Effective Action on Global Warming Prevention

by the Japan's Electrical and Electronics Industries

Our Initiatives for Creating a Low-Carbon Society

Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention

1 Initiatives for Mid- to Long-Term Global Warming Prevention

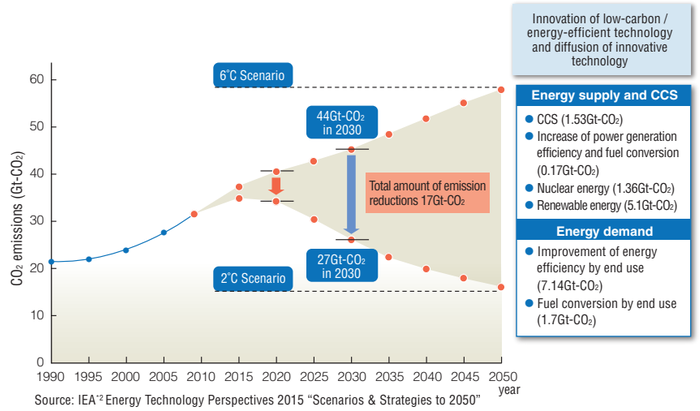
-Contribution to mid- to long-term CO_2 emission reductions by technological innovation

Awareness of Global Warming

(Predicted amount of CO_2 emissions for a mid- to long-term and its reduction scenarios)

IPCC*1 stated in its Fifth Assessment Report that warming of the climate system is unequivocal and that it is extremely likely that anthropogenic greenhouse gas emissions are the dominant cause of observed warming since the mid-20th century. It is also reported that, in order to keep the temperature rise less than 2°C over the 21st century relative to pre-industrial levels, greenhouse gas emissions should be reduced by 40 to 70 percent compared to 2010 by 2050, falling to almost zero or below in 2100.

*1 IPCC: Intergovernmental Panel on Climate Change
*2 IEA: International Energy Agency



Source: IEA*2 Energy Technology Perspectives 2015 "Scenarios & Strategies to 2050"

Contribution to Energy Supply by Technological Innovation

IEA estimates that CO_2 emissions will be reduced by a maximum of approximately 8 Gt in 2030 through advancement in development and global diffusion of technologies to capture and store CO_2 (CCS*3) from exhaust gas of coal-fired thermal power plants, in addition to the efficiency improvement of thermal power generation and the low-carbon technologies for energy supply, such as renewable energy including solar power generation. We will contribute to mid- to long-term CO_2 emission reductions as a leader of such technological development.

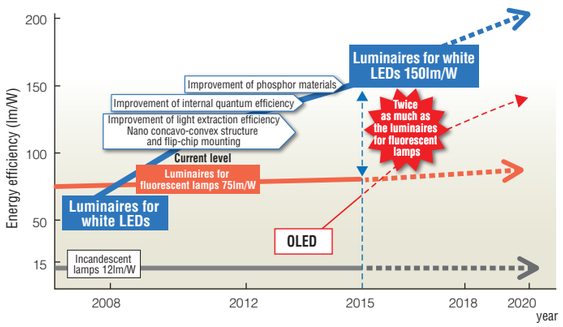
*3 CCS: Carbon Dioxide Capture and Storage

Contribution by Facilitating Diffusion of Energy-efficient products and Services

Approximately 30% of energy consumed in the world is used as electric energy by our products (motive power by motor, heat source by lighting, ICT and heat pumps).
We have achieved low-carbonization and energy-efficiency in various scenes where energy is used, through developing high-efficiency products and providing their combined systems and services. We will be also contributing to achieving secure, safe, and comfortable urban infrastructure by smart grids, intelligent transportation systems, and so on utilizing IT technologies.

Achieving High Efficiency of Lighting

Luminaires have been improved in energy efficiency through transitions from incandescent lamps to fluorescent lamps, then to Hf type fluorescent lamps, and further to LEDs. The energy efficiency of LEDs has exceeded double that of fluorescent lamps (75 lm/W) in 2015. The development of products exceeding 200 lm/W is also within reach in the future.
Furthermore, development of the next-generation high-efficiency lighting systems utilizing semiconductor technologies such as organic light emitting diodes (OLED), improvement of lighting quality, and formulation of controllable lighting systems are also under way.

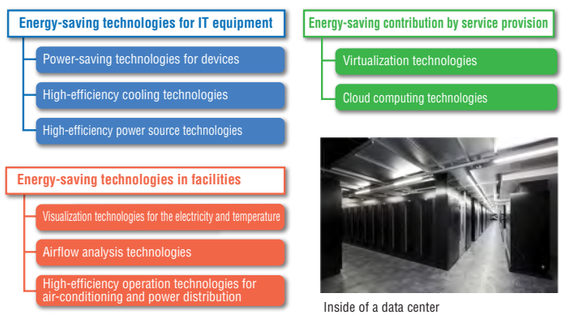


Source: Created by Japan's EE industries with data from "New Growth Strategy for Lighting Business" (2009) of Japan Lighting Manufacturers Association (formerly Japan Luminaires Association)

Energy-efficient Technologies of Data Centers

Energy consumption of data centers in 2020 is predicted to become approximately 4 times that in 2005. Energy consumption in buildings breaks down into 50% for IT equipment, 40% for air-conditioning, and the rest for lighting, and so on*4.
Besides raising device power-saving and virtualization to improve the utilization efficiency of IT equipment, technologies of air flow simulation to "visualize" the room temperature of data centers and so on have been introduced to advance the energy utilization efficiency.

