CONTENTS

APPENDIX

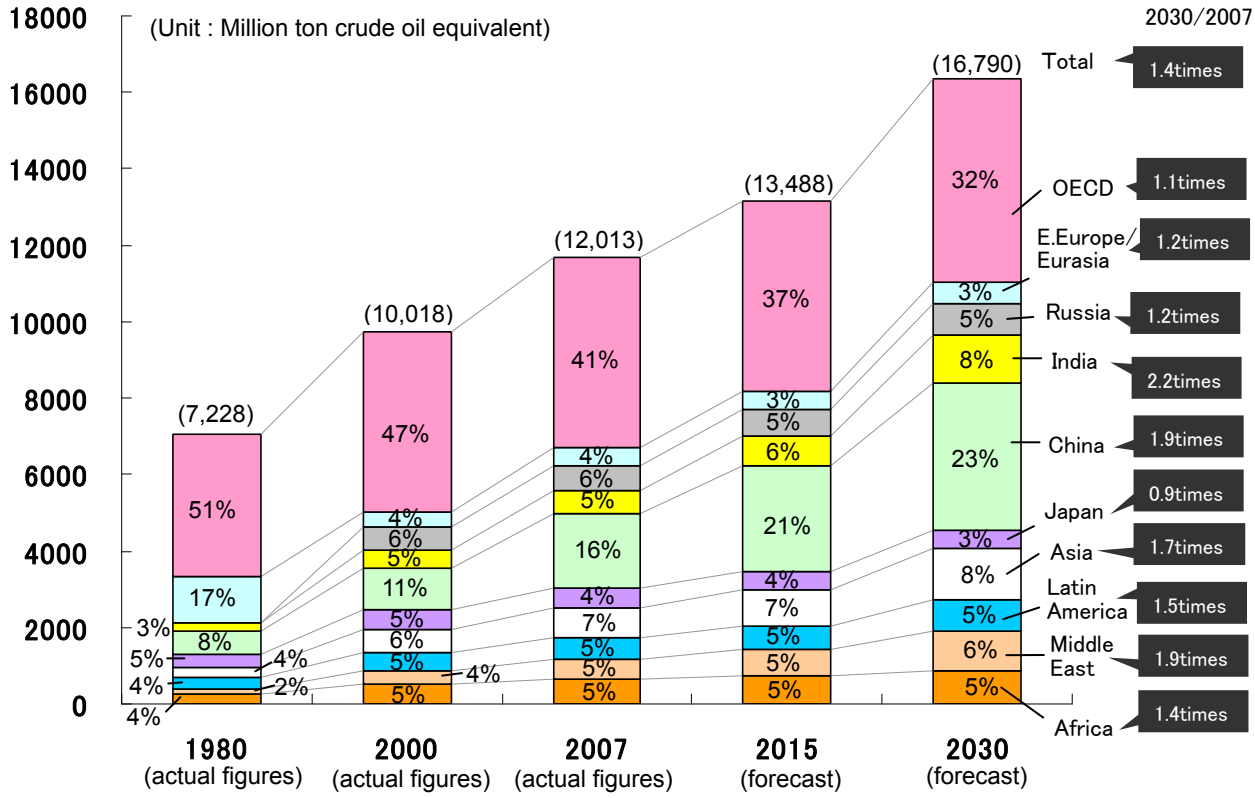
REFERENCE

1. ENERGY SITUATION

1.1 World Energy Situation

The world energy demand in 2030 is expected to continue to be in an increasing trend. As shown in the below figure, the energy demands especially in China, India and other Asian countries are expected to largely increase. For further world energy data, refer to the Appendix 1.1.

Increase of world energy demand



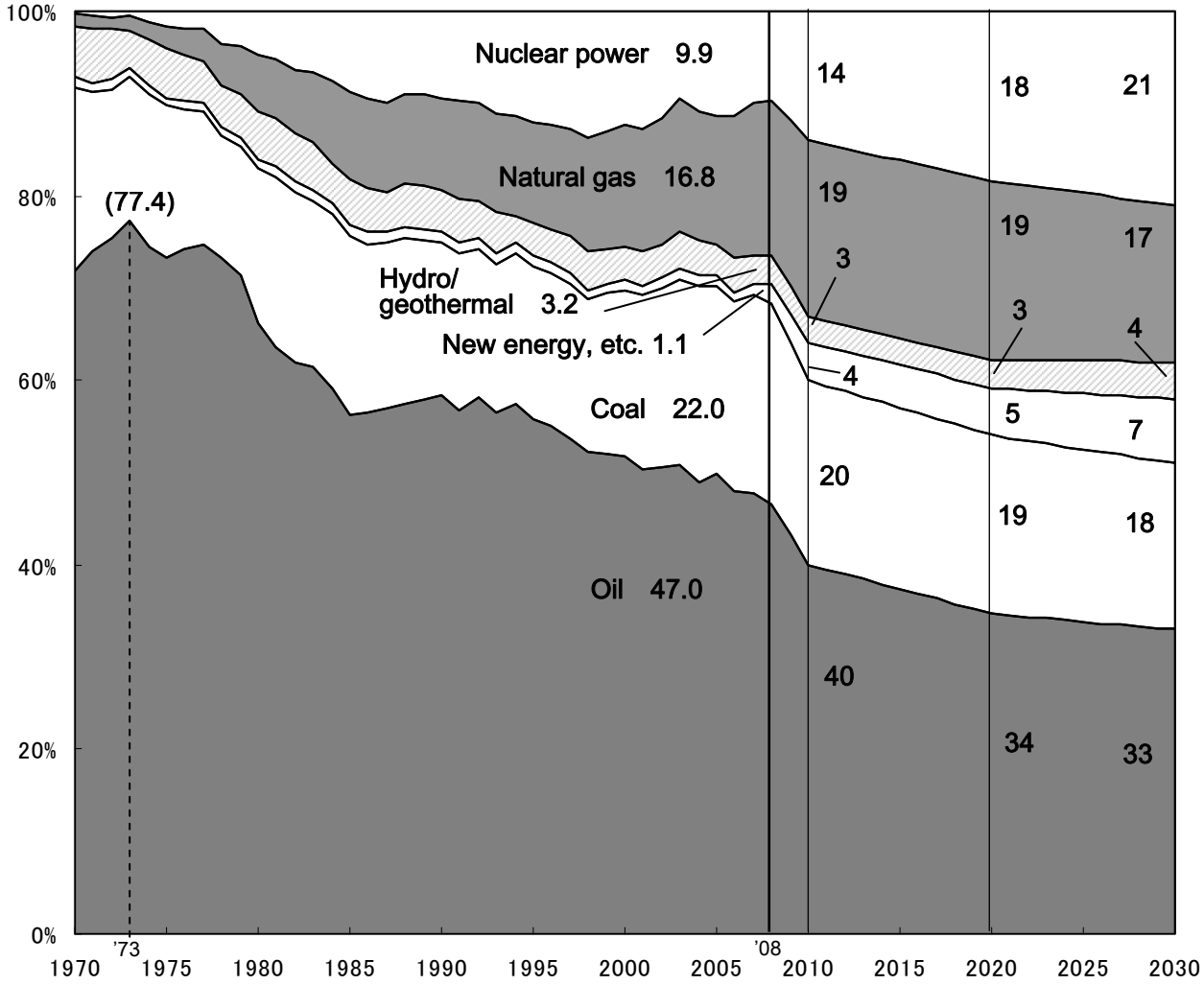
* "Total" includes international marine and aviation bunkers (not included in regional totals).
* In the data of 1980, "Russia" is included in "E.Europe/Eurasia".
*"India" and "China" are excluded from "Asia".
*"Japan" is excluded from "OECD".

Source) Prepared from "World Energy Outlook 2009 (IEA)"

1.2 Japan's Energy Situation

As shown in the below figure, Japan's oil share among the primary energy supply total has been significantly lowered since the highest level (approximately 77 %) marked in 1973 to the current lowest level (approximately 47 %) in 2008. As shown in Page 3, Japan's energy consumption has been steadily expanded especially in the commercial/residential sector since the 1970's oil crises period, largely due to convenience-thriving and energy-needing lifestyles. As for the transportation sector, though the energy consumption was on a rising trend until 2001, after that the trend turned downward because of a decrease in freight transport volume and improvement in fuel economy of cars. Refer to Appendixes 1.2 and 1.3 for more information of the Japan's energy consumption trend.

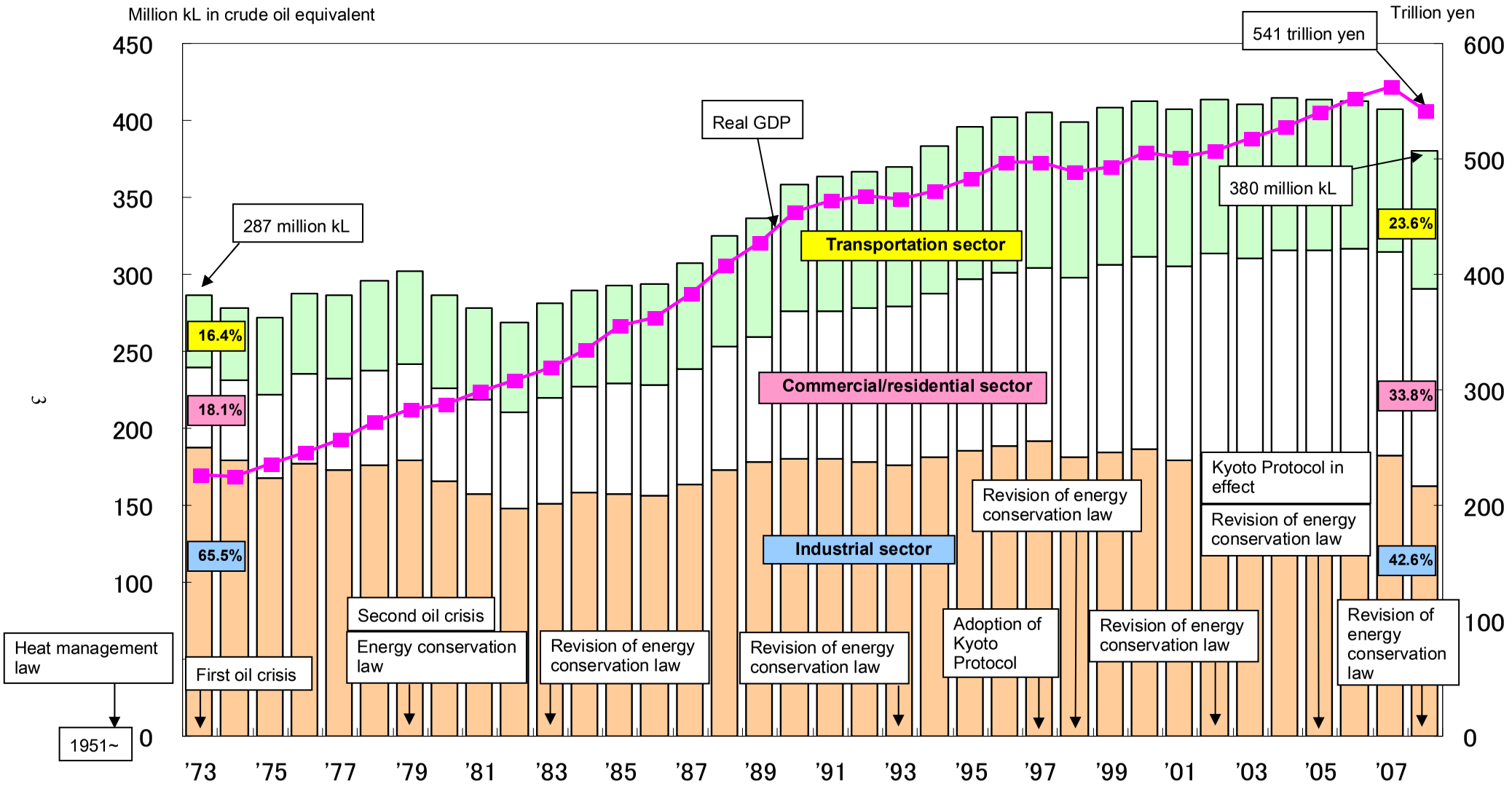
Transition of energy mix in Japan's primary energy supply (1970-2030)



Note) The estimated figures of FY 2020 and 2030 are based on the long-term energy supply and demand outlook published by the Advisory Committee on Energy and Natural Resource in May 2008.
The figure of "New energy, etc." after FY1990 includes amount of "waste heat and others".

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

Transition of Japan's Final Energy Consumption and Real GDP



Note) Note that, due to revision of the aggregation method in Energy Balance Tables in Japan, values for FY1990 onwards and values for preceding years are the results of utilizing different methods.

Source) Prepared from "Comprehensive Energy Statistics", "Annual Report on National Accounts", "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

3

2. ENERGY CONSERVATION POLICIES AND LAWS IN JAPAN

2.1 Outline of Energy Conservation Policies

(1) Brief history of energy conservation policies in Japan

Since the first oil crisis, Japan has made impressive achievements in energy conservation, mostly due to the combined efforts made by both public and private sectors. In1973 when the first oil crisis occurred, the oil resource dependency of Japan was as high as 80% of its total primary energy demand. The oil crisis revealed that the country's fragility of energy supply and demand structure, but the government took advantage of the situation as a precious lesson and has made utmost efforts that subsequently have built a robust supply and demand structure. On the supply level, the diversification of energy sources has been facilitated by successfully switching to alternative energies such as natural gas or nuclear power. On the demand level, the industrial sector has played a central role in energy conservation. As the result of those tireless efforts, the country's oil dependency has declined to 47%, which enables Japan to realize an energy conservation oriented society while staying as an economic power at the same time. In terms of energy consumption per GDP, Japan has been successful in curbing increasing the consumption, compared with other major developed nations.

In the meantime, the member nations reached an agreement with the target that required developed nations to cut their GHG emissions at the 3rd Session of the Conference of the Parties (COP3) in Kyoto 1997. Further energy conservation efforts have since been perceived to reach the goal and conserve the environment on a global level. More than 90 % of GHG is carbon dioxide and approximately 90% of carbon dioxide is emitted from combusting fossil fuels, which means nearly 80 % of GHG emissions originates from energy use. For that reason, potent and effective energy policies are regarded to be the key player in resolving the environmental problems.

The government decided to set up measures covering both energy supply and demand to achieve the 6% GHG emission reduction goal set by the Kyoto Protocol. On the demand level, the government has urged the industrial, commercial/residential and transportation sectors to promote further energy conservation, even though considerable efforts have already been taken since the oil crisis. Especially, as the countermeasures for the recent continuing rising trend of energy consumption in the commercial sector and the transportation sector partly due to people's lifestyle changes, the Advisory Committee on Energy and Natural Resources has reviewed the measures for energy conservation from 2001. The committee put forward additional measures in 2005 and reviewed them in 2007 (refer to Page 39, 3.6 (3)). The expected minimum saving amount is about 77 kL-oe. Furthermore, the government announced on 23rd September, 2009 that Japan will aim to reduce GHG emission by 25% by 2020 compared to the 1990 level.

(2) Promotion of energy conservation measures

1) Financial support of energy conservation equipment and systems

To promote energy conservation equipment, investment in industry and commerce, loan programs have been established (low interest loans by Japan Finance Corporation) by the Law

for Energy Conservation and Recycling Support. Additionally, tax reduction measures and the subsidy programs are provided by the government.

2) Acceleration of development and practical application of energy conservation technologies

To technologically ensure the practice of energy conservation in future, the R&D of technologies concerned with energy conservation has been promoted under the cooperation among industries, the government, and academy.

3) Formulation and application of guidelines based on the Energy Conservation Law

(a) Industrial sector: Guidelines for factories etc. such as standards of judgment and target value for operating equipment, etc.

(b) Transportation sector: Fuel consumption standards for automobiles and trucks.

(c) Commercial/residential sector: Standards of judgment for buildings and appliances

4) Raising people's awareness of energy conservation by publicity activities

(a) Being thoroughly informed of various measures by the Council for Promotion of Energy and Resources Conservation Measures, such as "Energy conservation campaign in summer and winter."

(b) Preparing and distributing posters and pamphlets, holding symposiums and offering information through mass media.

2.2 Basic Energy Plan

In June 2010, the government released a revised Basic Energy Plan. This revised plan lays out specific measures covering the next approximate 20 years, through 2030, on the premise that far-reaching reforms in the energy supply/demand structure as well as social systems and lifestyles are essential in order to respond appropriately to the resource limitations and environmental constraints in the medium to long term. The measures related to energy conservation are described below.

<Basic Perspective>

The energy supply and demand structure must be reformed further in order to strengthen energy security, address global warming and at the same time achieve economic growth centered on energy. The government must work closely with citizens, business operators and local public bodies and proceed with consideration for the unique attributes of individual sectors.

(1) Industrial sector

To maintain and reinforce the world's highest standard of energy-conserving and low-carbon technology, the introduction of current cutting-edge technology will be encouraged when equipment is replaced, and the Energy Conservation Law will be more stringently enforced. In addition, applications for innovative technologies (such as environment-friendly iron manufacturing processes), a fuel shift to gas using highly-efficiency facilities, the use of cogeneration, and the development and introduction of next-generation heat pump systems will be promoted.

