Affiliate Groups and Organizations

Green IT Promotion Council
Chiyoda First Building Minami-kan
Nishikanda 3-2-1, Chiyoda-ku
Tokyo 101-0065 Japan
Phone:03-5275-7267/ FAX:03-5212-8122
http://www.greenit-pc.jp/

Semiconductor Equipment Association of Japan (SEAJ)
Rokubancho 3, Chiyoda-ku
Tokyo 102-0085 Japan
Phone:03-3261-8260 / FAX:03-3261-8263
http://www.seaj.or.jp

Semiconductor Equipment Association and Materials International Japan (SEMI Japan)
Kudan Minami 4-7-15, Chiyoda-ku
Tokyo 102-0074 Japan
TEL:03-3222-5755 / FAX:03-3222-5757
http://www.semi.org/jp/index.htm

International Affiliate Groups and Organizations

Semiconductor Industry Association in China	http://www.csia.net.cn
Semiconductor Industry Association in Chinese Taipei	http://www.tsia.org.tw
Semiconductor Industry Association in Europe	http://www.eeca.eu/index.php/esia_home
Semiconductor Industry Association in Korea	https://www.ksia.or.kr
Semiconductor Industry Association in US	http://www.sia-online.org
Semiconductor Equipment and Materials International (SEMI)	http://www.semi.org
World Semiconductor Council (WSC)	http://www.semiconductorcouncil.org

Japan Electronics and Information Technology Industries Association
http://www.jeita.or.jp
Chiyoda First Building Minami-kan
Nishikanda 3-2-1, Chiyoda-ku
Tokyo 101-0065 Japan

JEITA

Green Clean Semiconductor

JEITA Semiconductor Board Environmental Activities

Japan Electronics and Information Technology Industries Association Semiconductor Board

Greetings from the Chairman

April 2009
Haruki Okada, Chairman
Semiconductor Board
Japan Electronics and Information Technology Industries Association

As our world faces environmental problems in forms of both environmental protection and global warming prevention, the semiconductor industry enters this situation with two diverse approaches: understanding negative effects on the environment via semiconductor production, including factories, processes, and logistics; and, enhancing positive effects on the environment by utilizing semiconductors in end products.

Through these approaches, the entire industry seriously considers ways to identify and outline challenges clearly, and to implement standardized solutions in our businesses.

This is an important time when all members of the Japanese semiconductor industry, in manufacturing, materials, and equipment, are responsible in searching for answers together.

In response to the current situation, the Semiconductor Board of Japan Electronics and Information Technology Industries Association has created a pamphlet titled Environmental Activities in order to introduce the organization's efforts to the public and gain understanding.

Since the implementation of the Kyoto Protocol in February 2005, the country's attention toward global warming has grown rapidly, compelling the government to further increase measures. Also in chemical regulations, perfluorooctane sulfonates (PFOS), a substance vital to semiconductor production, was selected as one of the chemicals to be banned at the Stockholm Convention on Persistent Organic Pollutants (POPs).

To keep up with these trends, the semiconductor board envisions the development of eco-friendly businesses and the creation of a low-carbon society, that supports people's comfortable standards of living, and also protects the Earth's natural environment. Individually, board members have established the environmental committees and task forces, such as: Energy Saving; Chemicals; PFC; and, Resources Utilization. These committees participate in promotional activities for the environment and industrial safety by cooperating and collaborating with both domestic and international organizations.

Major activities include lateral benchmarking of guidelines, standardization, and practices initiated by semiconductor companies in order to promote efficient factory operations and energy saving. As a part of the industry-wide measures against global warming, the efforts to reduce emission volume, such as that of PFC, are currently in progress. The goal is set to improve emission volume by a minimum of 10% in 2010 (compared to1995 figures).

Waste reduction, reuse, and recycling are practiced to promote zero emission. Technologies to recycle used hydrofluoric acid have also been investigated.