*4 GIPC, "Survey and Estimation Committee Report (2013)"

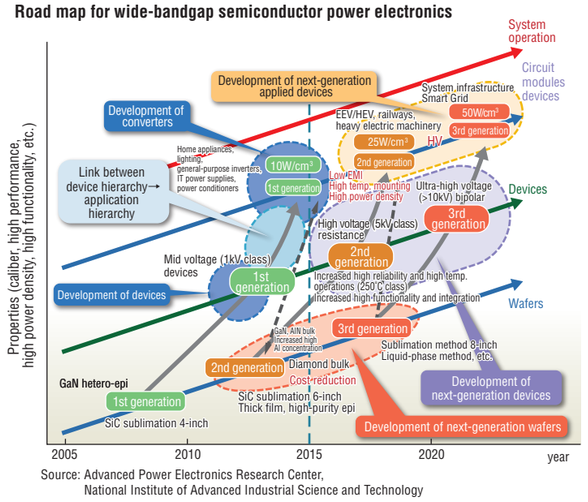


Inside of a data center

Road Map for Technological Development of Power Semiconductor

Power semiconductor is a key device that plays a crucial role in power conversion and control. It contributes to achievement of a low-carbon society by advancing energy-savings for home electric appliances, electric vehicles, railways as well as power supplies. Silicon (Si) has been used as its material up until now; however, silicon carbide (SiC) and gallium nitride (GaN) are drawing attention as the leading material of a new era. These new materials are characterized by higher conductivity, lower power loss, and higher operational stability under high temperature compared to Si. Since these properties enable the uses of power semiconductors in wide variety of domains, including industrial and infrastructure equipment using high power, development of next-generation devices and research into practical applications are in progress.

Road map for wide-bandgap semiconductor power electronics

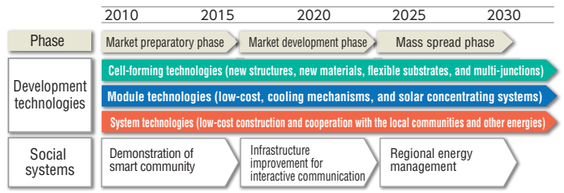


Source: Advanced Power Electronics Research Center, National Institute of Advanced Industrial Science and Technology

Technological Development in the Renewable Energy

Road map for technological development of solar power generation

For solar power generation, we are advancing development of modular technologies that embrace new technologies to form cells, cooling mechanisms, solar concentrating systems, and so on with the aim to enhance panels' power generation efficiency and resource-saving. To disseminate them, we are also engaged in developing appropriate systems for power system interconnection, such as energy storage functions and demand and supply control utilizing IT technologies.



Source: Created by Japan's EE Industries with data from NEDO, "PV2030+" and Japan Photovoltaic Energy Association, "JPEA PV OUTLOOK 2030"

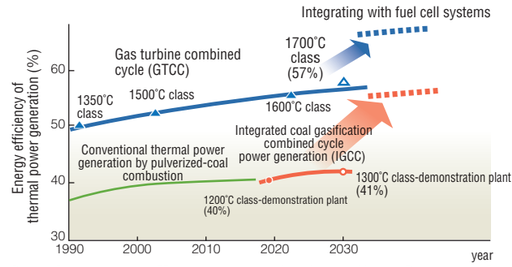
Floating off-shore wind turbine systems

Development of off-shore wind power generation, where the strong wind can be expected stably, is in progress worldwide. Particularly for the large off-shore floating wind turbine system that is appropriate for the steep submarine topography of Japan, we have participated in demonstration projects (2MW, 5MW and 7MW) off the coast of Fukushima and have been working on its commercialization.