(2) Residential sector

CO_2 generated by energy use has increased 35% since 1990 as a result of an increase in home appliances and a rise in the number of households. Measures targeting the residential sector are intended to spread the use of energy conservation equipment through research and development

into such equipment as well as support for the adoption of global cutting-edge energy conservation equipment and the Top Runner Program in the Energy Conservation Law. In addition, the use of high-efficiency home appliances and lighting, high-efficiency water heaters, and solar power generators and the mandated adoption of energy conservation standards for houses would promote the spread of ZEH (net zero energy houses). The policies also aim to jumpstart citizen campaigns such as awareness reforms targeting citizens and lifestyle shifts through the increased use of smart meters to cut in half CO_2 generated by energy consumed in day-to-life (residential sector) by 2030.

(3) Business sector

CO_2 generated by energy use has increased about 40% since 1990 as a result of the adoption of IT in offices and an increase in floor space. The spread of net zero energy buildings (ZEB) will be promoted by carrying out research and development aimed at improving the efficiency of IT equipment and lighting, reinforcing and mandating energy conservation standards for buildings, and giving incentives for the adoption of energy conservation equipment and high-efficiency air conditioners with the aim of achieving substantial reductions in CO_2 generated by energy use.

(4) Transportation sector

In addition to measures targeting vehicles on a stand-alone basis, a comprehensive approach will be taken that includes the development of infrastructure such as battery chargers, measures to optimize the flow of traffic such as Intelligent Transportation Systems (ITS), fuel measures, measures to improve approaches to use such as citizen efforts in eco-drives, and the greater efficiency of commodity distribution. Specifically, this Plan aims to popularize next-generation vehicles through an integrated deployment of measures including supply-side measures (support for research and development, fuel regulations, etc.) and demand-side measures (subsidies, tax systems, etc.). In addition, fossil fuel consumption will be reduced by encouraging modal shifts.

(5) Cross-cutting measures

In addition to the aforementioned stand-alone measures, next-generation energy and social systems will be developed in affiliation with city and transportation policies, as well as urban planning, for broad-scale energy use and the utilization of renewable energy.

2.3 National Strategies and Plans

(1) New National Energy Strategy

In May 2006, Japan declared the “New National Energy Strategy” which specified five featured fields that would be the focus for the future energy security. This includes energy efficiency and conservation policy with specific measures and targets setting the 2030 targets of 30 % energy efficiency improvement. Listed measures include:

1) Establishment of a state-of-the-art energy supply-demand structure, with the aim to reduce oil dependence level to less than 40% by 2030, from the current level of approximately 50%. Measures to address this aim include:
   (a) Energy Conservation Frontrunner Plan
   (b) Transport Energy for the Next Generation Plan
   (c) New Energy Innovation Plan
   (d) Nuclear Power National Plan
2) Comprehensive Strengthening of Resource Diplomacy and Energy and Environment Cooperation, by means of:

(a) Comprehensive Strategy for Securing Resources
(b) Asia Energy and Environment Cooperation Strategy

3) Enhancement of Emergency Response Measures such as the revision and strengthening of the oil stockpiling system and preparation of the emergency response system for natural gas.
4) Other: In order to promote cooperation between the public and private sectors, technological challenges to be solved by 2030 will be summarized in the energy technology strategy.

(2) Energy Conservation Frontrunner Plan

In order to secure the country's energy security, the "New National Energy Strategy" was formulated. This strategy sets out the strategy toward 2030 in the area of energy conservation, transport energy, new energy, nuclear energy, etc. In this strategy, the plan called "Energy Conservation Frontrunner Plan" was set. In the "Energy Conservation Frontrunner Plan", as a means to improve energy efficiency more than 30% by the year 2030, it states that a virtuous circle of technological innovation and a social system will be established, setting an strategy for energy conservation technology that has a look over the future and the developing and dissemination of the benchmarking approach (with this approach, energy conservation effect can be quantitatively verified). Based on this plan, the "Energy Conservation Technology Strategy" was formulated with the prospective target of recognizing the energy conservation technology as Japan's "source of the industrial competitiveness" in the international society and achieving the respected status of the "World No.1 Country of Energy Conservation" by overcoming the restrictions of resources and environment toward 2030.

(3) Energy Conservation Technology Strategy

The "New National Energy Strategy (May 2006)" and "Basic Energy Plan (March 2007)" specified that the "Energy Conservation Technology Strategy" should be formulated. They specified that, in the strategy, issues to be solved by technology should be identified and a roadmap regarding technology development to solve these issues should be formulated. In the "Energy Conservation Technology Strategy", under the recognition that technology development in the energy field needs both the long term lead time and the long lasting efforts between public and private, energy technology expected to be commercialized were identified and classified as follows in the five items per each policy target:

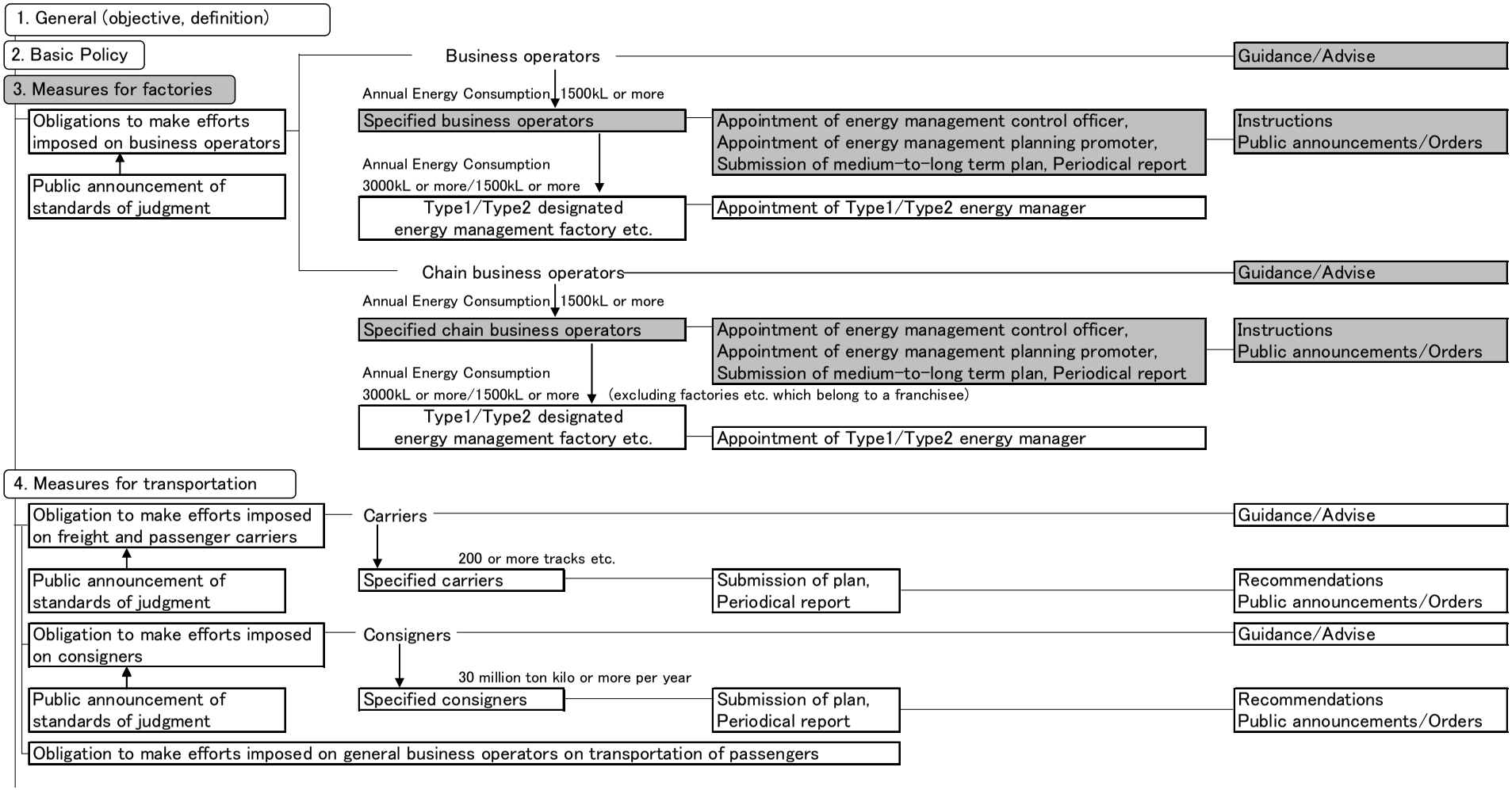
1) Total energy efficiency improvement
2) Fuel diversification in the transportation sector
3) Development and promotion of dissemination of new energy
4) Promotion of nuclear energy and securing the safety
5) Security of supply of fossil fuels and utilization of effective and clean use of them

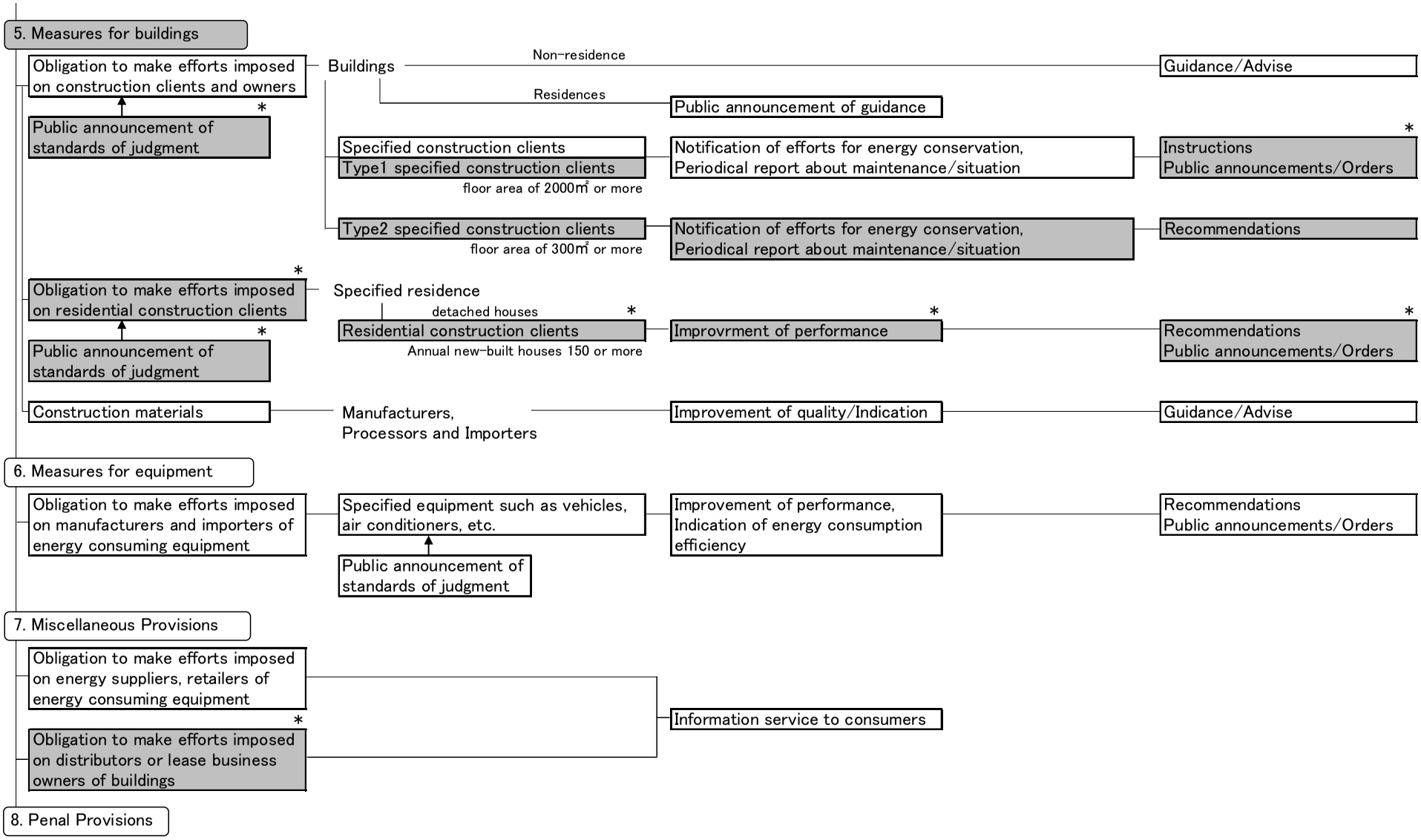
Based on these concepts, "Technology map", "Roadmap", and "Introduction Scenario" were made.

In the energy conservation technology development, integration of various seed technologies is important. Especially, to generate a radical technology, cooperation between actors which should not be restricted in each business category and field of study. To this effect, toward 2030, for the purpose of promoting the energy conservation technology development that takes into consideration of societal system change and the emergence of the synergy effect resulted from the mutual cooperation in technology development, five important technology fields were identified for the purpose of the development and dissemination in the form of a roadmap.

2.4 Law Concerning the Rational Use of Energy

The Law Concerning the Rational Use of Energy (Energy Conservation Law) was enforced on 1 Oct. 1979, and revised six times until now. The latest revision was promulgated on 30 May 2008 and enforced partly on 1 April 2009 and wholly on 1 April 2010. The latest structure of the law is as below. (For the chronicles of revisions of the Energy Conservation Law, refer to Page 18.)





Note) [ ] were amended on 30 May 2008. The parts with * and without * were enforced on 1 April 2009 and 1 April 2010, respectively.

(1) Objective

This law aims to contribute to the sound development of the national economy through implementing necessary measures for the rational use of energy in factories, buildings, transportation, and machinery and equipment, and other necessary measures to comprehensively promote the rational use of energy, while it seeks to ensure the effective utilization of fuel resources that would meet the economic and social environment of energy at home and abroad.

(2) Energy defined by the law

The term "energy" in this law means fuels such as oil, flammable natural gas, and coal, as well as heat and electricity produced by using such fuels (excluding electricity generated by the renewable energy such as photovoltaic cells, wind power, etc.).

(3) Basic policies and obligations of energy users

The Minister of Economy, Trade and Industry (METI) is to establish and announce fundamental policies aiming at comprehensive promotion of the rational energy utilization in respective fields. The main energy users in each field have to take into account of the fundamental policy and make efforts to rationalize their energy use. This is to comprehensively promote the rational use of energy through the systematic formulation and the public announcement of the basic matters pertaining to the measures to promote the rational energy utilization.

(4) Measures for factories etc.

Japan's final energy consumption in the industrial sector and commercial/residential sector accounts for as much as 75% of the total energy consumption. More proactive actions to promote the rational energy utilization in factories and business premises are needed and then the Energy Conservation Law was revised in May 2008. This revised law newly defined "Specified Business Operators" and "Specified Chain Business Operators and largely expanded the regulatory coverage of total energy consumption in the commercial sector from approximately 10% to 50%.

1) Standards of judgment for business operators

METI is to establish and announce the subject of standards of judgment regarding the measures to be taken deliberately in order to achieve the goals towards the rationalization of fuel combustion, utilization and recovery of waste heat, prevention of electricity loss by resistance etc, and the relevant goals: the subject of standards of judgment are targeted to those who conduct business activities and utilize energy in their factories, offices or other workplaces (hereafter referred to as factories etc.) and are purposed that the rational utilization of energy in factories etc. would be implemented appropriately and effectively. (Refer to Appendix 2.1 "Standards of Judgment for factories etc. on Rational Use of Energy" and Table: "Standards and Target Values for Operating Equipment in Factories etc.")

These standards of judgment present themselves as a set of guidelines for the individual and concrete measures about the basic matters stated in the basic policy and to guide business operators to judge and conduct appropriate and effective implementation of the rational energy utilization in factories etc.

2) Guidance and advice

The competent minister (METI and other minister(s) responsible for the programs of the relevant factories etc.) may provide business operators with guidance and advice about the rational energy use with the consideration of the things concerning the standards of judgment when judged necessary by the minister.

3) Specified Business Operators

Companies who have and run factories or workplaces of which total energy consumption amounts to over 1,500kL are designated as “Specified Business Operators”

4) Specified Chain Business Operators

Chain business operators such as convenience stores or restaurants who have and run factories, workplaces or member stores of which total energy consumption amounts to over 1,500kL are designated as “Specified Chain Business Operators”

“Specified Business Operators” and “Specified Chain Business Operators” are obliged to prepare and submit a mid-to-long term plan, and report annually the status of their energy utilization to the competent minister. Also they have to appoint an “Energy Management Control Officer”, who may be selected from board members having a voice in the business operation, and an “Energy Management Planning Promoter”, who needs to finish the designated energy management seminars or to be a qualified energy manager. The energy management planning promoter will assist the energy management control officer practically.

5) Type 1 Designated Energy Management Factories

Factories or workplaces which consume large amount of energy (the total consumption of fuel and electricity is 3,000 kL or more per year in crude oil equivalent) and the buildings are designated as “Type 1 Designated Energy Management Factories” from the view point that the rational energy utilization has to be promoted. The designated criteria were amended and reinforced in April, 2006. The “Type 1 Designated Energy Management Factories” are obliged to appoint either “*Type 1 Energy Managers” or “**Type 2 Energy Managers” depending on the industrial category to promote energy management in workplaces.