As expectations for ecological conscientiousness increase, it is necessary to strengthen and invigorate activities, balancing environmental friendliness with the development of the semiconductor industry. We hope to continue our active participation in building a low-carbon society, solidifying systems to improve corporate values, to promote operational excellence, and to reduce environmental cost through the semiconductor board's environmental activities.

November 18, 2008
Haruki Okada, Chairman
Semiconductor Board
Japan Electronics and Information Technology Industries Association

Statement: The Role of the Semiconductor Industry in Building a Low-Carbon Society

The world today has been in search for solutions to facilitate a low-carbon society that both supports people's comfortable standards of living and protects the Earth's natural environment. Providing highly efficient green IT products has become an important responsibility for the electronics industry as a whole. Semiconductors play a significant role in developing these green IT products. Creating semiconductors through innovative technologies is our duty. The semiconductor industry is essential for sustaining and enriching our lifestyles.

With current measures against global warming becoming stagnant, such as the reduction of energy consumption, the semiconductor industry has an opportunity to lead the world in developing solutions for a low-carbon society with Japan as the originator of the Kyoto Protocol.

The Japan Electronics and Information Technology Industries Association (JEITA) semiconductor board has designated an environmental committee in order to promote efforts in reducing the environmental impact.

Activities include: improving efficiency in semiconductor production; reducing emissions of greenhouse gasses, such as perfluorocarbons (PFC); prevention of chemical pollution of both people and the environment; and, promoting effective utilization of limited resources.

The PFC emissions reduction program, in which the semiconductor industry voluntarily sets the reduction targets, has been recognized worldwide. By 2010, the industry is estimated to achieve a 10% reduction compared with emissions of 2001.

Green Fab, a set of processes conceptualized to improve energy efficiency in semiconductor factories, also sets targets voluntarily to control water and power usage, as well as to minimize waste. As an energy efficiency target, the program aims to reduce production power usage per wafer by 30% between 2001 and 2010. Green Fab intends to continue efforts in minimizing energy consumption in semiconductor production processes as its main activity.

Semiconductors' functional abilities per energy consumed have improved tremendously due to continuous development in minimizing semiconductor chip size. Advancements in semiconductor design have also improved energy efficiency by reducing both energy consumption and energy loss.

Semiconductor products are incorporated into various end products to assist in both reducing energy consumption and improving the user-friendliness of home appliances, IT devices, and social infrastructure systems.

Semiconductor products' high-technology, energy-efficient mechanisms allow low-energy operation of home appliances, computers, automobiles, and other end products. Used as the platform technology in computing, sensors, wireless networks, and the Internet, semiconductors can reduce energy consumption in human and freight logistics as well as in air-conditioned buildings with automatic sensing technology. The semiconductor industry is becoming a leading force in the shift to an energy-saving society, contributing to environmental protection not only within the factories through Green Fab efforts, but for the entire society with energy-efficient end products that are used daily. The semiconductor industry has a major responsibility to consistently supply adequate semiconductor products based on society's needs.

The semiconductor industry's greater contribution against global warming can be achieved through a global shift to social systems that utilize energy-saving products incorporating semiconductors.

The JEITA Semiconductor Board expresses its commitment to continue efforts in improving energy efficiency in development and production, and to contribute to a sustainable, low-carbon society by developing green IT and electronic technology, and building green social systems through innovative semiconductors.

Released on November 18, 2008

Building Energy-Saving Societies With Semiconductors

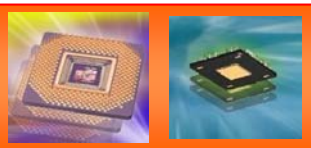
The Semiconductor Industry's Four Contribution Areas