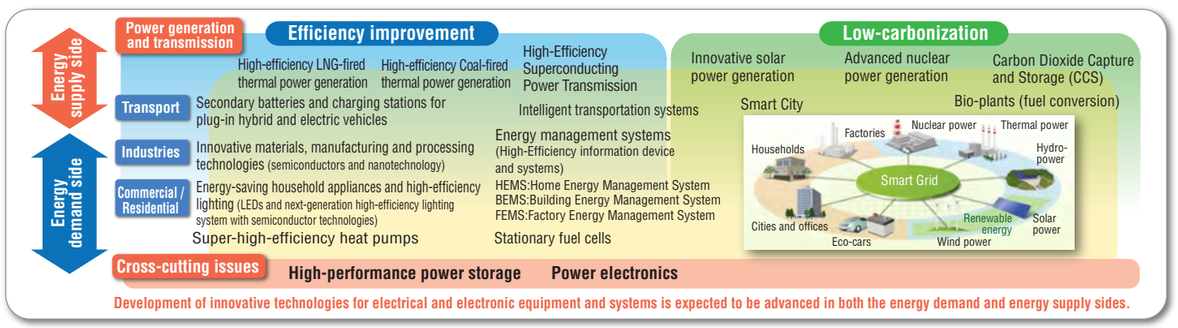
Fukushima floating offshore wind farm (Photos courtesy of Fukushima Offshore Wind Consortium)

Leading High-efficiency Technologies for Thermal Power Generation

For thermal power generation (coal, oil, and natural gas), which supplies almost 70% of the electricity consumed in the world, we have been working on improvement of power generation efficiency by technological development such as increase of steam temperature and pressure, pulverized-coal combustion, and combined operation of gas turbines and steam turbines.
As a result, the efficiency of domestic thermal power generation is currently among the best in the world. Furthermore, we are advancing technological development to improve the efficiency by integrating solid oxide fuel cells with combined gas turbine systems, and so on.



Source: Created by Japan's EE Industries with data from Agency of Natural Resources and Energy



Source: Created by Japan's EE Industries with data from "Ministry of Economy, Trade and Industry, Cool Earth Energy Innovative Technology Plan (2008)"

2 Initiatives for Greenhouse Gas Emission Reductions in Commercial and Residential and Industrial Sectors

-Contribution to greenhouse gas emission reductions and promotion of high-efficiency product manufacturing

Development and Promotion of Energy-Saving Appliances

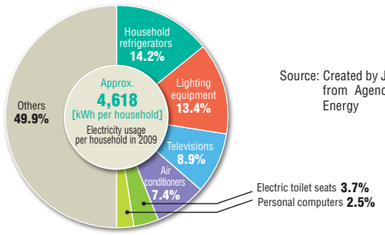
(Continuous initiatives to improve energy-saving performance)

As many home appliances and some of office equipment are designated as target devices of the Top-Runner Standard*5 under Japan's energy-saving law, we have been engaged in enhancing energy-saving performance significantly by a steady step towards improvement of energy efficiency and reduction of standby power consumption through development and introduction of innovative technologies.

Through these initiatives, we will continue to contribute to energy-saving and CO_2 emission reductions in the household and residential sectors.

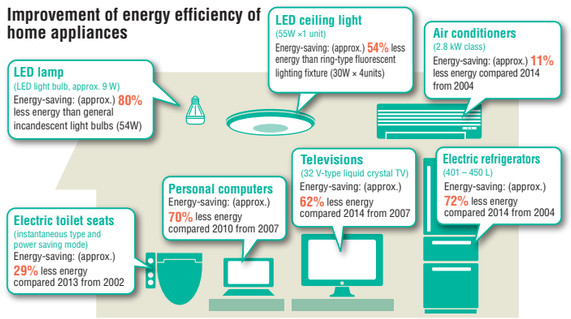
*5 Top-Runner Standard: The standard mandates improvement of energy consumption of home appliances in household and automobiles beyond products currently on the market

Power Consumption by Home Appliances (2009)



Source: Created by Japan's EE Industries with data from Agency of Natural Resources and Energy

Improvement of energy efficiency of home appliances



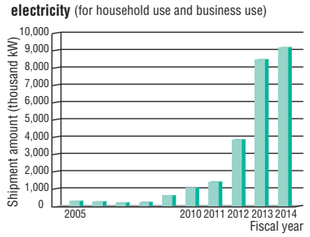
Source: Created by Japan's EE Industries with data from Agency of Natural Resources and Energy and Association for Electric Home Appliances

Promotion and Diffusion of Solar Power Generation

Introduction of solar power generation has been promoted rapidly in recent years with support mainly by the "surplus electricity purchase system," the "Feed-in Tariff Scheme". Given the circumstances, we have initiated mass production of solar cells promptly and expedited to cost reduction and heighten efficiency.

For Mega-Solar power generation system that is expected to expand in the future, we will work on facilitating the spread as well as reducing the cost of the entire system by developing high-efficiency and large-capacity power conditioners.

Shipment transitions of solar power for domestic electricity (for household use and business use)



Source: Created by Japan's EE Industries with data from Japan Photovoltaic Energy Association, "statistics of shipping volumes for PV cells"

Promotion of Energy-Saving of Office Buildings by LED Lighting

Use of high-efficiency LED lighting that has high energy-saving performance and adoption of lighting design appropriate for each usage enable acceleration of energy-savings of the entire office building.

An office that accomplished full LED installation in the ceiling lighting has successfully reduced the expense of lighting to almost one-third that of fluorescent lighting by using personal control, motion sensors, and daylight sensors at the same time.