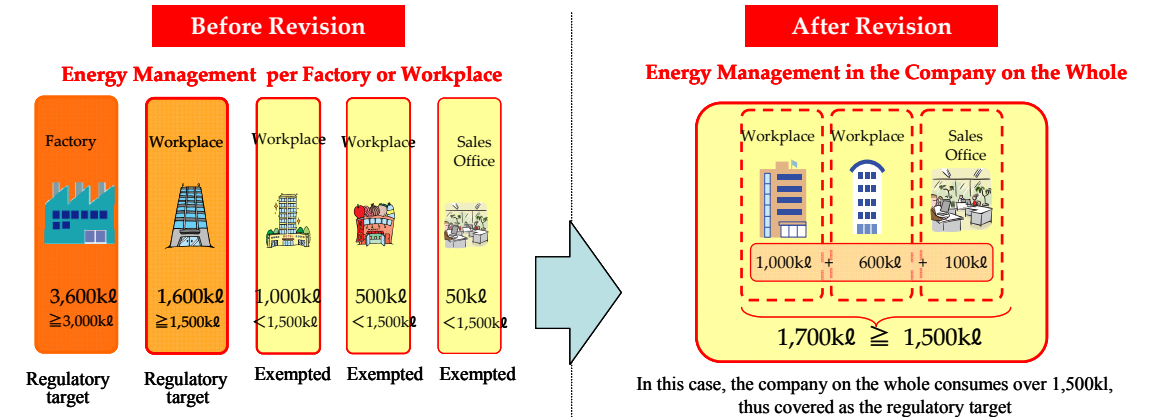
6) Type 2 Designated Energy Management Factories

A factory whose energy consumption is a medium scale (the total consumption of fuel and electricity is 1,500 kL or more per year in crude oil equivalent) have to promote the rational use of energy in the same way as “Type 1 Designated Energy Management Factories”. Those factories are designated as “Type 2 Designated Energy Management Factories”. The law prescribes that “Type 2 Designated Energy Management Factories” are obliged to appoint “Type 2 Energy Managers” to promote energy management in workplaces.

*The “Type 1 Energy Managers” must be selected from qualified license holders for energy management by the government. (Regarding “Certified energy manager system”, refer to the item 9) in Page 14.)

**The “Type 2 Energy Managers” must be selected persons who finished the designated energy management seminars or who are qualified energy managers.

The comparison of regulatory target before and after revision in 2008

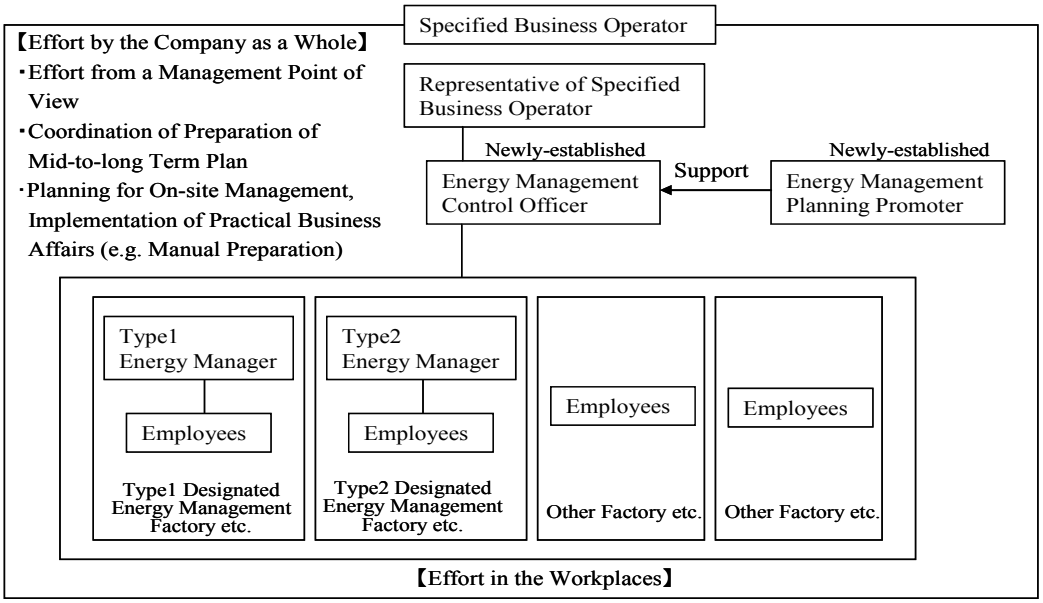


[Energy management system]
➢Energy managers are selected for each designated energy management factory.
[Plan settlement and report]
➢Each Type1 designated energy management factory should submit medium-to-long term plan.
➢Each designated energy management factory should submit regular report.

[Energy management system]
- ➢ Energy management control officer is selected from executives.
- ➢ Energy management planning promoter to support energy management control officer is selected.
- ➢ Energy managers are selected for each designated energy management factory.

[Plan settlement and report]
- ➢ Submission of medium and long-term plan and periodical report by each company.

The condition and role of each key person for energy management after revision in 2008



Energy Management Control Officer

Condition : According to the law, the position shall be filled with a person who supervises and manages the implementation of the business (executive-level employee). It means the person shall implement energy management for a company as a whole with a bird's eye view.
Role : 1. Promotion of efforts with management perspective 2. Coordination of mid-to-long term plan
3. Planning for on-site management, implementation of practical business affairs

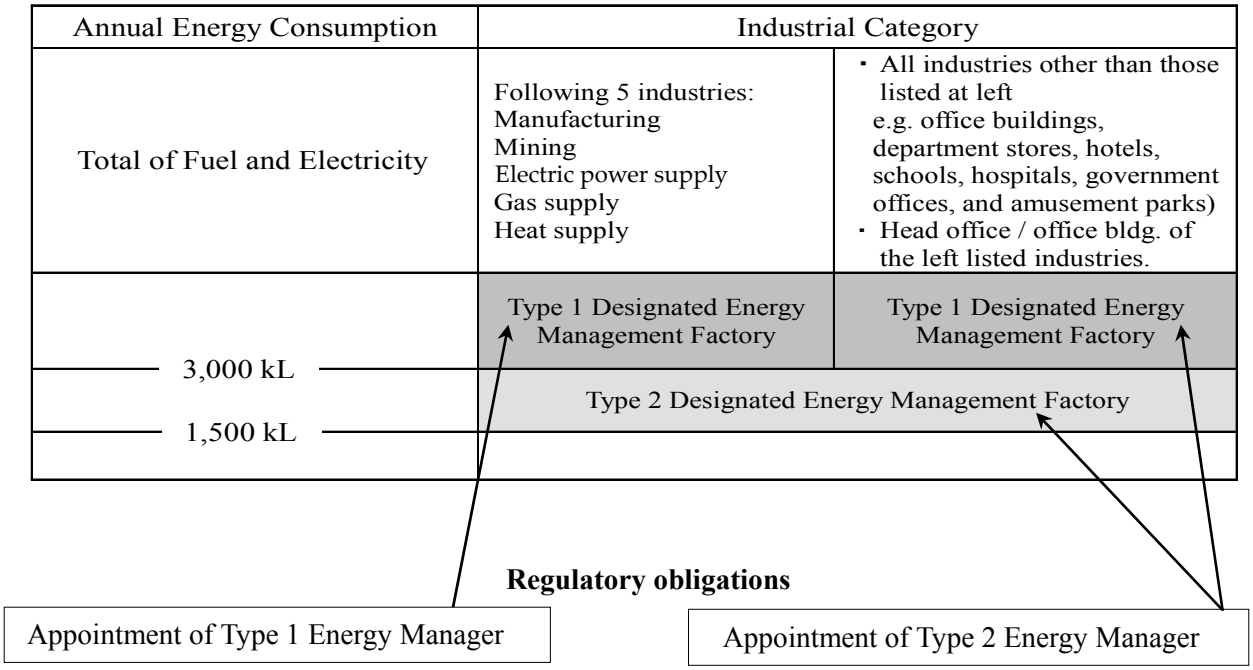
Energy Management Planning Promoter

Condition : A person who has completed training courses concerning energy management or who has a qualified energy manager's license.
Role : Practical assistance for an energy management control officer

Type 1 Energy Manager and Type 2 Energy Manager

Condition : Same as before the revision
Role : Same as in the law before the revision, they shall implement management in the workplaces such as designated energy management factory. Also, they shall collaborate with an energy management control officer and energy management planning promoter to implement systematic efforts based on management judgment and to take effective measures for energy conservation for a company as a whole.

7) Category of designated energy management factory



8) Number of Type 1 energy managers required by the law

Type 1 Designated Energy Management Factories (Coke Manufacturing, Electricity, Gas and Heat supply)

Annual Energy Consumption	Number Required
3000 or less than 100,000 kL-oe	1
100,000 kL-oe or more	2

Type 1 Designated Energy Management Factories (Mining and Manufacturing other than Coke)

Annual Energy Consumption	Number Required
3,000 or less than 20,000 kL-oe	1
20,000 or less than 50,000 kL-oe	2
50,000 or less than 100,000 kL-oe	3
100,000 kL-oe or more	4

9) Certified energy manager system

The Type 1 Energy Managers must have a qualified energy manager's license.

A license is awarded to a person who has passed the examination for qualified person for energy management or who has been authorized by the Minister for Economy, Trade and Industry upon completing a qualification course of qualified person for energy management. This certification process works as follows:

(a) Examination of qualified person for energy management

a) Prerequisites : None

b) Examination subjects

Examinees have to take No1 subject as [Requisite] and No2-4 subjects by choosing a set of [Heat] or [Electricity].

[Requisite]

1 Comprehensive energy management and laws/regulations

[Heat]		**[Electricity]**
2 Basics of flow of heat and fluid		2 Basics of electricity
3 Fuels and combustion	**Choice**	3 Electric equipment and machinery
4 Heat utilization equipment and their management		4 Power application

c) Application destination

Examination Department, Energy Management Examination and Training Center, the Energy Conservation Center, Japan

d) Examination date and sites

The examination is held in August every year and at 10 locations in the whole country.

e) Announcement of successful applicants

The examinee's number who passes the examination will be announced on the Official Gazette

f) Issue of certificate

Examinees who pass the examination first submit an application of a credential to the Minister for Economy, Trade and Industry. The issuance of a certificate requires a year or more of practical experience in the rational use of energy.

(b) Qualification course of qualified person for energy management

a) Contents of course

i) Lecture

ii) Examination

b) Prerequisites

At least three years of practical experience in the rational use of fuel/electricity.

c) Course period and sites

The course is held for 7 days in December in every year at six locations in the whole country.

d) Application destination

Training Department, Japan Energy Management Examination and Training Center, The Energy Conservation Center, Japan

(5) Measures for buildings

Most of the energy consumed in the civil sector is used in buildings. The measures focusing on the insulation of buildings are highly effective for the rational use of energy. The law provides the following rules for rational energy use in the field of buildings.

1) Obligations of building owners

Construction clients (those who intend to construct or modify buildings) and owners of buildings must take appropriate measures to prevent heat loss through external walls, windows, etc. and to utilize efficiently the energy for building facilities such as air conditioners, mechanical ventilation systems, lighting, water heaters and elevators, with the basic policies in mind, in efforts to contribute to the rationalization of energy use in the building.

In order to ensure proper and effective implementation of such measures, the Minister of Economy, Trade and Industry and the Minister of Land, Infrastructure and Transport are to establish and announce standards which building owners should refer to in making decisions for rationalizing energy use in their buildings. The new standard for the buildings (excluding residences) was announced on 30 January, 2008. (Refer to Appendix 2.2 “Standards of Judgment for Buildings on Rational Use of Energy”.) The new standard for houses was announced on 30 January, 2008.

2) Guidance and advice

The competent authorities (Local (prefecture) authority with district construction surveyors and governing authorized construction procedures) may, when necessary, give necessary guidance and advice on building design and construction to the building owners other than residences while taking into account the standards of judgment which the building owners should refer to in making decisions. In addition to these rules, the Minister of Economy, Trade and Industry may give manufacturers of insulation and other construction material necessary guidance and advice for improving the insulation properties of their construction materials to ensure the improvement of the quality of insulation materials, which constitute a basic element in improving the total insulation capability of buildings. For residences, the Minister of Land, Infrastructure and Transport is to establish and announce guidelines for their design and construction in accordance with the criteria which construction clients and building owners should refer to in making decisions.

3) Instructions for specified buildings

Under the revision of the Energy Conservation Law in May 2008, buildings having a total non-residence floor area of “2000m^2 or more” and “300m^2 or more to less than 2000m^2 ” are designated as “Type 1 Specified Buildings” and “Type 2 Specified Buildings”, respectively in order to largely expand the regulatory coverage in the building sector.

Construction clients and owners (Specified Construction Clients, etc.) who intend to construct or extensively modify “Type 1 Specified Buildings” or “Type 2 Specified Buildings” are obliged to

submit notification of energy-saving measures to the competent authorities before the start of construction. In addition, after the completion of construction or modification, the Specified Construction Clients, etc. who submitted the abovementioned notification are obliged to submit periodical reports on maintenance of buildings with respect to energy-saving measures.

When the competent authority finds energy-saving measures for "Type 1 Specified Buildings" to be significantly insufficient in consideration of the criteria, the authority will instruct them for improvement. When the Specified Construction Clients, etc. do not follow the authority's instruction for improvement on the measures described in the notification, the authority will announce to the public the name of the owner in question or order them to follow the instruction.

Also, when the competent authority finds energy-saving measures for "Type 2 Specified Buildings" to be significantly insufficient in consideration of the criteria, the authority will advise them for improvement.

(6) Measures for equipment

Automobiles, air-conditioners, and other equipment require large amounts of energy, which are mostly purchased after systematically produced in large quantities. For the rational energy use of such equipment, it is important to call for consumers to act on energy conservation effort in the use, but a more drastic way is to improve the energy efficiency at a production stage. Based on this idea, the law provides for various following rules in the use of equipment.

1) Obligations of manufacturers

Those who produce or import energy consuming equipment have to, with the basic policies in mind, ensure the rationalization of energy consumption concerning the equipment by improving the energy efficiency of the equipment which they produce or import. For automobiles and other equipment as specified in the Government Ordinance, the Minister of Economy, Trade and Industry (and also the Minister of Land, Infrastructure and Transport for automobiles) is to establish and announce standards for energy efficiency improvement which manufacturers must refer to in making decisions. The Minister of Economy, Trade and Industry (and also the Ministry of Land, Infrastructure and Transport for automobiles) may give necessary recommendations to manufacturers and importers when the government finds a considerable improvement is needed for their specific products in view of the standards which they must refer to in making decisions, provided that the production or import volume for such products exceed a certain level (for example, more than 2,000 automobiles per year, or more than 500 air conditioners per year).

Target standard values are set based on the product in the market having the highest energy efficiency of all the products of the same group. ("Top Runner Program")

The years when each of the specified equipment was designated are as follows:

1 April 1999	: Gasoline and diesel passenger vehicles, Air conditioners, Fluorescent lights, TV sets, Copying machines, Computers, Magnetic disk drives, Gasoline-fueled and diesel powered freight vehicles and Video cassette recorders
22 December 1999	: Electric refrigerators, Electric freezers

27 December 2002 : Space heaters, Gas cooking appliances, Gas water heaters, Oil water heaters, Electric toilet seats, Vending machines, Transformers
15 July 2003 : LPG passenger vehicles (This is categorized in the passenger vehicles.)
1 April 2006 : Microwave ovens, Electric rice cookers, DVD recorders
1 July 2009 : Routers, Switching units

2) Labeling

Equipment described above is obliged to be marked to show its "energy consumption efficiency" to help consumers selectively purchase highly efficient equipment. The Minister of Economy, Trade and Industry (and also the Minister of Land, Infrastructure and Transport for automobiles) is to establish the labeling procedures to be followed by manufacturers etc. concerning "energy consumption efficiency", labeling method, and other matters to be observed in labeling for each item of specified equipment, and is to issue a notification of them.

If the minister(s) deem(s) that the labeling does not conform to the notification, he (they) can give a recommendation to the manufacturer, etc., and if the manufacturer, etc. does not comply, the minister(s) can announce to that effect and give an order to take an action conforming to the recommendation.

(7) Measures for transportation

In the transportation sector, which has showed a significant increase in energy consumption during recent years, the Energy Conservation Law had been imposed only on automobile fuel improvement. However, under the Revised Energy Conservation Law enacted in April 2006, new obligations were imposed on carriers (freight, passenger) and consigners.

Carriers which own 200 or more trucks, 300 or more trains, and so on (Specified carriers) are obliged to submit mid-and-long term plan and periodic report of the state of energy use to the Minister of Land, Infrastructure and Transport once a year.

Also, consigners which transport 30 million ton kilo or more per year (Specified consigners) are obliged to submit mid-and-long term plan and periodic report of the state of energy use to the Minister of Land, Infrastructure and Transport once a year.

In both cases, when the authority finds that efforts are significantly insufficient or intensity has not been improved, advice is given to take proper measures. If the advice is not followed, the authority will announce to the public the name of the carrier or consigner in question or order them to follow the advice.

