to develop new products. As energy-efficiency standards are mandatory, they tend to influence the enterprise production plan and development strategy, resulting in additional economic loss.

The purpose of formulating leading energy-efficiency standards is to determine the energy-efficiency target value that should be reached in the future 3~5 years and establish future energy conservation objectives for enterprises while leaving a certain time for enterprises to adjust their product design, the production and reasonably implement measures of technical reconstruction. Production and development units will have time to develop highly efficient energy-saving products in a planned manner so as to promote the continuous improvement of overall product energy-efficiency. Meanwhile, this can improve the guidance of standards for the market and prevent unnecessary waste.

Countries like the US and Japan have implemented leading energy-efficiency standards. The future energy conservation level is determined according to the development and foreseeability of energy conservation technology and by adopting engineering economic analysis and model calculation etc., so as to better serve the manufacturing industry of household electrical appliances, lighting equipments as well as industrial, commercial and office products. The overall achieved effects on energy conservation have been very satisfying and at the same time a consistend development of the market was achieved.

Leading energy-efficiency standards for double-capped fluorescent lamps and household refrigerators have been studied and drafted to gather experience for the development of energy-efficiency standards in China, with the help of the US Energy Foundation and the Lawrence Berkeley National Laboratory (LBNL), in conjunction with the State Administration of Environmental Protection, United Nations Development Program / Global Environment Facility (UNDP/GEF) Refrigerator Project and the State Economic and Trade Commission/UNDP/GEF Green Lighting Promoting Engineering Project, and with reference to overseas experiences and analytical methods.

- **Strengthening implementation of standards in terms of EMS, OHS and CSR**

China should gradually step up efforts in assessing implementation performance of ISO14000 and OHSAS18001, and expand the efforts in system construction and continuous improvement while closely following the developments of research and formulation of the international standard ISO26000 on CSR with the target of transfering it into a national standard for implementation in a timely manner.

5.2.4. Management of energy labels

- **Paying more attention to the significance of energy labelling**

  - From an international perspective, energy labelling is a successful policy tool for administration and green-marketing way for enterprises. Energy labels can enhance the transparency of energy-efficiency equipment, provide consumers with direct information about products' energy-efficiency.
  - In designing energy–labelled products it is important for enterprises to fully consider economic, social, cultural, linguistic and other related factors in the product design process. Before a simple adoption of international labels, consideration should be given to whether local consumers can accept them;

- **Building a database and tracking system and learning from implementation experiences and other energy labels**

  - A database and tracking system within an enterprise of the electrical and electronic industry should be established in time. It is necessary to collect the data of sales of labeled energy-efficient products in the market, in order to share this information and experiences between enterprises;
  - The following evaluation of activities requires widespread resource data. The evaluation by definition is a method, which describes the degree of success of an activity by assessing several related indexes;

Enhancing the capacity of SMEs to follow the development of standards and energy labels

- It is very important for Chinese SMEs to follow and comply with the new trend

of energy label management. A national energy-efficiency standard formulation, amendment plan and annual plan should be formulated in time and be communicated to the industry;

- Enterprises should participate in activities such as the research, amendment and development of standards.
- Furthermore it is important to keep track of changes to the scope of energy labels as well as the related media coverage such as in newspapers, journals and on the internet.