Green Society

Energy-Saving Social Systems

Green IT / End Products

Energy-Efficient IT Products and Home Appliances



Green Components

Low Power/Low Energy-Loss Components

Green Fab

Efficient Factory Operations

〔 Sources : WSC 〕

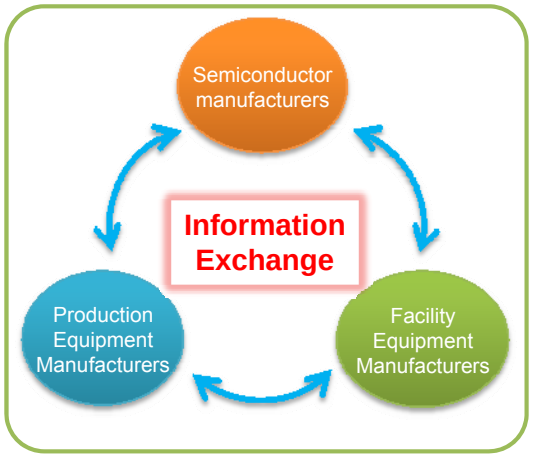
The world has been focusing on finding a way to build an energy-saving society that supports a comfortable standard of living and also protects the natural environment. As more IT and electronics devices with semiconductors are utilized in various parts of society, the industry assists in the development of the 21st-century IT world directly and indirectly, and contributes enormously to society's energy-saving efforts. It is necessary to understand this scheme from the life cycle assessment (LCA) viewpoint, and compile sound and clear explanations. The industry has been considering active output by incorporating research findings from external institutions.

For Greenhouse Gas Reduction(1)

Energy Saving Promoted by the Expert Committee on Energy

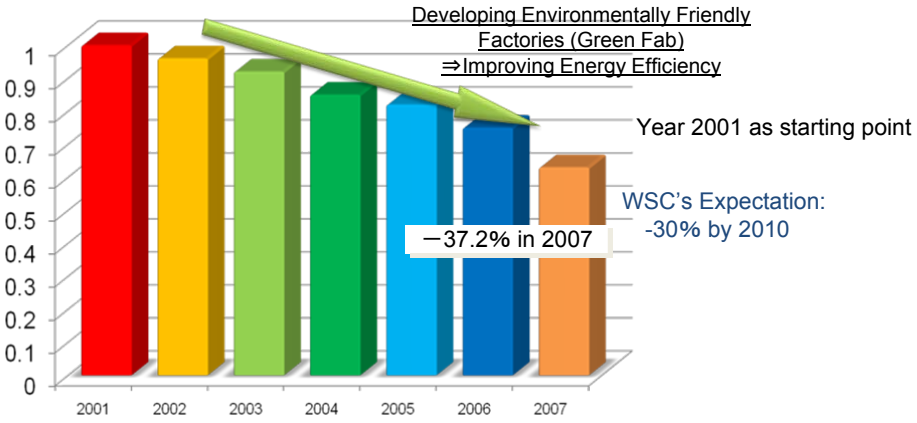
The efficiency guideline for energy consumption at semiconductor factories has been set to a 30% reduction of energy usage per wafer area by the year 2010 (based on 2001 figures). The Expert Committee on Energy promotes energy-saving activities at semiconductor factories in the following ways:

◆Regular study sessions and network meetings are held to share the latest eco-related information with production and facility equipment manufacturers.
◆Factory tours at the "Green Fab" factories are organized for affiliated companies to spread effective practices laterally.
◆Annual surveys on energy usage are conducted to obtain the total volume of energy consumed by affiliated companies.



Task Force Members Participate in a Factory Tour

Direct Contribution to an Energy-Saving Society <Green Fab>



Graph 1 - Energy Consumption Per Wafer Area
(WSC Electricity Data:2001-2007)

Energy-Saving Measures on Air-Conditioning and Heat Sources at Semiconductor Factories