Source: IINO BUILDING - The grand prize of "Energy saving and effective lighting design award 2011", Ministry of Environment

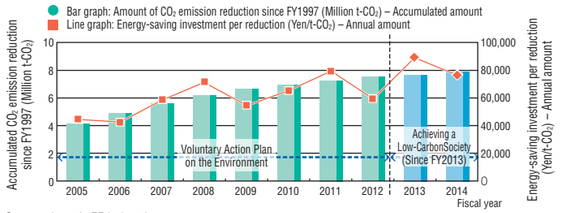
Promoting Energy-Efficient Manufacturing

Having formulated a voluntary action plan for global warming prevention since 1997, we achieved a total CO_2 emission reduction exceeding seven million tons by FY2012. Continuous investment and actions for energy savings throughout this period, amid the tendency of increasing amount of investment per CO_2 reduction, has enabled us to reach the lowest level of greenhouse gas emissions per sales amount in comparison with other companies in the same businesses around the world.

We have been working on a mid- to long-term Action Plan toward Achieving a Low-Carbon Society (by FY2020/2030) since 2013 onwards as a continuation to the Voluntary Action Plan on the Environment and will continue to expedite the manufacturing of products with proper energy efficiency not only by innovating production processes and further improving energy-consumption efficiency including innovating production processes but also by enhancing logistics efficiency and promoting energy-saving measures in offices.

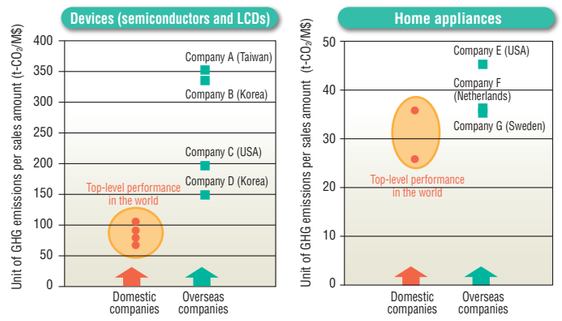
Investments in energy-savings and accumulated energy-savings

(CO_2 emission reduction)



Source: Japan's EE industries

Unit of GHG emissions per sales amount in 2010 (in comparison with overseas companies in same business)

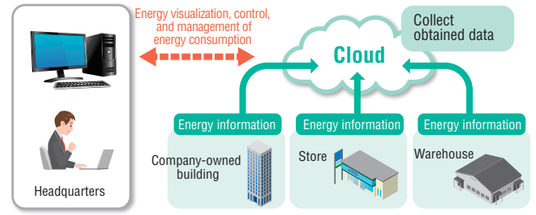


Source: Created by Japan's EE Industries with data from each company's financial report and the Carbon Disclosure Project

Promotion of Energy-Saving Measures by IT Solutions

Energy-savings of buildings and stores with BEMS

For buildings and stores, energy-savings are achieved by utilizing cloud technologies and conducting energy management based on various information.



Rate of energy reduction for each functional category

(The actual reduction rates for buildings vary depending on the individual cases)

Functional categories		Actions	Reduction rates (examples)
Diagnosis	Visualization	Energy visualization of all equipment	2%~10% (Overall)
	Energy-saving services / diagnosis	Utilization of BEMS data	7%~15% (Overall)
Energy-saving Control	HVAC control (central air-conditioning)	Energy-savings of heat sources and heat transport by management and setting adjustment	5%~20% (HVAC)
	HVAC control (individual air-conditioning)	Individual air-conditioning control (scheduling, intermittent operation, settings, etc.)	10% (HVAC)
	Lighting control	Lighting control (illuminance adjustment, etc.)	10% (Lighting)
	Power outlet control	Visualization and management of IT devices such as PCs	15% (Cases of leading power outlet)
	(Reference) Future technologies	HVAC and lighting (task/ambient) control Across-the-board management of several buildings	20%~60%
Demand response / Peak cut	Peak cut	All devices ●Peak cut by mainly reducing demand	5%~28%
	Energy supply / Time shift	All devices ●Effectiveness improvement with accumulator, cogeneration device, heat storage device	More than 60%

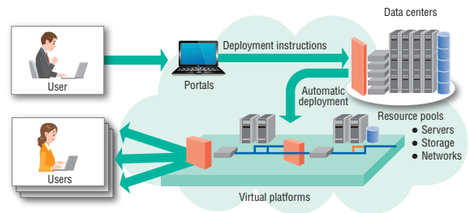
Source: BEMS Promotion WG, JEITA Green IT Committee

Promotion of Energy-Saving Measures by IT Solutions

Energy-savings by cloud computing systems

Energy-savings can be achieved by integrating client server systems, which used to be placed in each office, into the servers of data centers to considerably reduce the number of servers.