(8) Amendment of the law concerning the rational use of energy

The 1979 law was amended and reinforced in 1983, 1993, 1998, 2002, 2005 and 2008. In the amended version promulgated in May 2008, energy conservation measures were strengthened in both the commercial sector including offices, convenience stores, etc. and household sector.

The chronicles of revisions of the law are shown in the following table.

Chronicles of Revisions of Energy Conservation Law

	Promulgation Date	Effective Date	Summary of Legislation and Measure Revisions	Note
Legislation	June 1979	Oct. 1979	1. Provides specific criteria (guidelines) for energy conservation regarding factories, buildings, equipment. 2. Obliges designated energy management factories whose energy consumption is very large to appoint energy managers and record energy utilization. 3. Establishes a new test scheme to qualify energy managers.	1. Thorough energy conservation initiatives were required after the oil crises. 2. Designated energy management factories count 3,000.
Revision (1)	Dec. 1983	Dec. 1983	1.Streamlines the process of license approval and issuance（transfers clerical work to the private sector）.	1. ECCJ starts the examination and training scheme for energy managers in 1984.
Revision (2)	March 1993	April 1993	1. Guarantees the implementation of energy conservation efforts. 2. Adopts a mandatory periodic report to be made by the designated energy management factories.	2. The '92 Earth Summit raised concerns over global environmental issues.
Revision (3)	June 1998	April 1999	1. Adopts the Top Runner program (to strengthen measures for the residential and commercial sector） 2. Obliges the type 1 designated energy management factories to submit a medium- to long-term plan. 3. Creates a new category as to the type 2 designated energy management factory.	3. The amendment of long-term prospect on energy supply and demand（1994）

	Promulgation Date	Effective Date	Summary of Legislation and Measure Revisions	Note
Revision (4)	June 2002	April 2003	1. The category of the type 1 designated energy management factory that had targeted five manufacturing industries was expanded to all industries. 2. Obliges the type 2 designated energy management factories to make periodic reports. 3. Obliges the designated buildings to report energy conservation measures.	1. Strengthens measures for the commercial sector being on the remarkably increasing trend in energy demand.
Revision (5)	August 2005	April 2006	1. The regulatory divisions of heat and electricity for factories and offices are abolished and integrated into a single amount of energy (to expand the designated energy management factories). 2. Strengthens energy conservation measures for residential buildings and construction sector. 3. Additional three products of the Top Runner program were designated to include microwave ovens, electric rice cookers, and DVD recorders. 4. New obligations imposed on consigners and carriers (cargoes and passengers) for the transportation sector. 5. Obliges energy suppliers and equipment retailers to make efforts to promote and disseminate energy-saving information.	1. Additional measures are necessary to achieve the GHG reduction target required by the Kyoto Protocol.

	Promulgation Date	Effective Date	Summary of Legislation and Measure Revisions	Note
Revision (6)	May 2008	Partly in April 2009 Wholly in April 2010	1. Industry, Commercial Sectors ・Introduces a system for energy management obligation per whole enterprise. ・Treats a franchise chain such as convenience stores and restaurants also as a single enterprise, and applies the same regulation per enterprise. (Though the adoption of these measures, energy conservation measures will be reinforced not only in factories on manufacturing but also in business sectors such as offices of enterprises, convenience stores, etc.) 2. Buildings, Houses ・Strengthens measures for large residences and buildings (introduction of orders in addition to instructions and notices). ・Adopts a report on energy-saving methods by owners of small- to medium-sized residences and buildings above a certain size. ・Adopts energy-saving measures by businesses engaged in the construction and sales of residences (recommendations and orders for those who are engaged in the construction and sales of a large number of residences). ・Promotes of indication of the energy saving performance of residences and buildings.	1. Strengthens measures for the commercial sector including offices, convenience stores, etc and household sector.

2.5 Financial Supporting Measures

The financial supporting measures are provided to accelerate the introduction of energy efficient technologies and equipment in the industrial and commercial sectors.

(1) Loan program with special interest rate (FY 2010)

This program is based on "Law for Energy Conservation and Recycling Support" and was revised in 2008 to apply only to small and medium-sized enterprises.

1) Energy conservation facilities (Financing Institution: Japan Finance Corporation (Operations Aimed at Small and Medium-sized Enterprises, Operations Aimed at Micro Business and Individuals))

Target recipients	Available funds	Financing percentage*[1]
< Energy conservation equipment > Enterprises which install energy conservation equipment (including those which lease or rent energy conservation facilities based on ESCO projects)	Funds required to acquire energy conservation equipment*[2(1)]	Up to 270 million yen <special interest rate II> Over 270 million yen <standard rate>
< Enterprises leasing energy conservation equipment > The leasing enterprises or rental companies which purchase energy conservation equipment	Funds required to acquire mechanical self-running equipment for works*[2(2)]	Up to 270 million yen <special interest rate II> Over 270 million yen <standard rate>
< Specific high energy performance equipment > Enterprises which plan to install specific high-performance energy consumption equipment and others	(1) Funds required to install specific high-performance furnace and boiler (2) Funds required to install specific additional equipment which enhances the performance of the current equipment to the level of a high-performance furnace or boiler	Up to 270 million yen <Special energy conservation interest rate B> Over 270 million yen <standard rate> ・Interests are subsidized from Energy Special Account

*[1] Financing percentage is the rate defined by Japan Finance Corporation, Operations Aimed at Small and Medium Enterprise. For the financing percentage applied by JFC, Operations Aimed at Micro Business and Individuals, please contact the appropriate client service.

*[2] Equipment items are limited to those listed below and satisfy the following conditions.

・Newly acquired equipment should improve energy efficiency by more than 25% compared to existing average equipment.

・In the case of replacement of equipment, newly acquired equipment should improve energy efficiency by more than 40% compared to the replaced equipment.

(1) Subject equipment includes 52 items such as heat pump type heat source equipment, waste heat boilers, energy saving type industrial furnaces, and cogeneration systems.

(2) Subject equipment includes 11 items such as excavating machines, compacting machines, tractors, and foundation work machines.

Additionally, there are categories for “subject equipment related to non fossil energy” and “subject equipment related to Eco-Action 21* or reduction of greenhouse gas emission” in this loan program.

*Eco-Action 21 is a certification and registration scheme based on the guidelines for environmental management, actions and report, which was established by the Ministry of the Environment.

2) Finance conditions [*1]

Financing limit	Direct loan[*2]	720 million yen	
	Alternate loan[*2]	120 million yen	
Financing percentage	Refer to the rate specified by the concerned financing		Predefined rate is applied based on the credit risk and financing period.
Financing period	Less than 15 years (of which 2 years are designated as a grace period)		

[*1] These finance conditions are those defined by Japan Finance Corporation, Operations Aimed at Small and Medium Enterprise. Operations Aimed at Micro Business and Individuals accommodate only the direct loans and the special financing limit is 72 million yen. For the details on the conditions for finance, please contact the client service of the appropriate financial institutions.

[*2] Direct loans are loans which should be applied directly at the window of financing institutions. Alternate loans are those which are applied through the applicant’s financial agency.

(2) Tax incentives program (FY 2010)

This program is based on “Tax System Promoting Investment in the Reform of the Energy Supply and Demand Structure”. When business operators purchase the equipment which contributes to efficient energy use and utilize it for their business activities within a year, they can choose either one of the following options:

1) Tax exemption is equivalent to 7% of the equipment acquisition cost and that applies only to small and medium sized companies. However, if the tax exemption is equivalent to 20% or more of the corporate tax of the fiscal year, the limit of the tax exemption will be 20%.

2) Special depreciation of 30% of the equipment acquisition cost in the year of acquisition, in addition to ordinary depreciation and that applies to all companies including large sized companies.

• Energy-conserving equipment: Equipment for general industries 74 units

(3) Subsidy program (FY2010)

This program is prepared by the government for those who will introduce energy conservation facilities, projects and technologies.

Implementing Organization	Project name		Granted persons			
			Local public authority	NPO, etc	Companies	Individual, etc
New Energy and Industrial Technology Development Organization (NEDO)	・Projects for formulating visions of regional energy conservation etc.		●	▲	▲	–
	・Projects for supporting business operators promoting the rational utilization of energy		●	●	●	▲
	・Projects for supporting the introduction of energy conservation measures		–	●	●	–
	・Projects for promoting the introduction of high-efficiency energy systems into homes and buildings	for homes	●	●	●	●
		for buildings	●	●	●	●
		for supporting the introduction of BEMS	●	●	●	●
		for supporting the introduction of high-efficiency water heaters	●	●	●	●
	・Projects for promoting the energy supplier-led collaboration of comprehensive energy conservation (for buildings)		●*1	–	●	–
Japan Electro-Heat Center	・Projects for promoting the introduction of high-efficiency water heaters (Eco Cute)		All types of industries including household			
	・Projects for promoting the introduction of high-efficiency air conditioning equipment		Private business operators (commercial sector) etc. who introduce high-efficiency air conditioning equipment (including local governments)			
Toshi-gas Shinko Center	・Support projects for promoting natural gasification of energy-intensive facilities		All types of industries			
	・Projects for disseminating the introduction of high-efficiency water heaters (town gas)		Individuals and private business operators etc. who introduce high-efficiency water heaters			
	・Model projects for the introduction of area energy network of natural gas type		Business operators who introduce this system into buildings (including local governments)			
The Conference of LP Gas Associated Organizations	・Projects for supporting the introduction of high-efficiency water heaters (LP gas)		Individuals and private business operators etc. who introduce high-efficiency water heaters			
Petroleum Association of Japan (PAJ)	・Subsidy system for supporting the introduction of high-efficiency water heaters (Eco Feel)		Individuals and private business operators who introduce high-efficiency water heaters			

▲ : applied to a part of projects.

*1 : For photovoltaic etc. generation system, the upper limit is one-quarter of subsidy for other than photovoltaic etc. generation system.

2.6 Awarding Programs toward Energy Conservation Efforts

There are various awarding and awareness raising programs on the rational use of energy as follows.

1) "Awarding of Excellent Energy Conservation Manager"
   An award certificate is given to individuals who have long been pursuing energy management and contributed to efficient energy management. (Sponsored by METI)
2) "Awarding of Excellent Energy Conservation Factory & Building"
   An award certificate is given to factories or business facilities that have long made efforts to rationalize the energy use, have long been pursuing energy management and contributed to energy management as acknowledged as a paragon of successful energy management. (Sponsored by METI)
3) "Awarding of Successful Cases of Energy Conservation in Factory & Building"
   The winner of the contest is determined based on how well the technology or the procedures will be developed based on theoretical grounds and elaborate research and can contribute to the further promotion of energy conservation. (Sponsored by METI)
4) "Awarding of Excellent Engineer of Energy Conservation"
   An award certificate is given to individuals who have long played a central role and contributed to promoting the efficient energy managements. (Sponsored by ECCJ)
5) "Awarding of Excellent Technician of Energy Conservation"
   An award certificate is given to individuals who have long provided efforts to the energy management service and contributed to promoting the efficient energy management. (Sponsored by ECCJ)
6) Awarding of Energy Conservation Poster Contest and Essay Contest for elementary and junior high school students (Sponsored by METI)
7) Awarding of Excellent Energy Conservation Equipment[1]
   An award certificate is given to companies or teams for their commitment to promoting the efficient use of energy. The commitment to the global environment and security can be a crucial variable for judging. (Sponsored by JMF[2])
8) Energy Conservation Grand Prize for Excellent Energy Conservation Equipment
   Awarded to equipment, resources or systems all high in energy conservation which have already or likely to be in the market, the prize has three targets: i) home-use, ii) commercial use, and iii) automobiles. Energy efficiency, originality, and marketability are factors for judgment. (Sponsored by METI)
9) Awarding of "Top Energy Efficient Product Retailing Promotion Store". (Sponsored by METI)
10) Awarding of "Excellent ESCO projects". (Sponsored by METI)

The awarding ceremony is held in February and prize certificates are conferred by the Minister of Economic, Trade and Industry, the Director-General of the Agency of Natural Resources and Energy, the President of Energy Conservation Center, Japan, etc.

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[1] "Energy Conservation Equipment" represents, i) devices, facilities and systems in addition to "equipment" in general sense, ii) measuring instruments remarkably contributing to energy conservation, iii) equipment that exploits unutilized resources such as wastes.

[2] JMF = The Japan Machinery Federation

2.7 Publicity Activities

In order to promote energy conservation as a nationwide activity, the government has established "Energy Conservation Day" on the 1st of every month, "Energy Conservation Month" in February and "General Check-up Day for Energy Conservation" on the 1st of August and December. Educational and publicity activities are conducted in cooperation with the local governments and private companies. In those designated days and months every year, various kinds of campaign activities are held nationwide for promotion of energy conservation. Especially ENEX (Energy & Environment Exhibition) which is one of the biggest comprehensive exhibitions in Japan regarding energy efficiency and conservation is held in "Energy Conservation Month" every year in February in Tokyo.

2.8 Energy Audit Program by ECCJ

Several audit experts make an interview with the persons in charge about the management standards for the factory or building which is going to have an energy audit. Then, they make an on-site survey how the facilities in the factory or building are operated. After the survey, they draw up a list of areas which need remedies and give advice for energy saving potential and needed actions. This energy audit program is conducted free of charge by the Energy Conservation Center Japan.

(1) Energy audit for factories

The total number of factories which received the energy audit service is 3,528 from FY1998 to 2009.

The target factories are ones in the category of "Type 2 Designated Energy Management Factories" by the Energy Conservation Law and undesignated factories whose annual energy consumption is 100kL or more of crude oil equivalent.

(2) Energy audit for commercial buildings

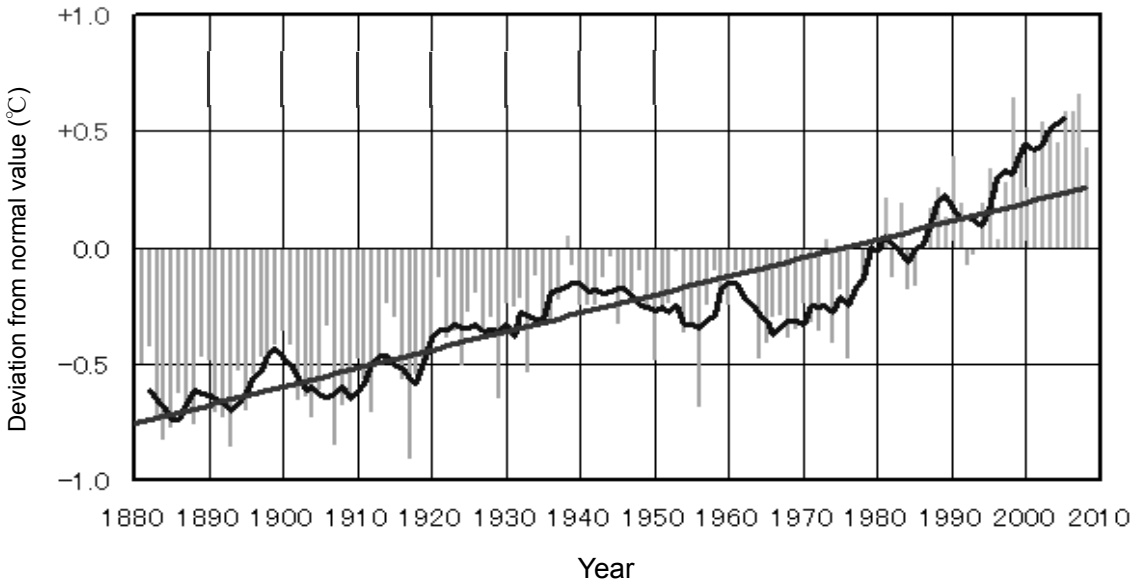
The total number of buildings which received the energy audit service is 3,578 from FY1998 to 2009. During this period, the target buildings were ones in the category of "Type 1 Designated Energy Management Factories".

From FY2008, the target buildings are ones in the category of "Type 2 Designated Energy Management Factories" by the Energy Conservation Law and undesignated buildings whose annual energy consumption is 100kL or more of crude oil equivalent.

3. GLOBAL ENVIRONMENTAL TRENDS

3.1 Climate Change and Energy Consumption

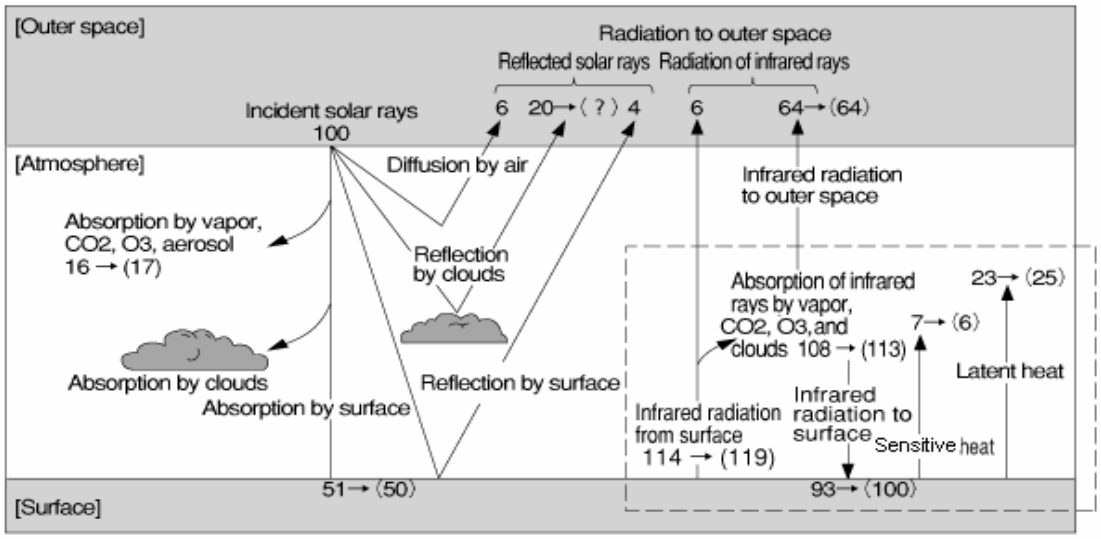
(1) Transition of deviation of global average near-surface temperature (only at the ground level)



Note) The bar graph represents the temperature of each year, the line graph shows 5-year running average and the straight line stands for long term trend.