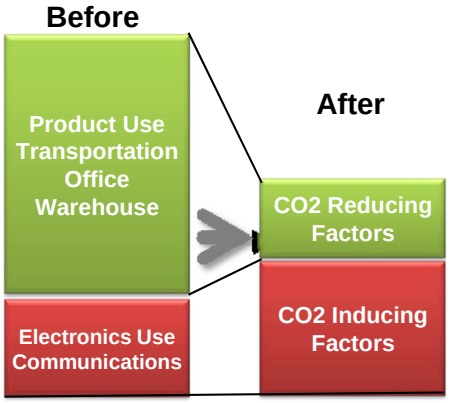
◆Procuring highly efficient equipments, such as inverter centrifugal chillers, vacuum pumps, chillers, and fans.
◆Reducing feeding power
  ◆Eliminating secondary pumps, and implementing low-resistance pipe crafting techniques
  ◆Lowering energy usage by modifying dry-air pressure settings
◆Improving Air Conditioners
  ◆Utilizing mini-environments in clean rooms
  ◆Utilizing the water film humidifying systems and eco-washers in external units
  ◆Modifying temperature and humidity control settings by the season
  ◆Incorporating natural cooling phenomena for chilled water cooling coils and free-cooling heat-exchangers in winter
◆Reusing Waste Heat
  ◆Collecting used air-conditioner heat
  ◆Reducing water-heating load with waste heat recovery from factories via heat exchangers.
  ◆Incorporating more advanced technologies for compressors, water coolants, and freezers for waste heat recovery
◆Reducing Heat Loss from Production Equipments
  ◆Saving energy by reducing exhaust air from equipment
  ◆Implementing dual coolant water passages(5℃ → 5℃+9℃)

Affiliated semiconductor companies play active roles as JEITA members by participating in energy-saving activities conducted by four electrical and electronics organizations.

CO2 Reduction with Energy-Saving Features on IT products <Green IT>

While energy consumption volume on IT products is increasing, there are high expectations for IT's contribution to reduce the overall effect on the environment.
➢Improving energy efficiency by incorporating devices with semiconductors into social systems
➢Improving the energy efficiency of innovative social systems by introducing IT devices with new features
Examples:

- Telecommuting
- Retail POS Systems
- E-Learning Systems
- In-Vehicle Stations
- Office Building Management Systems (BMC)
- Intelligent Transport System(ITS)



Graph 2 - CO2 Emission Factors and Comparison before and after the introduction of IT Systems

For Greenhouse Gas Reduction(2)

PFC Reduction Efforts Lead by the Expert Committee on PFC

PFC Gas is an essential element used for precision processing and internal cleaning of equipment in semiconductor production; however, due to its large Global Warming Potential (GWP *) value, PFC is considered to accelerate global warming, and is thus listed as one of the gasses to be regulated in the Kyoto Protocol.

The semiconductor industry actively takes initiatives in reducing PFC emissions, with a 10% reduction between 1995 and 2010. The Expert Committee on PFC assumes a central figure in both controlling PFC usage by optimizing conditions for semiconductor production, and reducing emission volume by speeding up the installation of equipment to remove harmful substances.

PFC Reduction Target Timeline

1997	COP-3, the Kyoto Protocol: Greenhouse gasses reduction target set by industrialized nations PFC listed as a greenhouse gas to be controlled
1999	The 3rd WSC, PFC reduction target by 2010 set for all regions to reduce the emission volume by 10% or more from the marker year
	JEITA (then EIAJ) initiatives released A target was discussed and set at the WSC after consideration of the decisions made in the Kyoto Protocol: For 2010, the total volume of PFC and other emissions, calculated with CO2 conversions, will be reduced by 10% or more in comparison with volumes in the marker year, 1995.

* PFC's GWP Value

Gas	GWP
CF4	5700
C2F6	11900
C3F8	8600
C4F8	10000
CHF3	12000
SF6	22200
NF3	10800
(CO2)	1

From IPCC 2001

PFC Emission Reduction Technologies

Types	Methods	Remarks
Optimization	Reduce consumption volume by optimizing gas usage	Optimize conditions for degree of vacuum, power, gas flow ratio
Alternative Gases	Switch to gasses with higher capacity, or with lower GWP	Gasses with a larger fluorine count perform equally in lower flow ratios.
Abatement	Decomposition into elements with lower GWPs	Four decomposition methods approved by the IPCC : electric heating; combustion; plasma; and, catalysis.
Recovery and Reuse	Recover, re-purify, and reuse	Isolation recovery from exhaust gasses using organic films Subject to future investigation

The Expert Committee on PFC continues its efforts to reduce PFC emissions though optimization, finding alternative gasses, PFC abatement, and recovery/reuse, while maintaining production volume and ensuring safety.
Upon the commencement of its activities in 1999, the task force mainly focused on optimizing conditions of gas use, and later on finding alternative gasses and implementing PFC abatement measures. The actual achievement ratio on emission reduction technologies in 2007 consisted of 70% PFC abatement and 30% alternative gasses.