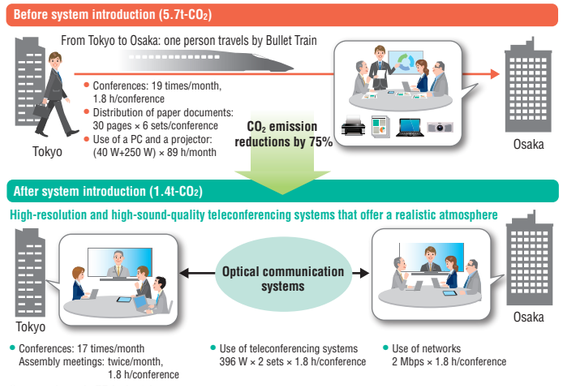
One successful example shows that the number of servers decreased by almost 90% as a result of integrating the client server systems in six offices worldwide into one data center.



Source: Japan's EE Industries

Energy-savings by remote teleconference solutions

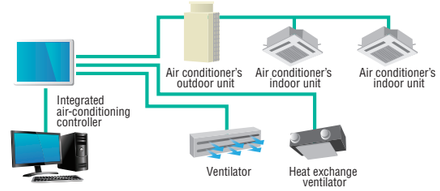
The introduction of high-resolution and high-sound-quality teleconferencing enables smooth remote communications and significantly reduces the energy otherwise needed to travel, as well as the travel expenses and time.



Source: Japan's EE Industries

Energy-savings through HVAC control

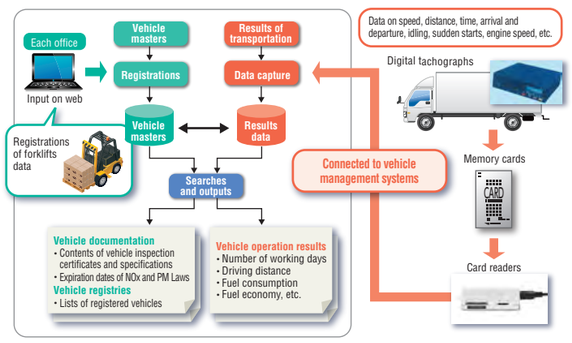
Energy-savings of offices and factories can be achieved by optimizing the operations of HVAC devices through a centralized IT control for peak cut, demand control, temperature settings, remote On/Off, timer, automatic ventilation, sequential rotation of operated units, and so on.



Source: Japan's EE industries

Efficiency improvement of physical distribution systems by IT

Energy-savings for physical distribution are ongoing through improvements in load efficiency, the expansion of joint transportation, and the efficiency enhancement of transportation and delivery networks. And, by installing digital tachographs on transport vehicles, we are increasingly "visualizing" the improvements.



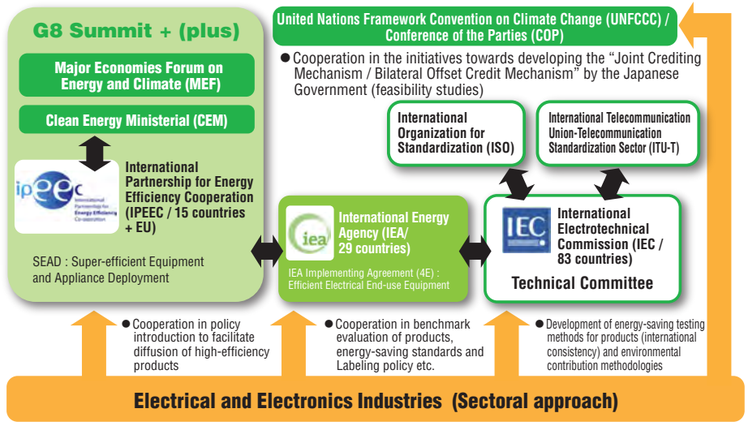
Source: Japan's EE Industries

3 Initiatives for Greenhouse Gas Emission Reductions through International Cooperation

-Global contribution through cooperation in international standardization and new reduction mechanisms

International Cooperation in Facilitating Diffusion of Low-Carbon and Energy Efficient Products

Policy introduction to facilitate diffusion of high-efficiency products and the methods to appropriately evaluate energy-saving performance are under discussion in various ways within the international framework. We are promoting the global adoption of low-carbon and energy efficient products, and have proposed evaluation and measuring methods for energy efficiency in international markets.



Source: Japan's EE Industries

Initiatives for international standardization (IEC*6) in the electric and electronic products sector

For international standardization of the rules of quantification, reporting, and verification of greenhouse gas emissions, we are advancing development of rational and transparent methodologies appropriate for the electric and electronic products sector.
Participating in the activities to facilitate diffusion of high-efficiency products under the International Partnership for Energy Efficiency Cooperation (IPEEC) and in the International Energy Agency (IEA) Implementing Agreement for energy-saving evaluation, we are also making various proposals globally for greenhouse gas emission reductions as well as appealing the excellent energy-saving performance of Japanese electric and electronic products.