Source) Prepared from "Website of Japan Meteorological Agency"

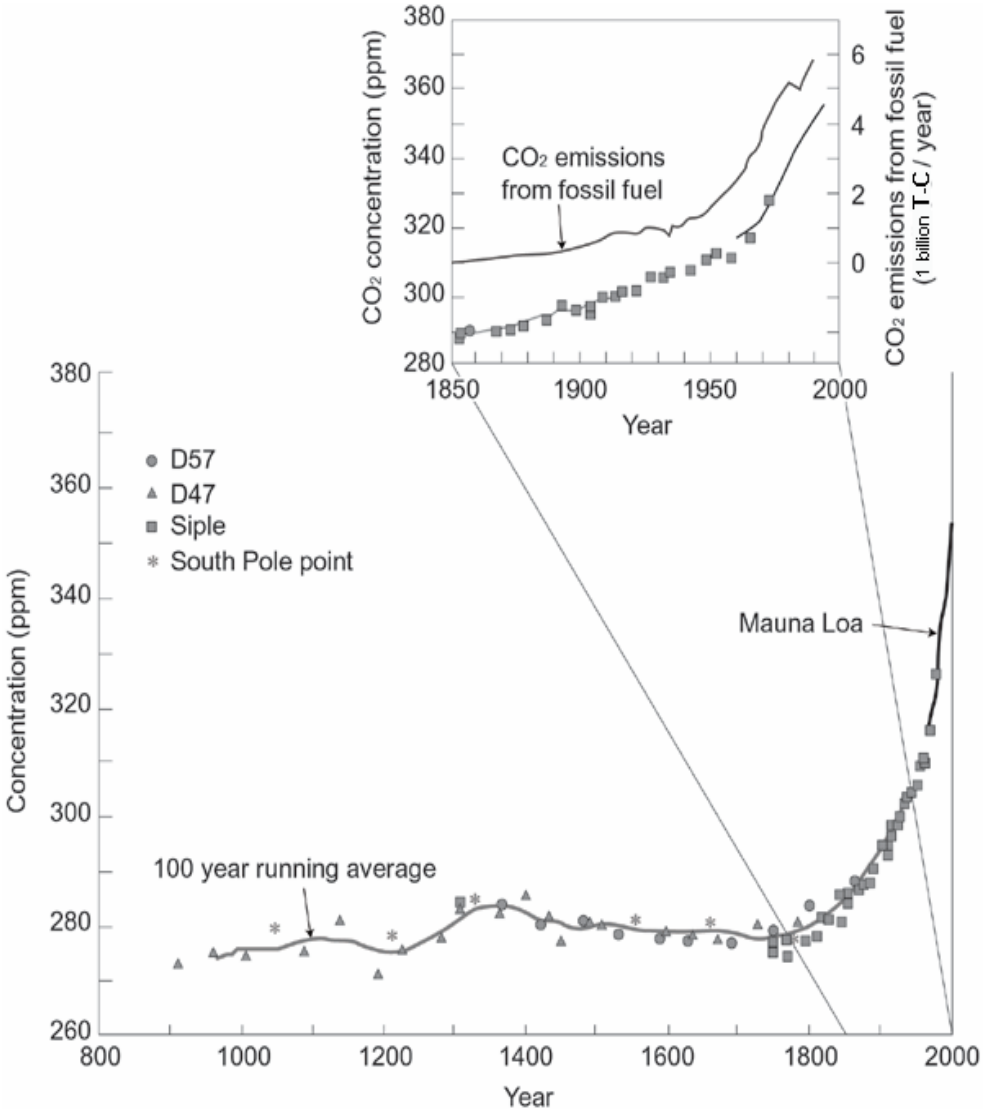
(2) Global energy balance (Index incident solar rays = 100)



Note) Figures in parenthesis represent estimated values when we assume the CO_2 concentration becomes double. In case the concentration of greenhouse effect gas such as CO_2 increases, the energy flow in the dotted line becomes larger. This causes the rise of temperature. The global temperature is said to fall to as low as -19℃ if no carbon dioxide or no steam should be contained in the atmosphere.

Source) Prepared from "Meteorological Research Notes No. 160, Carbon Dioxide Special" (Taro Matsuno, 1987, Meteorological Society of Japan, partially modified)

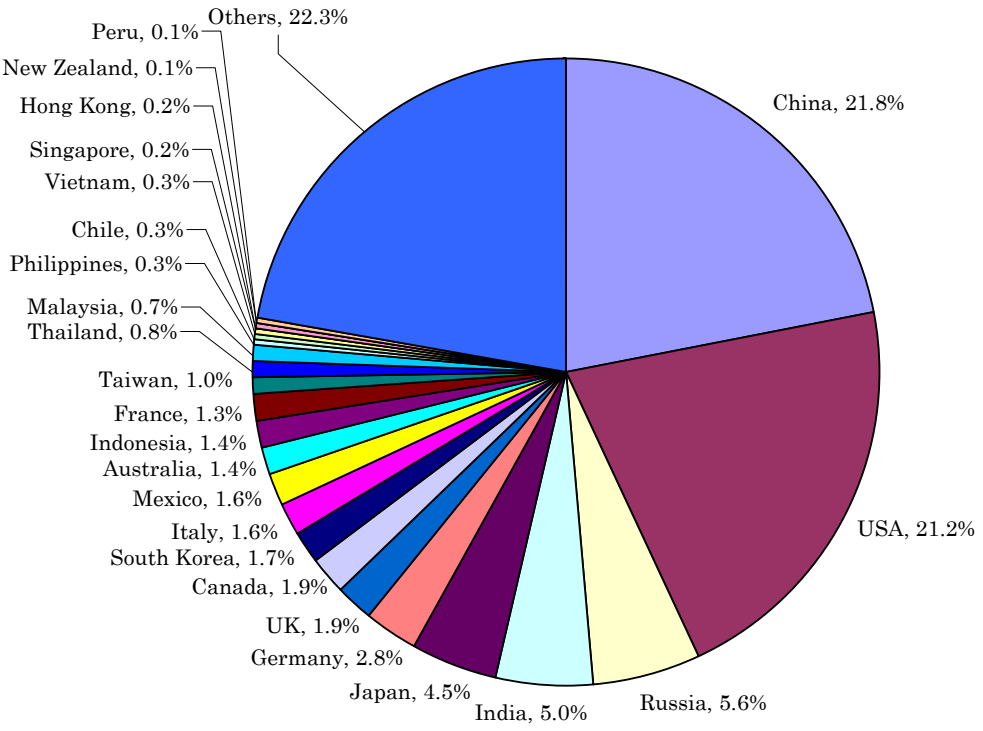
(3) Transition of atmospheric CO_2 concentration and CO_2 emission from fossil fuel



Note) This chart is prepared from the data of CO_2 concentration level of the past millennium based on the ice sheet core records at the D47, D57, Siple Station and the South Pole, and the CO_2 level since 1958 that are measured at Mauna Loa Observatory in Hawaii. Ice sheet cores were all collected on the Antarctic Continent. The smooth curve is a 100-year running average. The sharp rise of the CO_2 level since the outset of the Industrial Revolution is evident, going along with the increase of CO_2 emissions originating from the use of fossil fuels (See the enlarged chart since fiscal 1850).

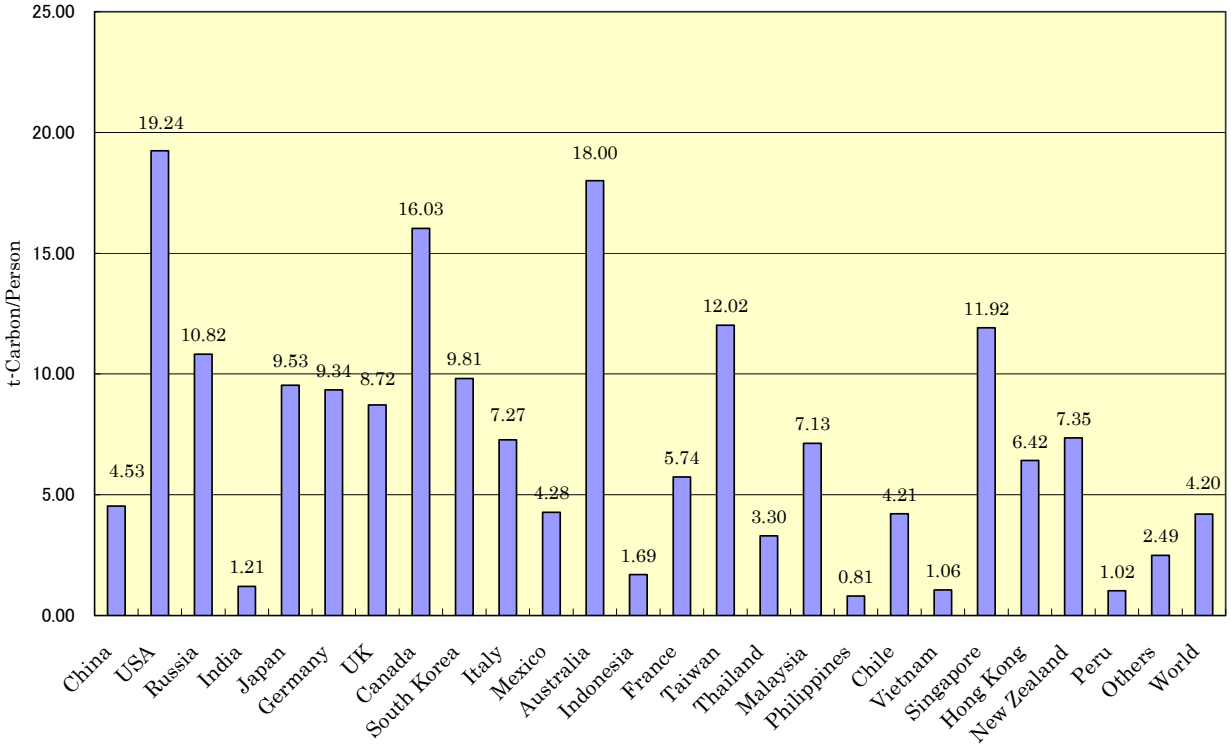
Source) IPCC (1995), translated by the Meteorological Agency. (IPCC: Intergovernmental Panel on Climate Change) "White Paper on the Environment 2000" (Ministry of the Environment)

(4) CO_2 emissions by country (2007)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

(5) Per-capita CO_2 emissions (2007)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

3.2 International Efforts to Counter Global Warming

The Intergovernmental Panel on Climate Change (IPCC) is the mechanism that accumulates scientific knowledge on global warming while debates on the international countermeasures have been made in the COPs (Conference of the Parties) of United Nations Framework Convention on Climate Change (UNFCCC). These two mechanisms are complementing each other.

(1) IPCC: accumulation of scientific knowledge

IPCC is a body organized by the scientists around the world. It was founded in November 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) jointly as a place to study global warming problems at a governmental level. In the report compiled for 1995, IPCC announced their analysis on the climate change since the 19th century. According to their findings, global warming had been already occurring due to the increasing amount of emitted greenhouse gases after the Industrial Revolution etc.

(2) UNFCCC: study of international countermeasures

UNFCCC discusses and performs international countermeasures to the climate change while IPCC is a place to accumulate scientific knowledge. In UNCED (United Nations Conference on Environment and Development: commonly named “Earth Summit”) which was held in Rio de Janeiro in Brazil in June, 1992, a large number of nations including Japan signed UNFCCC. The purpose of this treaty is to stabilize the concentration of greenhouse gases in the atmosphere. As a result, it is required that the amount of emitted greenhouse gases should be controlled or cut down. UNFCCC was ratified by 50 countries and went into effect in March, 1994. Following its effectuation, the COP1 was held in Berlin and the COP2 in Geneva, the COP3 was held in Kyoto to adopt "Kyoto Protocol", which defined the reduction targets of greenhouse gases in the period from 2008 through 2012.

(3) IPCC report on global warming

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) by the Working Group I (WGI) published in January, 2007 concluded that the global warming is occurring in the climate system and the increase of the man-originated GHG is the cause of the climate change.

Rise of Sea Level between 2090 - 2099 (the end of 21st century)

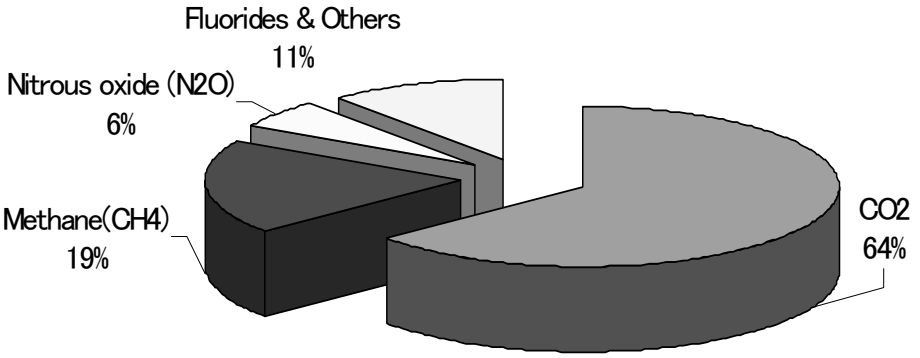
- 18-38 cm rise is estimated in the society where the environment and economic activities are projected to be globally balanced.
- 26-59 cm rise is estimated in the society where the high economic growth is achieved by recognizing fossil fuel as the important source of energy.

Rise of Average World Temperature between 2090-2099 (the end of 21st century)

- 1.8℃ (1.1℃-2.9℃) rise is expected in the society where the environment and economic activities are projected to be globally balanced.
- 4.0℃ (2.4℃-6.4℃) rise is expected in the society where the high economic growth is achieved by recognizing fossil fuel as the important source of energy.

★Average world temperature has risen 0.74℃ in the past 100 years (1906-2005).

(4) Influences of greenhouse-gases on global warming (1850-1990)



Source） Prepared from “IPCC Report” (2000)

(5) History of COPs of the UN Framework Convention on Climate Change

1) COP3 outline of the Kyoto Protocol

The COP3 (the 3rd Conference of Parties) was held on December 1 - 11, 1997.

Target gases	CO_2, CH_4, N_2O, HFC, PFC, SF_6
Target year	2008 - 2012
Reduction target *Base year: 1990	At least 5% for all Annex I parties -5% Croatia 0% Russia, New Zealand -6% Japan, Canada, Hungary, Poland -1% Norway -7% US +8% Australia -8% Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Portugal, Spain, Sweden, UK, Switzerland, Bulgaria, Czech, Estonia, Latvia, Lithuania, Rumania, Slovakia, Slovenia
Sinks	GHG reduction subject to afforestation is inclusive into calculation for the commitments.

38 Parties in Annex I: Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, USA, and 15 EU member states combined.

Kyoto mechanism

Emission Trading (ET)	Parties in Annex I may participate in the Emission Trading in order to achieve their commitments.
Joint Implementation (JI)	For the purpose of meeting its commitments, Parties in Annex I may transfer to or acquire from, emission reduction units, any other parties in Annex I.
Clean Development Mechanism (CDM)	The purpose of CDM mechanism is to assist Parties not included in Annex I in achieving sustainable development and to contribute to the Protocol, while Parties in Annex I may use the certified emission reductions accruing from such projects.

Enforcement and effect

Enforcement	The Convention shall become effective 90 days after 55 or more parties to the UNFCCC, incorporating Annex I parties of which total CO_2 emission in 1990 is 55% or more of total CO_2 emissions of all Annex I parties, ratify the Protocol.
Effect	When no Protocol exists, the global CO_2 emission in 2010 will increase by 24% compared with 1990. When the Protocol is enforced in 2000, the global CO_2 emission in 2010 will reduce by 5.2% compared with 1990.

2) Meetings after COP 6

The COP 6 of the UNFCCC was held in Hague, Netherlands on Nov. 13 - 25, 2000 and its Part-2 Conference was held in Bonn, Germany on July 16 - 27, 2001.
The COP 7 was held in Marrakech, Morocco on Oct. 29 - Nov. 9, 2001.
The COP 8 was held in New Delhi, India on Oct. 23 - Nov. 1, 2002.
The COP 9 was held in Milan, Italy on Dec.1-12, 2003.
The COP 10 was held in Buenos Aires, Argentina on Dec.6-17, 2004.
The COP 11 & COP/MOP 1 were held in Montreal, Canada on Nov.28-Dec.9, 2005.
The COP 12 & COP/MOP 2 were held in Nairobi, Kenya on Nov.6 -17, 2006.
The COP 13 & COP/MOP 3 were held in Bali, Indonesia on Dec.3 -15, 2007.
The COP 14 & COP/MOP 4 were held in Poznan, Poland on Dec.1-12, 2008.