PFC recovery and reuse are technologies yet to come, but future investigation must be accelerated to further 'Reuse and Recycle' practices.

PFC Purchase and Emission Volumes

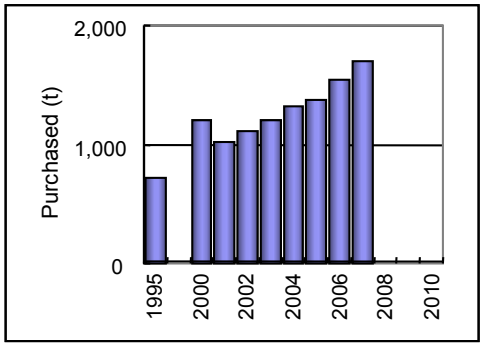
PFC purchase volumes are increasing gradually as the production volume of semiconductors grows (see graph 3).

Graph 4 indicates current PFC emission volumes. The emission volumes with PFC abatement measures are indicated as 'with measures'. For comparison purposes, hypothetical figures that do not include PFC abatement measures are also plotted and indicated as 'without measures'.

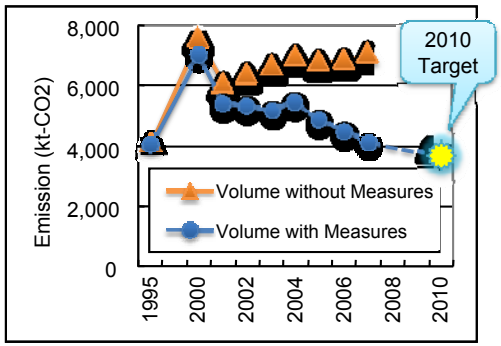
The actual emission volume (with measures) has been steadily reduced. The volume in 2007 almost equals that of 1995.

The comparison of the 2007 figures shows that over 40% reduction was achieved by introducing PFC removal equipment.

The semiconductor industry will strive to meet the PFC emission reduction target for 2010 by continuing with these efforts.



Graph 3 - Domestic PFC Purchase by the Semiconductor Industry

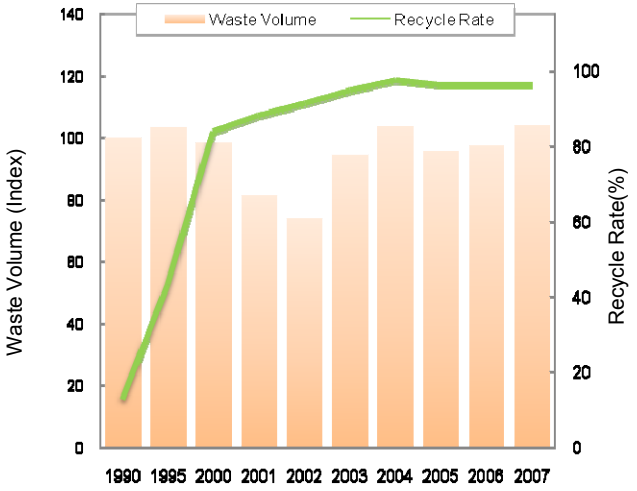


Graph 4 - Domestic PFC Emission by the Semiconductor Industry

For Sustainable Development (1)