*6 IEC: International Electrotechnical Commission

Participation in new mechanisms towards global warming prevention

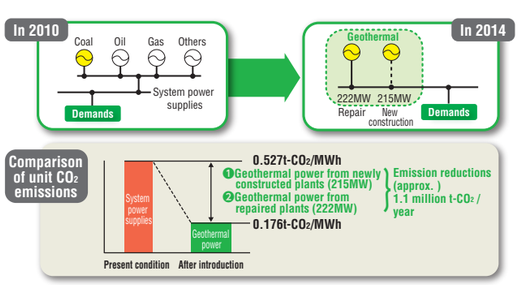
The Japanese Government advocates the introduction of the Joint Crediting Mechanism (JCM)*7 with a focus on the Asian region. Gathering our expertise that we have acquired to date, we evaluate the feasibility of global warming prevention policies of each country for the purpose of realizing these new mechanisms.

*7 The Joint Crediting Mechanism (JCM) Mechanisms to evaluate achieved contributions to greenhouse gas emission reduction or absorption from Japan in a quantitative manner for the purpose of contributing to global emission reductions, through facilitating diffusion of greenhouse gas emission reduction technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions in developing countries. Japan intends to accelerate mechanism design while getting cooperation from host countries, and aims to start the mechanism as soon as possible while ensuring the mechanism transparency to contribute to the discussions at the United Nations.

An example of conducted feasibility studies

- New construction and repair of geothermal power generation in the Philippines

Geothermal power generation is renewable energy that can generate large energy stably. In the case of the Philippines, the potential CO_2 emission reductions are estimated at almost 1.1 million t-CO_2 per year, as power supply from system power supplies (thermal power generation such as coal, oil, and gas) will no longer be required by the repair of power plants which are currently stopped and operation of newly constructed plants.

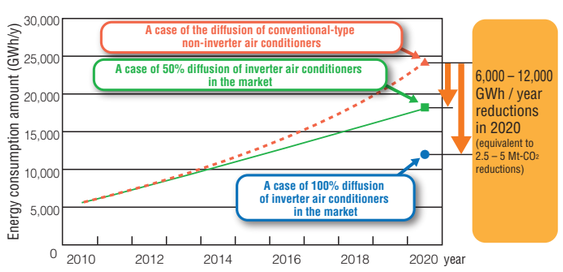


Source: Created by Japan's EE Industries with data from Joint Crediting Mechanism, feasibility studies report (March, 2011)

An example of conducted feasibility studies

- Diffusion of inverter air conditioners in Vietnam

In emerging countries where air conditioners are anticipated to be rapidly spread and expanded in the future, improvement of energy efficiency is expected by introduction of inverters that can control optimum current and voltage. In the case of Vietnam, it is estimated that electric power consumption can be suppressed to 12,000 GWh per year at most in the entire country in 2020.

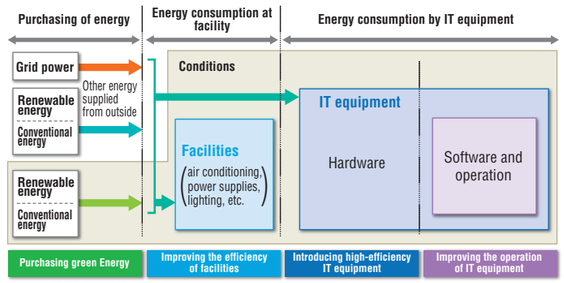


Source: Created by Japan's EE Industries with data from ABAC Vietnam meeting (July, 2012) with Joint Crediting Mechanism, feasibility studies

Evaluation of Energy Performance for Data Centers (DPPE*8)

The amount of information that data centers handle has been growing in geometric progression due to the spread of cloud-type services, smart phones, and so on. As a result, energy consumption has been also continuously increasing.
In response, Japan, the United States, and Europe collaborated to develop a set of metrics (DPPE) that evaluate energy consumption of data centers using four elements (purchasing of energy, use of facility, purchasing of IT equipment, and operation of IT equipment). They are the world's first successful metrics to comprehensively evaluate the use of green energy, energy-saving performance of IT equipment, and so on, in addition to energy consumption of conventional attached facilities.

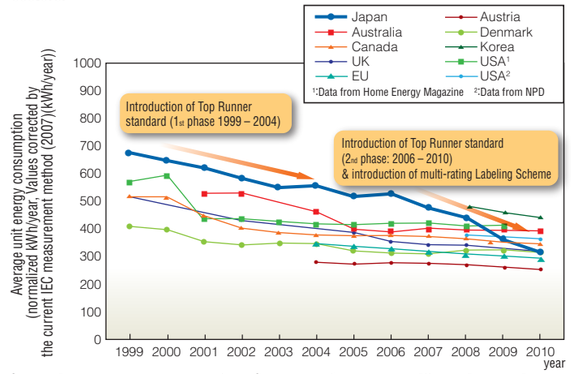
*8 DPPE:Datacenter Performance Per Energy



Source: JEITA Green IT Committee

International Evaluation of Energy-saving Performance of Electric Refrigerators

IEA evaluates the effects of energy-saving policies of every country through the benchmarks of energy-saving performance of electric and electronic products. In Japan, in response to the policy introduction of the Top Runner standard and Labeling Scheme, household refrigerators have met the requirements with technological development, including compressors' performance improvement, inverter control, and introduction of vacuum insulation materials.
Japan's major improvements are at the top-level from a global standpoint. IEA also evaluates introduction of these policies and efforts of technological development to be effective for energy-saving measures in the household sectors.