(6) Background and main points of COP 15 & COP/MOP 5

The COP 15 & COP/MOP 5 were held in Copenhagen, Denmark on Dec.7-19, 2009. Though almost all participating countries including developed countries, island states, LDCs agreed to and seeked the adoption of the "Copenhagen Accord", several countries including Venezuela, Cuba, Bolivia, Sudan, etc. resisted its adoption on the grounds that the making process of the accord was unclear. Consequently, the Conference of the Parties decided to "take note of the Copenhagen Accord".
The main points of the Accord are:

1) We shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius, enhance our long-term cooperative action to combat climate change.
2) Annex I Parties and Non-Annex I Parties will submit the emissions targets for 2020 in the format given in Appendix I and mitigation actions in the format given in Appendix II, respectively, to the secretariat by 31 January 2010.

3) Mitigation actions taken by Annex I Parties will be subject to MRV (measurement, reporting and verification). Mitigation actions voluntarily taken by Non-Annex I Parties will be subject to international consultations and analysis after domestic MRV. However, supported mitigation actions taken by Non-Annex I Parties will be subject to international MRV.

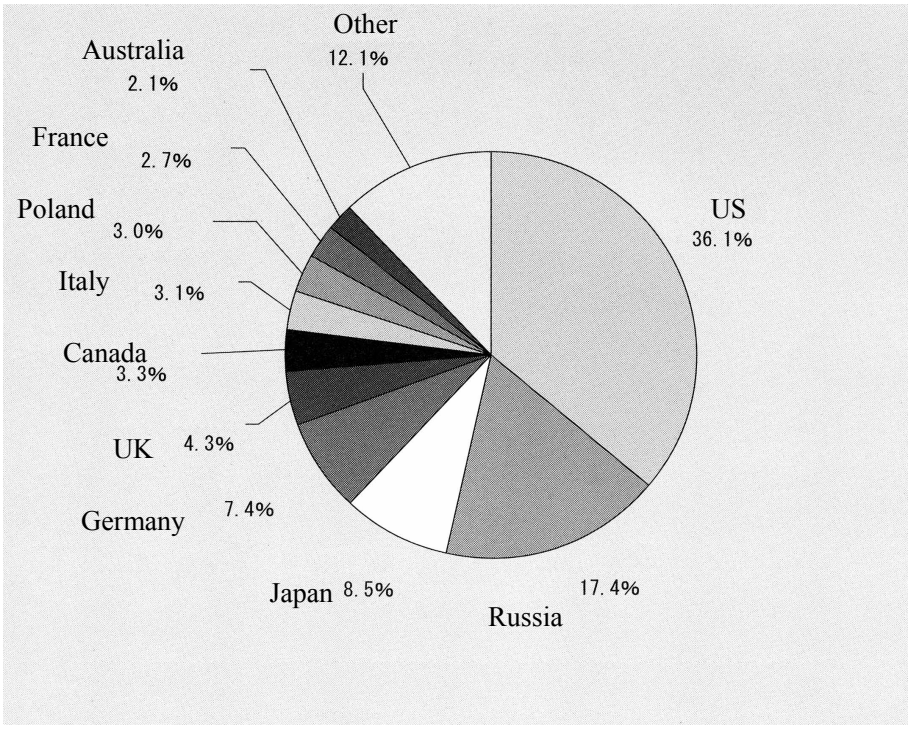
The COP16 & COP/MOP 6 will be held in Cancun, Mexico in November-December, 2010

Source) http://www.mofa.go.jp/mofaj/gaiko/kankyo/kiko/cop15_g.html

3.3 Kyoto Protocol Coming into Effect

The requirements for the Kyoto Protocol coming into effect included that (1) not less than 55 parties to the convention ratify the protocol, and (2) parties included in Annex I which accounted in total for at least 55% of the total CO_2 emissions in 1990 of the parties included in Annex I ratify the protocol (Figure below). The requirement (1) was met before some time, and the requirement (2) was met by the ratification of Russia in November 2004, and thus the Kyoto Protocol came into effect on February 16, 2005. Consequently, Japan is obliged to reduce the volume of greenhouse gas emissions by 6% from the standard year level during the first commitment period from 2008 to 2012. With regard to the commitment of the next period starting in 2013, the protocol stipulates that international examination begin by the end of 2005. At the COP10 held in Buenos Aires, Argentina in December 2004, the holding of a seminar for governmental experts was agreed, which will serve as the foothold of discussion concerning the framework after 2013.

Proportions of CO_2 emissions of annex I parties in 1990



Source) Compiled by the Ministry of the Environment based on data collected from each party by the secretariat of the convention before the COP3

3.4 G8 Summit

(1) Outline of Gleneagles Summit

The 31st Summit (meeting of leaders of major countries) was held in Gleneagles, Scotland, the United Kingdom from July 6 to 8, 2005. On the issue of the global environment, the Gleneagles Plan of Action involving energy conservation, clean energy use and other specific actions was agreed upon as well as an agreement to begin a dialogue between the G8 nations and other countries with significant energy needs (the outcomes are to be reported to the 2008 Summit in Japan). During the discussions with the leaders of emerging economy countries, the G8 members asked that these countries shoulder greater responsibility in tackling climate change and other problems. Japan emphasized the importance of compatibility between environment protection and economic development, use of technology for that purpose, promotion of the 3Rs (Reduce, Reuse and Recycle) and the spirit of mottainai (the spirit of virtue of thrift), and increasing efforts to curtail illegal logging, etc.

The G8 nations agreed to proceed with actions in the following key areas: Conversion to the effective use of energy; Cleaner power generation for future; Promoting research and development; Financing the transition to cleaner energy; Managing the impact of climate change; Tackling illegal logging.

Source) http://www.mofa.go.jp/mofaj/gaiko/summit/gleneagles05/s_03.html

(2) Outline of Hokkaido Toyako Summit

The 34th Summit was held in Toyako, Hokkaido from July 7 to 9, 2008 under the chairmanship of Prime Minister Yasuo Fukuda. It has been eight years since Japan last hosted a G8 summit (the Kyushu-Okinawa Summit in 2000).

Summary on “Environment and Climate Change” is below:

(a) Prime Minister Fukuda stated at the beginning that this was a very important summit, one that should determine whether humanity can move toward a low-carbon society, severing its dependence on fossil fuels and addressing challenges including global warming and resource depletion countries.

(b) Long-term Goal

With respect to the goal of achieving at least 50% reduction of global emissions by 2050, the G8 leaders agreed to seek to share and adopt it with all Parties to the United Nations Framework Convention on Climate Change.

(c) Mid-term Goals

In order to achieve absolute emission reductions in all developed nations, G8 leaders agreed to implement ambitious economy-wide mid-term goals.

(d) Sectoral Approach

It was recognized that sectoral approaches are useful tools for achieving national emission objectives and for reducing GHG emissions.

(e) Climate Investment Funds

G8 leaders welcomed and supported the establishment of the Climate Investment Funds administered by the World Bank to support the efforts of developing countries, and welcomed

commitments from other donors.

Source) http://www.g8summit.go.jp/eng/news/summary.html

(3) Outline of Muskoka Summit

The 36th Summit was held in Muskoka, Canada from June 25 to 26, 2010.

Regarding environment and climate change, the G8 leaders collaborated with each other and had discussions from the standpoint of giving political backup to future negotiations for the COP16. The summary of the discussion is below:

We will reduce at least 50% of global emissions by 2050, recognizing that this implies that global emissions need to peak as soon as possible. As part of this effort, we reaffirm a goal of developed countries reducing emissions of greenhouse gases in aggregate by 80% or more by 2050 compared to 1990 or more recent years and support the negotiations of the UN Framework Convention on Climate Change (UNFCCC).

We support the Copenhagen Accord and cooperate with Mexico as the President of the COP16. We want a comprehensive, ambitious, fair, effective, binding post-2012 agreement involving all countries, and including the respective responsibilities of all major economies to reduce greenhouse gas emissions.

Source) http://www.mofa.go.jp/mofaj/gaiko/summit/canada10/index.html

3.5 Energy Conservation Activities of the Foreign Countries

Approach to prevention of global warming by the major advanced countries

Item	Japan	U.S.	Canada	Australia
Greenhouse gas reduction target set by Kyoto Protocol (1990-basis)	－6%	－7%	－6%	＋8%
Ratification of Kyoto Protocol	Ratified (June 2002)	Not-ratified	Ratified (December 2002)	Ratified (December 2007)
Laws concerning energy conservation	Law concerning Rational Use of Energy “Energy Conservation Law” (Enforcement in '79, revision in '83, revision in '93, revision in '98, revision in '02, revision in '05, revision in '08)	Energy Policy Act 2005/Energy Independence and Security Act 2007/The American Recovery and Reinvestment Act of 2009 （ARRA）	Energy Efficiency Act (Establishment in '92, revision in '95, revision in '97, revision in '98, revision in '08)	Energy Efficiency Act 1997
				Energy Efficiency Opportunities Act 2006
				Renewable Energy (Electricity) Act 2000
Government’s plan and strategy	Kyoto Protocol Target Achievement Plan (’04, ‘08)	National Goal to Reduce Emissions Intensity2002	Project Green-A Plan for Honouring our Kyoto Commitment 2005	Energy White Paper-Securing Australia's Energy Future2004
		National Energy Policy 2001	Economic Action Plan 2009	National Framework for Energy Efficiency NFEE 2009
				National Greenhouse Strategy2002
Financial support system concerning energy conservation	Assistance measures based on the Law for Supporting Energy Savings and 3R Assistance (Energy Reform Tax System) and various other financial support measures	Assistance and tax incentive measures based on the Comprehensive Electricity Restructuring Act or 2005 Energy Policy Act	Various tax incentive/assistance measures including preferential for renewable energy based on the income tax act 1998 and partial subsidy for clean energy project based on Economic Action Plan 2009.	Various tax incentive/assistance measures based on the revised fuel tax
Governmental organizations having jurisdiction over energy conservation	Ministry of Economy, Trade and Industry (Agency for Natural Resources and Energy)	Department of Energy-DOE	Natural Resources Canada-NRCan	Department of Resources, Energy and Tourism-RET
	Ministry of Land, Infrastructure and Transport	Department of Transport-DOT	Transport Canada	Department of Infrastructure and Transport
	Ministry of the Environment	Environmental Protection Agency-EPA	Environment Canada	Department of Climate Change
Organizations promoting energy conservation	Energy Conservation Center, JAPAN (ECCJ)	Alliance to Save Energy	Energy Technology Center (In Natural Resources Canada-NRCan)	National Appliance and Equipment Energy Efficiency Committee-NAEEEC
	Japan Center for Climate Change Actions（JCCCA)	American Council for an Energy-Efficient Economy-ACEEE		Australia Energy Efficiency Trust
	Institute for Global Environmental Strategies (IGES)			Australia Carbon Trust
Major domestic measures for promotion of energy conservation	Drastic reinforcement of Law concerning Rational Use of Energy (Industry, transportation, and commercial/residential sectors) , pursuit of the objectives of the voluntary technical action plan in the industrial sector, and expansion and review of the standards for top-runner equipment	2009 Act-based measures for industry, transportation, public, and commercial/residential sectors: MEPS target equipment expansion continued promotion of Energy Star program, mandatory GHG emission reporting system, various voluntary agreements and programs, utilization of partnership schemes	Expansion of target products of energy efficiency standards based on the Energy Efficiency Act , promotion of EnerGuide labeling program, and other assistance measures for sectors	Various measures based on the national energy efficiency framework 2009 (NFEE) for industry, transportation, public, and commercial/residential sectors: expansion of target equipment of MEPS standard, various voluntary agreements and programs, utilization of partnership schemes
	Promotion of security and efficiency improvement of nuclear power generation	Promotion of security and efficiency improvement of nuclear power generation	Promotion of security and efficiency improvement of nuclear power generation	No nuclear power generation
	Promotion of renewable energy	Promotion of renewable energy	Promotion of renewable energy	Promotion of renewable energy

Item	EU	Germany	France	U.K.
Greenhouse gas reduction target set by Kyoto Protocol (1990-basis)	－8%	－8%	－8%	－8%
Ratification of Kyoto Protocol	Ratified (May 2002)	Ratified (May 2002)	Ratified (May 2002)	Ratified (May 2002)
Laws concerning energy conservation	Directive on Energy End-Use Efficiency and Energy Services(2006/32/EC), Framework Directive for Setting Eco-Design Requirements for Energy-Using Products (2005/32/EC), Directive on the promotion of cogeneration (2004/8/EC), Directive on the Energy Performance of Buildings (2002/91/EC), Directive on the promotion of electricity from renewable energy sources (2001/77/EC)	Energy Conservation Ordinance 2002, Renewable Energy Sources Act2004, Energy Consumption Labeling Act2002, Cogeneration Act2002, Renewable Energy Law2000, Energy Industry Act1998	"POPE Law"- Framework Law on Energy 2005, Decrees to Promote Cogeneration2001, Law on Air and Rational Energy Use1996, 2009 Finance Law	Climate Change Act 2008/ Renewable Obligation Order 2005, Energy Act 2004, 2010/ Sustainable Energy Act2003/ Climate Change Bill 2007/ Energy Bill 2007 - 2008
Government's plan and strategy	EU Energy Efficiency Target 2008 "20 20 by 2020"/ EU Action Plan for Energy Efficiency 2007 (2007-2012)	Integrated Energy and Climate Program 2008	Energy White Paper 2003 (Livre blanc sur les energies 2003)	Low Carbon Transition Plan 2009
	EU SAVE Program, etc. (*Intelligent Energy - Europe II* 2007-2013)		Energy Efficiency Action Plan 2007	Energy Conservation Implementation Plan 2004, 2007 (Energy Efficiency: The Government's Plan for Action 2004)
Financial support system concerning energy conservation	Promotion of Kyoto Mechanism including Emission Trading	Ecological tax, promotion of Kyoto Mechanism including Emission Trading, renewable energy promotion, and tax preferential measures for cogeneration, etc.	Promotion of Kyoto Mechanism including Emission Trading, assistance measures based on the 2009 Finance Law.	Climate change levy, tax preferential measures based on the climate change levy for cogeneration power, variation of tax rates based on CO2 emission introduced by the VED car tax, and promotion of Kyoto Mechanism including Emission Trading
Governmental organizations having jurisdiction over energy conservation	Directorate-General for Energy and Transport (In the European Commission)	Federal Ministry of Economics and Technology-BMWi	Ministry of the Economy, Finance, and Industry-MINEFI	Department of Energy and Climate Change-DECC
		Federal Ministry of Transport, Building, and Housing-BMVBW	Ministry for the Environment	Department of the Environment, Food and Rural Affairs-DEFRA
	Directorate-General for Environment (In the European Commission)	Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety-BMU		
Organizations promoting energy conservation	European Environment Agency-EEA	Deutsche Energie Agentur-DENA	Agency for Environment and Energy Management-ADEME	Environment Agency
				Carbon Trust
				Energy Saving Trust-EST
Major domestic measures for promotion of energy conservation	Various measures based on the related directives for industry, transportation, public, and commercial/residential sectors: promotion of Kyoto Mechanism including Emission Trading, various voluntary commitments, etc.	Compliance with EU directives, reinforcement of the insulation or equipment standards, voluntary commitments, environmental tax, utilization of economic measures such as emission trading, etc.	Compliance with EU directives, various measures based on the energy act 2005, introduction of white certificate scheme, promotion of Kyoto Mechanism including Emission Trading	Compliance with EU directives, various measures based on the domestic energy efficiency plan, regulatory measures targeting energy suppliers based on the EEC program, climate change levy and climate change agreement, reinforcement of the building regulation
	Efficiency improvement of nuclear power generation	Phase-out of nuclear power scheduled in 2022	Efficiency improvement of nuclear power generation	Efficiency improvement of nuclear power generation
	Promotion of renewable energy	Promotion of renewable energy	Promotion of renewable energy	Promotion of renewable energy

Source) Survey by the Energy Conservation Center, Japan

3.6 Japan's Policies to Deal with Global Warming

(1) Guideline for measures to prevent global warming

On March 19, 2002, the meeting of "the Global Warming Prevention Headquarters" was held in Prime Minister's official residence, where the members agreed on "Guideline for Measures to Prevent Global Warming". The guideline presents a broad picture of measures to realize Japan's targets set in the Kyoto protocol (6% reduction in relation to the 1990 level) and is made up of more than 100 measures and action plans. What needs to be stressed here is that the guideline sets a reduction goal for each greenhouse gas respectively. For instance, in terms of the CO_2 originating from the use of fossil fuels, the emission level should be reduced to exactly the same level as that of 1990. And the emission level of CO_2 from non-fossil fuels (e.g. waste incineration), methane and dinitrogen monoxide should be reduced by 0.5% in relation to the 1990 level. In terms of CFCs substitute, the emission level should be curtailed to the 1% increase compared with the base year (1995).