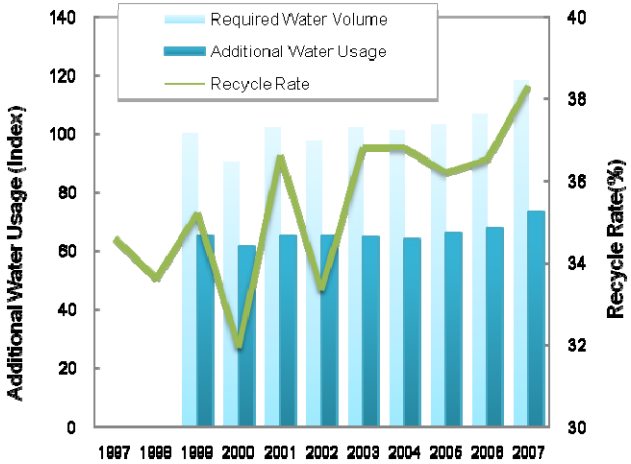
Effective Resource Use Promoted by the Expert Committee on Resources Utilization

The Expert Committee on Resources Utilization aims to reduce environmental load created by the semiconductor industry through the effective use of resources, such as reducing and recycling waste, and controlling water usage while improving water recycle rates. Much effort is focused on investigating new technologies for waste and water recycling and collecting information, to facilitate utilization of such technologies at affiliated companies. Annual surveys of waste volume and recycle rates as well as water usage and recycle rates are conducted to examine the companies' contributions.



Graph 5 – Waste Volume and Recycle Rates

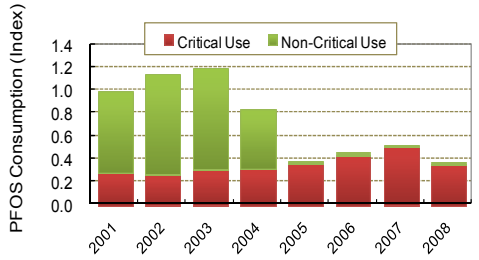
Results from JEITA affiliated companies surveys indicate that waste recycle rates exceed 95% (see graph 5).
Water recycle rates have improved steadily. Despite the rise in required water volume, additional water usage has been kept to a minimum thanks to the increase in the volume of water recycled (see graph 6).
Volume in both waste and additional water usage for production, per wafer size, has been decreasing gradually. The figures reflect the diligent effort made by each affiliated company to ease environmental impact.



Graph 6 – Water Volume and Recycle Rate

Handling Chemical Risk by the Expert Committee on Chemical Substances

The Expert Committee on Chemical focuses on chemical-related issues in the industry and promotes cooperation with international semiconductor associations through the WSC. In recent years, the task force has conducted usage surveys for the much-discussed PFOS, and has facilitated efforts to reduce consumption volumes. These efforts have enabled the industry to achieve the WSC's target of eliminating PFOS from non-critical use by 2007 (see Graph 7).
The Expert Committee also supports both the research of new technologies to reduce VOC emission volumes, and the deployment of technology within affiliated companies. This is in order to reach the Initiative targets set for 2010 in accordance with the Air Pollution Control Act.