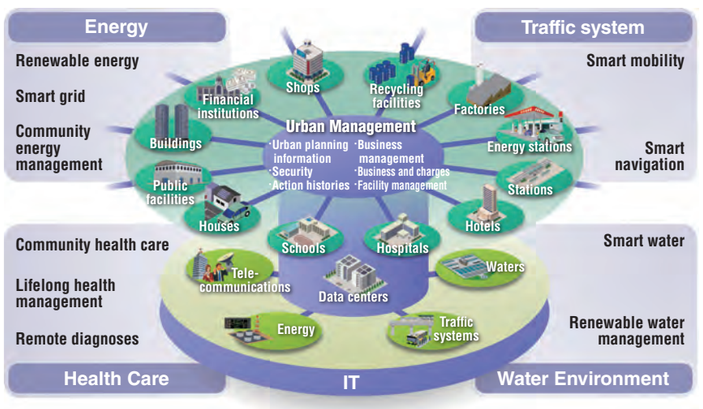


Source: IEA Implementing Agreement for a Co-operating Programme on Efficient Electrical End-Use Equipment (4E), Mapping & Benchmarking Annex, Tokyo meeting (Nov, 2012)

Initiatives for Smart City Development

UNEP*9 forecasts that "Two-thirds of the world population will live in urban areas in 2050." We will provide an environment where people can live securely and comfortably through "urban management" utilizing IT in these expanding cities.
Demonstration plans towards Smart City development are in progress in every region worldwide and we are actively participating in them*10.
We also positively support the international standardization (ISO/TC268/SC1) of "Smart Community Instructors Evaluation."

*9 UNEP: United Nations Environment Programme
*10 Demonstration plan of Smart city: Japan, USA, Spain, UK, France, Italy, Bulgaria, China, Vietnam, Thailand, Malaysia, India, and so on



Source: Japan's EE Industries

4 Initiatives for Action Plan toward Achieving a Low-Carbon Society

-Electrical and electronics industries' Action Plan for Commitment to a Low-Carbon Society towards 2020 and 2030

Electrical and Electronics Industries' "Action Plan for Commitment to a Low-Carbon Society"

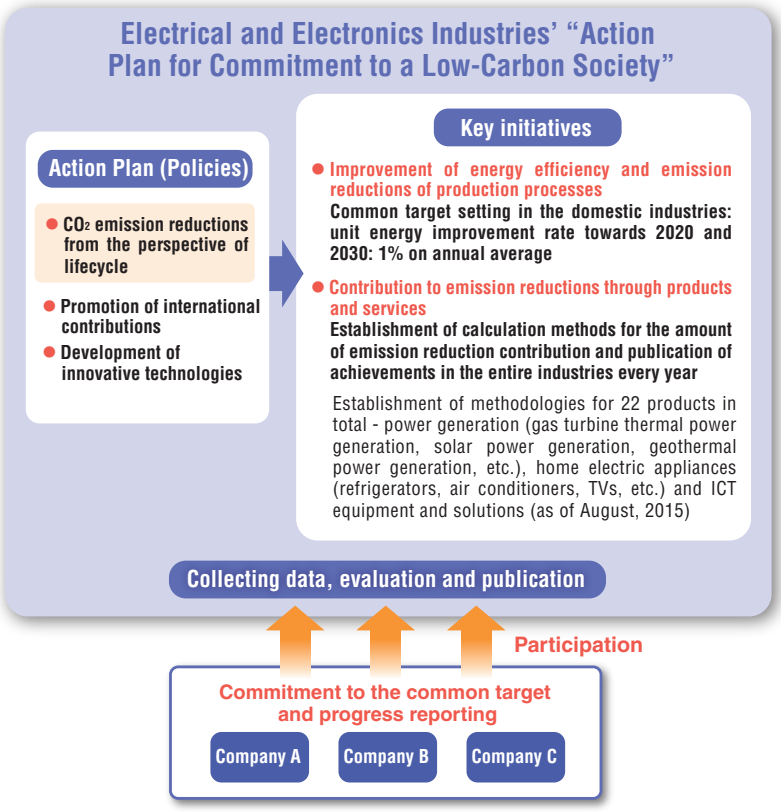
Japan' s electrical and electronics industries have been actively working on global warming prevention on a global scale by promoting "innovative technological development and creation of environmentally conscious products" that contribute to stable energy supply and achievement of a low-carbon society as well as by striving for and strengthening industrial competitiveness in light of the global market.