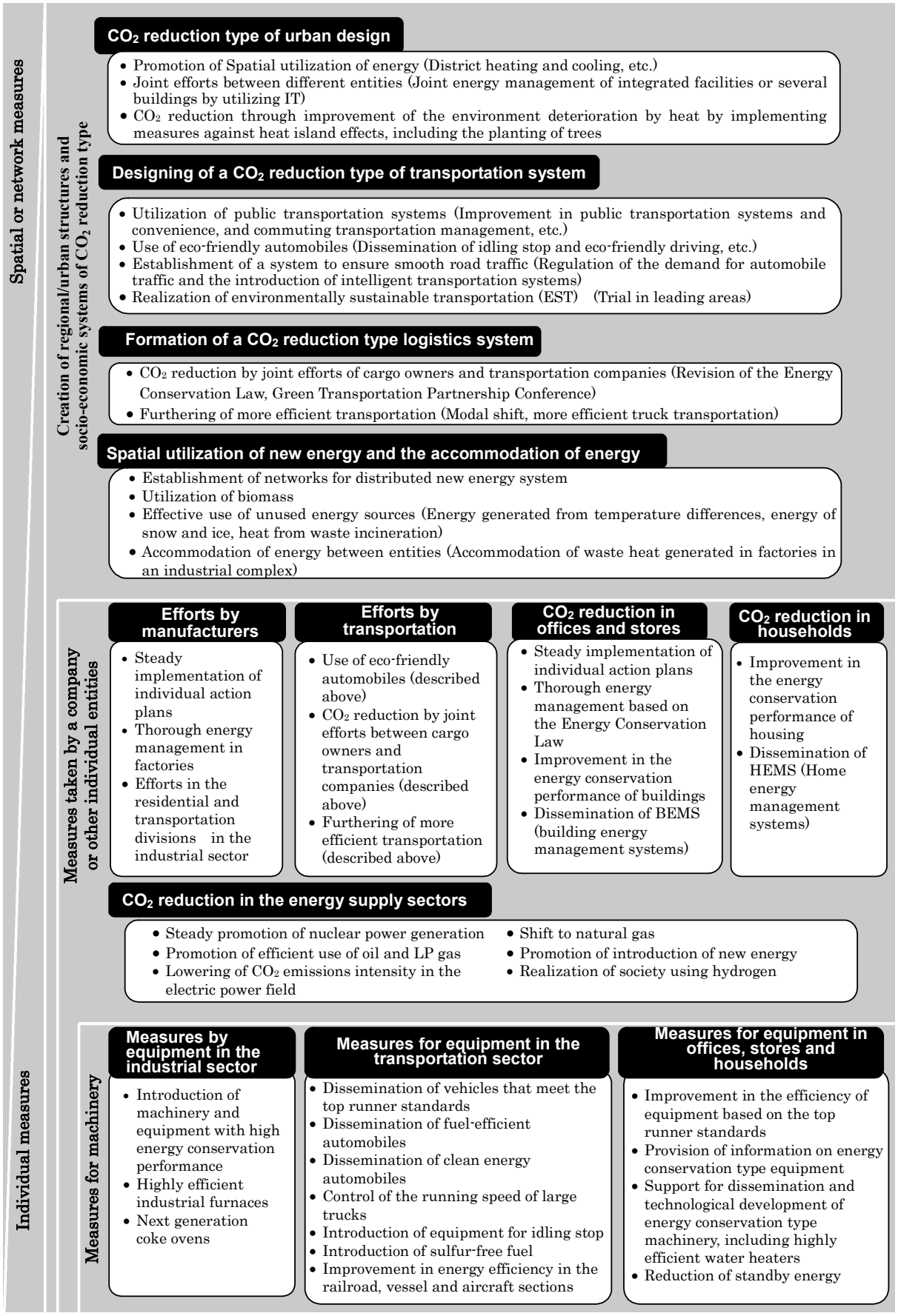
(2) Kyoto protocol target achievement plan

Since Japan ratified the Kyoto Protocol in June 2002, the country has been actively promoting the implementation of measures to reduce greenhouse gas emissions, including measures for energy conservation and new forms of energy, based on the Guideline for Measures to Prevent Global Warming. The government evaluated and reviewed the outline in FY2004, designated as the year for carrying out these tasks.

The Law Concerning the Promotion of Measures to Cope with Global Warming stipulates that a plan for reaching the target should be established when the Kyoto Protocol comes into effect. In response to the protocol coming into effect in February 2005, the Kyoto Protocol Target Achievement Plan was established, succeeding the Guideline for Measures to Prevent Global Warming as a result of its evaluation and review in FY2004 (Cabinet decision on April 28, 2005). The goals of this plan are to fulfill the commitment of 6% reduction and to further reduce greenhouse gas emissions globally and continuously over a long term. In addition, this plan contains the following items as its basic concepts: environmental conservation consistent with economic development, the promotion of technological innovation, the participation of all entities and partnership between them as well as the securing of transparency and the sharing of information to ensure the participation and partnership, the utilization of various policy tools, emphasis on the process of PDCA (plan-do-check-action), and international partnership for the implementation of measures to address global warming. The table below shows measures to change the country's energy supply-demand structure and structure a CO_2 reducing type of society.

Source) Prepared from "Materials 3-1 for the 27th Meeting of the Global Environment Subcommittee of the Industrial Structure Council"

Creation of CO_2 Reduction Type Society



(3) Reinforcement of energy conservation measures in each sector

1) Background

As part of the agreement reached at the COP3, held in Kyoto in December 1997, Japan pledged a 6% reduction in greenhouse gas emissions from the 1990 level, to be achieved in terms of the average annual value for the 2008–2012 period. CO_2 emissions reduction measures related to energy use by each sector are listed below.

2) Measures for achieving the goal and expected effect

(Unit:1,000kL-oe)

	Items for achieving the goal	additional measures or notes in 2005	Prospect in 2010 (as of May 2007)	
			Expected Minimum Effect	Expected Maximum Effect
Industrial Sector	Implementation of Keidanren Voluntary Action Plan on the Environment	Reflect improvement effect on energy intensity.	14,980	14,980
	Introduction of energy conservation equipment such as high performance furnaces, boilers		1,080	1,600
	Energy consevation by coordination among adjacent factories	Implement energy conservation by sharing waste heat etc. among multiple factories. (Support coordinated projects in major industrial complexes.)	450	1,000
	Reinforcement of energy management	Reinforce energy management in middle- to small-sized factories based on the Energy Conservation Law, expand target factories under the Law planned to be revised in 2005 and so on.	400	400
	Dissemination of fuel-efficient construction machine in construction sector	Encourage to use fuel-efficient construction machine and actively utilize it in public works.	100	100
Commercial/Residential Sector	Efficiency improvement of equipment by top runner standards	Review the top runner standards (9 items) and add electric rice cookers, microwave ovens and others to the target products.	6,100	6,100
	Reduction of standby power consumption		400	400
	Improvement of energy saving performance (Buildings, Houses)	Expect to further improve energy efficiency of buildings, newly built houses and existing houses under the Energy Conservation Law planned to be revised in 2005.	11,300	11,300
	Dissemination of energy saving equipment such as high efficient water heater, lighting (LED), air-conditioner, and refrigerator		2,600	3,100
	Provision of energy information to consumers by energy supply businesses etc.	Expect that consumers select energy saving products and use energy more efficiently by providing information to encourage them to save energy.	500	1,000
	Promotion of replacement with energy saving equipment	Expect the effect of the replacement of or with electric pots, dish washing machine, compact fluorescent lamps, water-saving shower heads and energy saving devices for air-conditioning compressor.	1,800	1,800
	Dissemination of HEMS and BEMS		1,600	2,200
	Reinforcement of energy management	Reinforce energy management in office buildings based on the Energy Conservation Law, implement on-site investigation and expand target factories under the Law planned to be revised in 2005	700	700
Transportation Sector	Improvement of fuel efficinecy of vehicles by top runner standards	Add LP gas passenger vehicles to the target products.	8,700	8,700
	Dissemination of clean energy vehicles	About 2.3 million vehicles	200	900
	Introduction of sulphur-free fuel and vehicles that can run on the fuel		0	100
	Support the introduction of idling stop vehicles	Expect to be disseminated at an accelerated rate by means of support measures for	10	20
	Energy saving measures concerning transportation system such as promotion of use of public transportation, modal shift to rail freight, and improvement of energy efficiency of rail and air		11,200	12,200
Supply	New energy		15,040	19,100
	Promotion of introduction of cogeneration with natural gas	Add the effect of measures for gas engine water heaters.	4980kW	5030kW
	Promotion of introduction of fuel cell		20kW	2200kW
	Reduction of CO2 emissions intensity in electricity sector by promoting nuclear power	Reduce CO2 emissions intensity (Emission per unit of user end electricity) by approx. 20% in FY 2010 compared to the FY1990 level.		

Source) Prepared from "Material-1 at the 11th meeting of the Energy Efficiency and Conservation Subcommittee of the Advisory Committee on Energy and Natural Resource"

4. ENERGY CONSERVATION MEASURES BY SECTOR

4.1 Industrial Sector

(1) Energy situation for the industrial sector

The significant energy efficiency improvement has been monitored for the industrial sector in Japan. In the oil shocks period, the total energy consumption share for all sectors marked at a ratio of 4:1:1 respectively for the industry, commercial/residential, and transportation, but the FY 2006 data marked the ratio of 2:1:1, approximately, with the industry significantly resulting in lowering its share and successfully leveled off its consumption. This industrial sector's positive trend is regarded attributed to the effect of the regulatory measures of the energy conservation law and manufacturers and businesses' accompanying efforts. For the detail of the industrial sector data, refer to the Appendix 1.3.

(2) Energy conservation policies and measures for the industrial sector

1) History of energy conservation measures for industrial sector

Since the oil crisis, Japan's industrial sector has played a central role in the efficient use of energy. Due to the efforts, the sector has successfully maintained almost the same energy consumption level as in the oil crisis despite the growing output. The sector accounts for nearly 45 % of the total energy demand in Japan. Despite those proactive efforts, there was a growing awareness that more measures were necessary in order to take more effective actions on global environmental issues. In June 1997, Japan Business Federation (Keidanren) announced the "Keidanren Voluntary Action Plan on the Environment", aiming to promote the efficient use of energy.

As a national policy, the Law Concerning the Rational Use of Energy (Energy Conservation Law) was revised to reinforce the sector's voluntary energy management. The revision of 2002 expanded the range of "the Type 1 Designated Energy Management Factory" designation, which had been limited to five industries such as the manufacturing industry, to include all industries. Through the revision, business operators became obligated to submit periodic reports, who own factories classified as "Type 2 Designated Energy Management Factory". The revised law came into force on April 1, 2003.

In unison with the revision of the Energy Conservation Law, new standards to assess energy use of factories and business offices were enforced on April 1, 2003, which were to control inefficient electric power facilities, to promote the implementation of the cogeneration system, which is highly energy efficient and to make good use of ESCO companies.

Starting in 2005, regulations on factories and business establishments, which were implemented based on the consumption of heat and electricity separately, shall be implemented based on the integrated energy consumption (crude oil equivalent) of both heat and electricity. The revised law came into force on April 1, 2006.

Moreover, regulatory structure was changed from regulating each factory or workplace to regulating the company wide management in 2008. The amendment obliged a company who uses a certain amount of energy as the whole company to regulate all of its factories and workplaces it has (the regulation is also introduced to a franchise chain such as convenience stores and restaurants, considering it to be a single company). This revised law came into force

partly on April 1, 2009 and wholly on April 1, 2010.

In addition, there are financial incentives such as low interest loan programs under the Law for Energy Conservation and Recycling Support, tax reduction measures, and the subsidy programs to boost investment in developing energy efficient products and technologies to restructure the country's energy supply-demand.

2) Relevant legislation

a) Measures based on the Law Concerning the Rational Use of Energy

i) Enactment of a Basic Policy Concerning the Rational Use of Energy (Cabinet decision announced by the Ministry of Economy, Trade and Industry (METI) on 31 March 2009)

ii) Standards of Judgment for Business Operators on the Rational Use of Energy for Factories etc. (Announcement No.66 of METI on 31 March 2009)

iii) Guidelines for Preparing Medium- and Long-Term Plans by the Type 1 Specified Business Operator that Install Factories for their Operations in the Manufacturing Industry (Announcement No.1 of Ministry of Finance, Ministry of Health and Welfare, Ministry of Agriculture, Forestry and Fisheries, Ministry of International Trade and Industry (MITI), and Ministry of Transportation on 25 February, 1999)

iv) Guidelines for Preparing Medium- and Long-Term Plans by the Type 1 Specified Business Operator that Install Factories for their Operations in the Mining Industry, Electricity Supply Industry, Gas Supply Industry and Heat Supply Industry (Announcement No.108 of MITI on 25 February 1999)

v) Guidelines for Preparing Medium- and Long-Term Plans by the Type 1 Designated Business Operator (except the Water Supply Industry, Sewer Industry, and Waste Processing Industry) (Announcement No.1 of Ministry of Education, Culture, Sports, Science and Technology, Ministry of Health, Labour and Welfare (MHLW), METI, Ministry of Land, Infrastructure and Transport (MLIT) on 26 February 2004)

vi) Guidelines for Preparing Medium- and Long-Term Plans by the Type 1 Designated Business Operator (the Water Supply Industry, Sewer Industry, and Waste Processing Industry) (Announcement No.1 of MHLW, METI, MLIT and Ministry of the Environment on 26 February 2004)

b) Supporting measures

i) Support based on the Law for Energy Conservation and Recycling Support by low-interest financing by Japan Finance Corporation, etc.

ii) Tax system to promote investment to reform the energy supply and demand structure

iii) Support for business operators who introduce leading-edge energy conservation equipment

iv) Advisor business regarding introduction of leading-edge energy conservation technologies

c) Awarding, dissemination and publicity activities on energy conservation

i) Awarding of Excellent Energy Conservation Factory & Building

ii) Conduction of the ENEX exhibition, a general exhibition of energy conservation technologies and equipment, etc.

d) Technology development

i) Study to lead basic technologies for the rational energy utilization

ii) Development of practical application of technologies to rationalize energy utilization

(3) Outline of the Keidanren Voluntary Action Plan on the Environment (Target and Measures of Major Organizations)

Name of Organization	Target	Measures to Attain Goals
The Federation of Electric Power Companies of Japan (FEPC)	・In the period from FY2008 to FY2012, aim to reduce CO_2 emissions intensity (Emission per unit of user end electricity) by an average of approx. 20% or to approx. 0.34kg- CO_2 /kWh compared to the FY1990 level.	1. Promotion of nuclear power generation based on security 2. Further improvement of efficiency in thermal power generation 3. Utilization of Kyoto mechanism etc. 4. Development and diffusion of renewable energy
The Japan Iron and Steel Federation (JISF)	・Reduce energy consumption in the production process in FY2010 by 10 % compared to the FY1990 level on the assumption of the crude steel production 100 million-ton level. * Take an average of five years from FY2008 to FY2012 to achieve the above target.	1. Recovery of waste energy (enhancement of TRT, newly installing of CDQ, enhancement of gas recovery, recovery of sensible heat of converter gas, regene-burner, etc.) 2. Efficiency improvement of facilities (introduction of high efficiency oxygen , improvement of electric turbine, improvement of sinter, modification of blast furnace, efficiency of motor, streamlining of power generating facility, modification of hot furnace, etc.) 3. Improvement of operation (reduction of ratio of reduced materials, management of steel temperature, utilization of chilled iron source, etc.) 4. Effective utilization of waste plastic (utilization of waste plastic, enhancement of facility for process of waste plastic, etc.) 5. Others (dust recycle, humidity conditioning for coal, preprocessing of ore, etc)
Japan Chemical Industry Association (JCIA)	1. In the period from FY 2008 to FY 2012, aim to reduce energy intensity to an average of 80% of the FY 1990 level. (However, in case aggravating factors for energy intensity become obvious, it could be about 87%.) 2. Establish guidelines for energy conservation activities in commercial sector, such as headquarters building, sales offices and start the activities. 3. Solicit “Energy conservation activities in residential sector promoted by the chemical industry” which encourages public campaign for energy conservation led by the government from all JCIA members and start the activities. 4. Prepare “Technology handbook for energy conservation and environment of Japanese chemical industry” and provide them to people in developing countries etc. who need energy conservation technologies. 5. Develop and disseminate new materials for energy conservation continuously.	1. Recovery of waste energy (recovery of waste heat and cool energy, turning waste fluid/ waste oil/waste gas into fuel, heat storage, etc.) 2. Rationalization of process (process rationalization, process conversion, system change, catalyst change, etc.) 3. Efficiency improvement of facilities and equipment (replacement of equipment and materials, improvement of equipment performance, installation of high efficiency facilities, efficiency improvement of lighting/motor, etc.) 4. Improvement of operation methods (condition change of pressure, temperature, flow, reduction of the number of operating unit, advanced control, reuse/recycle, etc.) 5. Others (product modification, etc)