Graph 7 – PFOS Consumption

PFOS Regulations Negotiated by the Task Force on PFOS Regulations

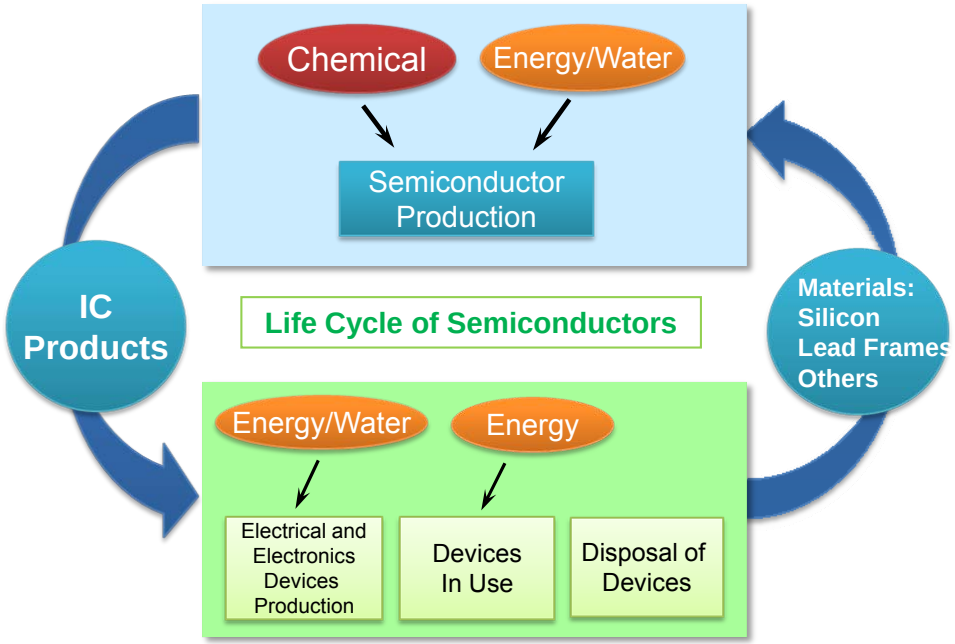
The Task Force on PFOS Regulations ensures that the PFOS regulations agreed to at the Stockholm Convention on Persistent Organic Pollutant (POPs) do not severely affect the semiconductor industry or any social systems by coordinating with the electrical and electronics industry, the Ministry of Economy, Trade, and Industry, and the WSC. The task force has been established to achieve two purposes: (1) to persuade the regulators to list PFOS for "limited use" and not "to be eliminated", (2) to obtain a ban waiver with uses for which alternatives cannot be found. The task force continues its efforts towards the 4th Conference of the Parties (COP 4), in May 2009, where details of regulations will be decided.

Activities
(1) Conduct surveys on all supply chains to inquire about potential PFOS uses, to identify critical uses, and then to apply to the POPs administration for ban waivers.
(2) Submit opinions, provide presentations at POPRC's side events, and lobby contracting parties. This is in order to inform contracting parties and NGOs of the importance of PFOS in social systems and the difficulty in both use inquiry and the search for alternatives.
(3) Obtain and classify data on the reduction of PFOS emission and detoxification for PR activities, as the semiconductor industry's efforts to reduce and control PFOS emission.

For Sustainable Development (2)

Life Cycle Assessment for Semiconductor Devices by the Subcommitee on LCA

Life Cycle Assessment (LCA) is a method for evaluating the environmental impacts of products and services. The Subcomittee on LCA surveys and inspects energy consumption and the environmental impacts of cradle-to-grave processes, from procured materials production stage through semiconductor fabrication to usage stage and then finally to disposal stage of the products.



Development of the JEITA LCA System for Semiconductors (JLCAS)

The JEITA Semiconductor Board has developed and been distributing an innovative tool called JLCAS, which enables to conveniently calculate semiconductor devices' LCA or Life Cycle Inventories.

Semiconductors require numerous types & volume of chemicals, gasses and complex fabrication processes in production.

Conventional semiconductor LCA calculation with weighing concept fails to make formula so that the results were complicated, human-specific & inconsistent.

JEITA Semiconductor Board has solved it out to adopt a new concept such as a functional unit of the shapes of IC's & the number of terminal pins.

JLCAS is a superb LCA tool to be used by whom without a specialized knowledge of semiconductors. The Board hopes that JLCAS will eventually be implemented worldwide.

The Semiconductor Environmental Committee

Organization and Activities: Domestic Semiconductor Manufacturers work in the Environmental Committee

The JEITA Semiconductor Board has been environmentally active for 25 years, beginning in 1985. This was when the chemicals committee was established within the former Electronic Components Department to take measures on chlorinated organic compounds. Through the years, the committee has expanded though mergers and reforms. Domestic semiconductor manufacturers are now joining in the effort to proceed with a whole array of activities regarding the Earth's environmental issues, including global warming, chemicals, resources utilization and waste management, and semiconductor LCA research.

With the guidance and advice of the Ministry of Economy, Trade, and Industry, the committee cooperates with related domestic associations in electrical and electronics industries. Internationally, the committee is a member of the WSC-affiliate world semiconductor association with six countries and regions. Following are the activity objectives and business overviews.