We participate in Keidanren' s Commitment to a Low-Carbon Society*11 and are aiming to improve energy efficiency of production processes by 1% annually on average. For the purpose of contributing to emission reductions in society through products and services, we established calculation methods for the amount of emission reduction contribution, and will publish the achieved amount in the entire industries every fiscal year.

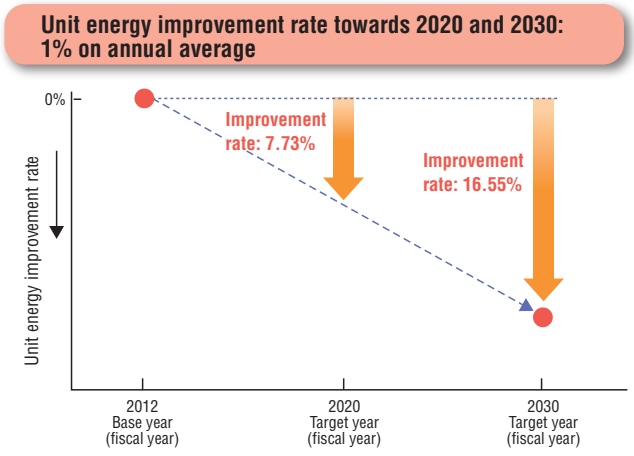
Furthermore, Japan' s EE industries also participate in Phase II*12 of Keidanren' s Commitment to a Low-Carbon Society, established as an additional policy, and continue to work on achieving targets for 2030.

*11 Keidanren (Japan Business Federation) has declared the establishment and promotion of a plan for a new voluntary initiative with targets for 2020, called "Commitment to a Low-Carbon Society," in December 2009. They requested the participating industries to publicly announce and pursue a set of voluntary initiatives in line with the following four pillars in the interest of fostering the development of a global-scale low-carbon society: a) establishment of CO_2 emission reduction targets for domestic business operations up to the year 2020; b) promotion of CO_2 emission reduction through product and service life cycles; c) promotion of international cooperation and contributions; and d) promotion of mid-to-long term innovative technological development which contributes to the achievement of low-carbon society. As of January 2013, 36 types of industries, including the EE industries, have announced their participation in the Commitment to a Low-Carbon Society.
http://www.keidanren.or.jp/en/policy/2013/003.html

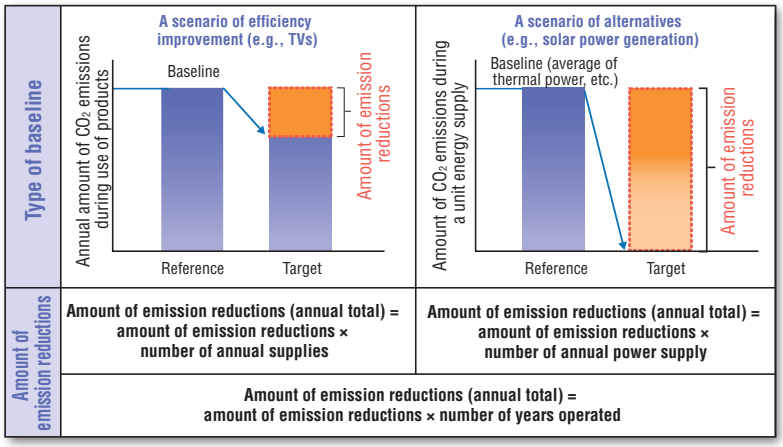
*12 In April 2015, Keidanren announced the establishment of Phase II of the Commitment to a Low-Carbon Society as the further challenges by the Japanese business community for 2030.
http://www.keidanren.or.jp/policy/2015/031.html (Japanese text only)



Common target of the industries and participating companies



Evaluation methods for emission reductions



Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention http://www.denki-denshi.jp/index.php

Japan Electronics and Information Technology Industries Association (JEITA)	http://www.jeita.or.jp	The Japan Electrical Manufacturers' Association (JEMA)	http://www.jema-net.or.jp
Japan Business Machine and Information System Industries Association (JBMIA)	http://www.jbmia.or.jp	Communications and Information network Association of Japan (CIAJ)	http://www.ciaj.or.jp
Association for Electric Home Appliances (AEHA)	http://www.aeha.or.jp	Japan Lighting Manufacturers Association (JLMA)	http://www.jlma.or.jp

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)
Battery Association of Japan (BAJ)
Japan Photovoltaic Energy Association (JPEA)

MIX Paper from responsible sources FSC® C014473 — Printed on the paper made from woods in well-managed forests in accordance with strict standard

VOC Free — Printed with environmentally conscious full vegetable oil with no VOC (Volatile Organic Compound) constituent

Printed by waterless printing method with less waste liquid containing organic substances

November 2015