Activities

2008	June	■The 15th International Semiconductor Environment, Safety and Health Conference (ISESH) in Sapporo
	September	■WSC Environmental Safety Health – Task Force (ESH-TF) Conference in Lisbon
		■Stockholm Convention POP RC4: Critical uses of PFOS
	October	■Global Warming Task Force
	December	■SEMI Global Environment Symposium
2009	February	■WSC ESH-TF at Nagaragawa Convention Center in Gifu
	May	■WSC Conference in Beijing (Scheduled)
		■Stockholm Convention (COP 4) (Scheduled)
	September	■WSC ESH-TF in Korea (Scheduled)

At WSC ESH-TF in Lisbon in September 2008

Four Electrical and Electronics Organizations' Coalition

The Semiconductor Environmental Committee cooperates with the four electrical and electronics organizations above, and actively participates in various committee activities.

◆Product Chemicals Task Force:
Has large influence over the semiconductor industry and regulation committee such as RoHS and China RoHS.

◆4 Organizations' Global Warming Provision Network:
Aligns with domestic regulations, and initiates action plan target setting. Promotes energy-saving activities in the electrical and electronics industry by cooperating with the Japan Federation of Economic Organizations, the head organization.

◆Energy Saving Integrated Follow-Up:
A subordinate organization to the Global Warming Provision Network. Maintains updates on energy-saving action plan initiatives, and compiles reports for the Industrial Structure Council.

◆Business-Related Chemicals Task Force:
Aligns with domestic regulations on chemicals, and conducts research on chemical management.

◆Business Waste and Recycle Task Force:
Aligns with domestic regulations on industrial waste, and conducts research on resource utilization.

◆Ad Hoc Working Group (WG) for Energy Saving Revisions
Collates revised laws and regulations in the Energy Saving Act and also for resultant discussions in governmental and ministerial ordinances. Represents electrical and electronics industry opinions for acknowledgement of the effort in promoting fair and appropriate activities.

◆Ad Hoc WG for PFOS Provision
Promotes the inclusion of PFOS as critical use in the Stockholm Convention, whose decision to eliminate would greatly affect the electrical and electronics industry.
Activities are supported by the Ministry of Economy, Trade, and Industry.

◆Ad Hoc WG for the Chemicals Act:
Encourages an inclusion of a ban waiver for PFOS in the revision of the Chemicals Act, a Japanese regulation which is closely linked to the Stockholm Convention. In the Chemicals Act, PFOS is classified as a Section 1 Chemical Substance: banned from importation, manufacture, and use.

Glossary

- **COP** : **C**onference **o**f the **P**arties
- **ESH - TF** : **E**nvironment **S**afety **H**ealth - **T**ask **F**orce
- **GWP** : **G**lobal **W**arming **P**otential
- **IPCC** : **I**ntergovernmental **P**anel on **C**limate **C**hange
- **ISESH** : The **I**nternational **S**emiconductor **E**nvironment, **S**afety and **H**ealth
- **JSTC** : **J**oint **S**teering **C**ommittee
- **ESH - TF** : **E**nvironment **S**afety **H**ealth - **T**ask **F**orce
- **PFC** : **P**er **f**luoro **c**arbon, a greenhouse gas that has 6,000 to 10,000 times more influence on global warming than carbon dioxide, and is mainly used as an etching gas
- **PFOS** : **P**er**f**luoro**o**ctane **s**ulfonate, a persistent organic fluorine compound used as a water repellent or surfactant in various industries including the semiconductor industry. Persistence in human and animal bodies is an issue. Regulated use has been considered domestically and internationally
- **WSC** : **W**orld **S**emiconductor **C**ouncil
- Four Electrical and Electronics Organizations :
  Japan Electronics and Information Technology Industries Association
  The Japan Electrical Manufacturers' Association
  Japan Business Machine and Information System Industries Association
  Communications and Information-Network Association of Japan