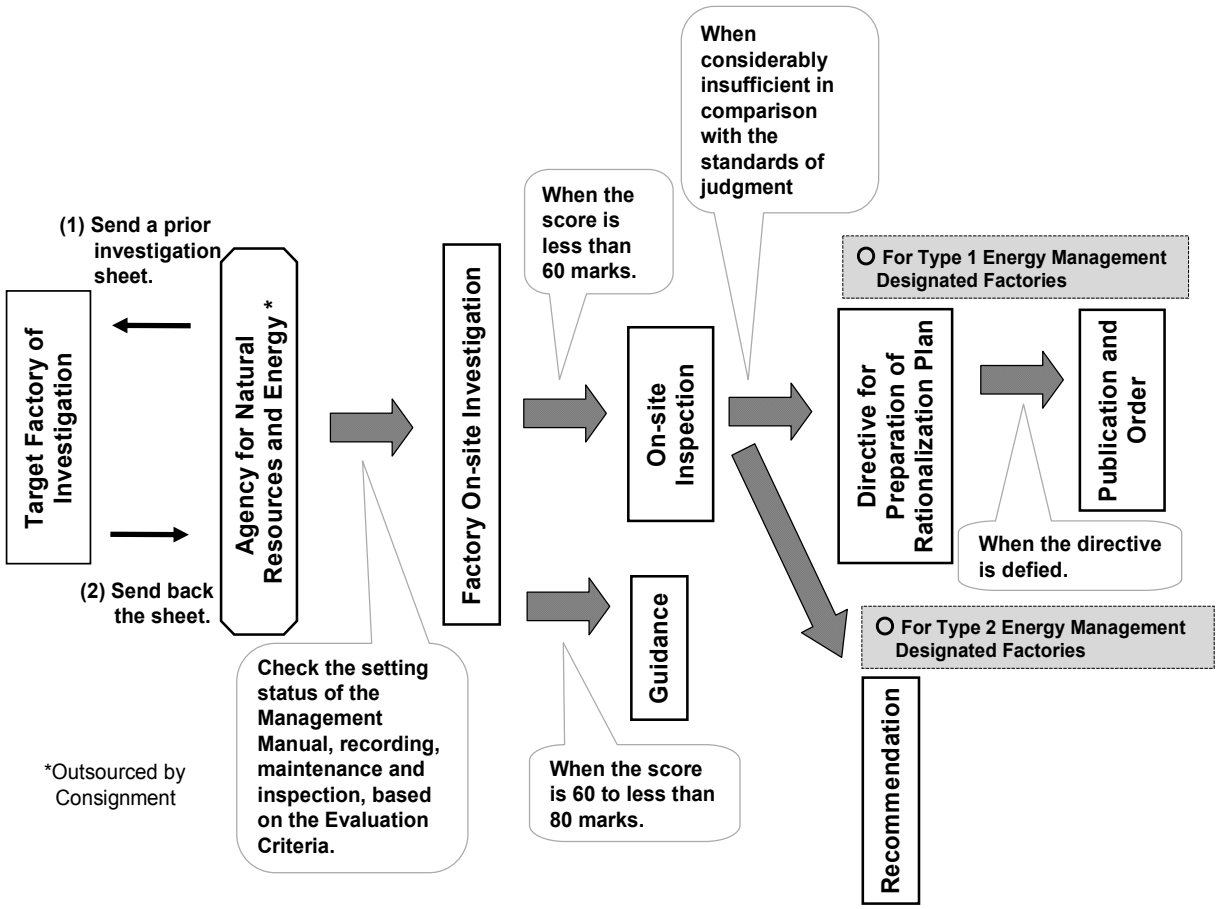
Name of Organization	Target	Measures to Attain Goals
Petroleum Association of Japan (PAJ)	・In the period from FY2008 to FY2012, reduce energy intensity in refineries by an average of 13% compared to the FY1990 level.	1. Revision of operation management (Improvement of control technology and optimization technology) 2. Expansion of mutual utilization of waste heat among facilities 3. Additional construction of recovering facilities of waste heat and waste energy 4. Adoption of efficient equipment and catalyst 5. Efficiency improvement by appropriate maintenance of facilities 6. Participation in "Industrial Complex Renaissance"
Japan Paper Association	・In the period from FY2008 to FY2012, aim to reduce fossil energy intensity per product by an average of 20% and CO_2 emissions intensity derived from fossil energy by an average of 16% compared to the FY1990 level. ・Strive to promote forestation in Japan and overseas to expand owned or managed forested areas to 0.7 million ha by FY2012.	1. Introduction of energy conservation equipment (heat recovery equipment, introduction of high dew point hood, introduction of inverters etc.) 2. Introduction of high efficiency facilities (high-temperature high-pressure recovery boilers, efficiency improvement of turbine, high-efficiency cleaning equipment, low differential pressure cleaner, high efficiency lighting, etc.) 3. Revision of manufacturing process (shortening and integration of processes) 4. Renewable energy (black liquor, waste materials, bark, paper sludge, etc.), energy recovery from waste (RPF, waste plastic, waste tire, waste oil, etc.), switch to fuel with low CO_2 emission 5. Strengthening management (review of management value, reduction of dispersion)
Japan Cement Association (JCA)	・Reduce energy intensity of cement production (Thermal energy for cement production + Thermal energy for private power generation + Purchased electrical energy) in FY2010 by 3.8% compared to the FY1990 level. * Take an average of five years from FY2008 to FY2012 to achieve the above target.	1. Facilities to utilize waste as alternative heat energy source (waste wood, waste plastic, etc.) 2. Efficiency improvement of facilities (fans, coolers, finishing mills, etc.) 3. Installation of energy conservation equipment (high-efficiency clinker coolers, etc.) 4. Replacement of facilities (including repair of facilities)
Japan Automobile Manufacturers Association, Inc. (JAMA) Japan Auto-Body Industries Association inc. (JABIA) (Two associations integrated their effort to promote the reduction of GHG emission from FY 2007.)	・In the period from FY2008 to FY2012, reduce the total CO_2 emissions by an average of 25% compared to the FY1990 level.	1. Energy supply side measures (introduction of cogeneration, improvement of efficiency of boilers, introduction of high-efficiency compressors, introduction of energy conservation facilities) 2. Energy demand side measures (energy conservation in coating line, introduction of invertors for fans and pumps, energy conservation in lighting and air-conditioners, energy-saving operation of compressors, reduction of energy-loss during operation, etc.) 3. Upgrading energy supply methods and technologies of operation and management (reduction of energy loss during no operation, reduction of air leak, etc.) 4. Merger, abolition and integration of lines 5. Fuel switch

Source) Prepared from "Results of the FY2009 Follow-up to the Keidanren Voluntary Action Plan on the Environment (Section on Global Warming Countermeasures, Version Itemized per Business Category), in April 2010" (Website by Keidanren (Japan Federation of Economic Organization))

(4) Overall factory inspection based on the energy conservation law

An on-site investigation targeting the "Type 1 designated energy management factories" ("overall factory inspection**"**) has been conducted since FY 2001 guided by METI. The "Type 2 designated energy management factories" were also targeted from FY 2008. In the investigation, the observance situation of the criterion part of the judgment standards is evaluated. The assessment results based on the objective standards determine whether any directions should be given. When the achievement in rational use of energy is extremely insufficient, the factory/building is given instruction to formulate and submit a rationalization plan and to implement it after the on-site inspection.

The flow diagram of the overall factory inspection is shown below.



(5) Dissemination and promotion of energy conservation technology

1) Categorization of technologies and energy conservation methods with high feasibility for ripple effects in other fields

The presentation of energy conservation projects held at the Energy Conservation Center, Japan included a wide range of reports on some excellent examples. Some cases used ingenious ways of conservation energy or showed originality in selecting improvement themes. Some cases focused on main improvement technologies. Other cases carried out comprehensive energy conservation measures which gave special attention to detail, although the measures themselves were quite ordinary. Introduction of new production methods taking a hint from other fields and measures based on results of technology development, especially those based on development or introduction/application technology development of new processes and innovative production technology have brought large energy conservation effects. The technology and methods among the cases that will be useful in a wide range of fields can be grouped into the following.

a) Structure and approach for promotion of energy conservation
b) Understanding of current conditions by visualization
c) Abolishing the existing ideas and reviewing designed values and management criteria
d) Use of surplus energy that has been left unused
e) Introduction of cogeneration, improvement of operation methods, raising utilization rate
f) Remodeling equipment into or replacing one with high-efficiency equipment
g) Utilization of ESCO projects/Introduction to factories and buildings
h) Energy conservation measures for power receiving system/Measures for demand side
i) Energy conservation measures for compressed air/Energy conservation measures for cleaning and blower
j) Energy conservation measures for steam
k) Energy conservation measures for air conditioning
l) Energy conservation measures for hating furnace and melting furnace
m) Inverter measures
n) Thermal insulation technology
o) Energy reduction with shorter hours by improving productivity / Reduction of fixed energy
p) Integration, consolidation and newly establishment of production process / Reduction of fixed energy
q) Shift of fixed energy to energy proportional to the production / Reduction of fixed energy
r) Reduction of production area, minimization of fixed energy area / Reduction of fixed energy
s) Rationalization and low loss of fixed energy equipment / Reduction of fixed energy
t) Optimal control and JIT(Just in Time) “required quantity of energy supply when needed, where needed” / Reduction of fixed energy
u) Mutual utilization of energy among adjacent factories and workplaces / interindustry collaboration

2) Reduction of the fixed consumption of energy, which is highly-needed from the demand side

In most of the case reports, details of a preliminary investigation for selection of a task for energy conservation improvement and narrowing down of themes were described. One of the themes that were listed up in most of the cases was reduction of the fixed consumption of energy or reduction of the amount of energy consumption not linked to production, even if such energy was

not termed a constantly required amount of energy.

There are some cases about the consumption of the fixed consumption of energy, namely, the case that it is high because the existing utility system and low-efficiency energy supply equipment had been maintained and operated, and another cases that it is large because the excess equipment had been maintained expecting high economic growth.

In this way, reduction of consumption of the fixed consumption of energy is a cross-sectional theme. Rationalizing the consumption of such energy is advantageous even if the business pattern and main products change. According to the data of past cases, technologies to reduce consumption of the fixed consumption of energy are summarized in the table below. Excellent energy conservation technologies can be flexibly applied to a wide range of fields, in addition to being able to reduce energy consumption by rationalization. Evaluation of the energy conservation technologies is carried out reviewing the following points: high-efficiency, low-loss, downsizing, weight reduction, adaptability, as well as improvement in user-friendliness including capability to deal with networking and safety of the technology itself.

Methods of reducing the fixed consumption of energy introduced by excellent cases

Among the energy conservation measures in the industry sector, technology highly required by the demand side is reduction of the fixed consumption of energy that is not in proportion to production by converting it to a variable energy, which is an energy required in proportion to the production. Generally, points for reducing of the fixed consumption of energy are rationalization of a utility energy supply system, optimization of excess demand, and reduction of consumption of a standby power requirement.
1. Method 1: Reduction of the fixed consumption of energy by raising production efficiency and reducing production duration. 1) Cut-down of processing steps by partial integration of production steps 2) Cut-down of duration by paralleling the processes that can directly influence production efficiency 3) Cut-down of duration by rationalization of preliminary treatment, preliminary processing, preheating, etc., in production processes 4) Cut-down of duration by rationalization of post treatment, energy recovery, etc. in production processes 5) Cut-down or omission of post treatment duration by improvement of production technology (high precision processing and high quality processing) 6) Cut-down of heating/melting duration by improvement and rationalization of energy consumption rate 7) Cut-down of duration by raising production efficiency through raising production technology by basic technology 8) Cut-down of waste time to the utmost limit, including cutting standby time in production processes
2. Method 2: Conversion the consumption of the fixed consumption of energy to the variable energy 1) Replacing hydraulic actuator system with electric actuator system 2) Replacing pneumatic actuator system with electric actuator system

3) Lowering the set pressure for pneumatic line, and converting the fixed consumption of energy to the variable energy by using booster pump and buffer tank
4) Lowering temperature level of the retention furnace, and adopting induction heating at pouring gate and additional heating by DC torch
5) In the heating process, converting the fixed consumption of energy to the variable energy by adopting infrared heating, laser heating, and pulse combustion burner introducing
6) Reduction of heating and cooling sources by applying recovered heat in before and after heating/cooling processes in the same production line to preheating and pre-cooling process
7) Diligently setting control values before rebooting in more detail by stopping equipment to be at standby time by the minute and second

3. Method 3: Reduction of production space and minimization of the fixed consumption of energy amount
1) Level down of clean room, etc., and raising the cleanliness of each appliance, chamber, and container
2) Introduction of zone or spot air-conditioning by dividing air-conditioning area
3) Dividing into smaller lighting areas for the purpose of adaptive control of lighting for each area, and adopting localized lighting and natural light
4) Distributed allocation and adaptive control for boilers, compressors, transformers, power factor improvement equipment, etc.
5) Reduction of energy for lighting/air-conditioning by adopting Just In Time (JIT) production system and dividing spaces for assembly process and parts stockyard into smaller areas

4. Method 4: Rationalization and lowering loss of appliances related to the fixed consumption of energy
1) Adoption of higher efficiency appliances for lighting, air-conditioning, ventilation, water supply, and other appliances that consume the constant amount of energy
2) Rationalization of fluid pump, blower, etc., by introducing inverter control system
3) Reduction of energy for lighting, ventilation, air-conditioning by mitigating work environment conditions under unmanned operation
4) Lowering losses by cascade connection of different types of pumps
5) Reduction of waste power by reducing potential risk of steam leakage, compressed air leakage, water leakage, etc.
6) Reduction of holding energy by improvement of adiathermancy of furnace wall, etc.

5. Other methods :
1) Utilization of recovered energy with a total enthalpy heat exchanger, etc., from sensible heat of products in batch processing system for the energy constantly required
2) Reduction of pumping energy by rationalizing pressure utilization in decompression and compression chambers in the same production line
3) Converting exhaust heat/coolant in production process to the fixed consumption of energy by using absorption type refrigerator
4) Reduction of the fixed consumption of energy amount by utilization of internally generated exhaust heat in clean rooms, etc., for drying
5) Reduction of number of appliances consuming the fixed consumption of energy amount by time-sharing

(6) Energy conservation by coordination among factories and workplaces

1) What is "Coordination among factories and workplaces" ?

This is comprehensive energy conservation system by mutual utilization of exhaust heat or waste in various neighboring factories and workplaces. It includes coordination among different industries, so it's also called "Interindustry coordination". In industrial complexes in various regions in Japan, there is a growing tendency of the coordination such as mutual utilization of exhaust heat from factories by multiple bodies.

2) Needs for "Coordination among factories and workplaces"

(a)In Japanese industry, each enterprise has promoted energy conservation since the first oil crisis in 1973 and there has been little room for improvement by effort by each enterprise (or each type of business). That is why coordination among factories and workplaces is expected to promote further energy conservation.

(b)More than 30 years passed after Japanese industrial complexes were built. The energy intensity is decreasing due to aging of the facilities compared to new industrial complexes in Asian countries. That is why coordination among factories and workplaces is expected to maintain and recover international competitiveness of Japanese industries.

(c) Now Japan has high-efficient cogeneration system and its technical advancement, new technical concept called "Coproduction", pinch technology which optimizes energy use, LCA analysis technique and various system technologies, and advanced energy management technology. That is why coordination among factories and workplaces is expected to promote further energy conservation with these technologies.

(7) Dissemination of high-efficiency industrial furnaces and high-efficiency boilers

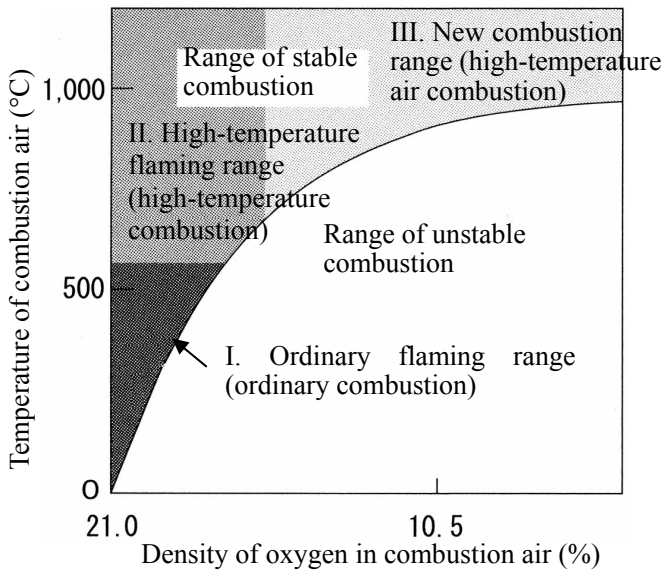
1) Development of high-efficiency industrial furnaces[*1]

When heat efficiency is raised by setting a higher preheating temperature of combustion air using the existing combustion technology, a rapid increase in NO_x occurs due to the regional rise in flame temperature. Accordingly, it had been thought that achieving energy conservation and reduction of environmental burden at the same time was impossible. This changed, however, with the introduction of high-temperature air combustion technology, in which combustion air preheated to reach over 1,000 degree centigrade is rapidly blown into the furnace and fuel is sprayed into this high-speed air stream and burned at high-temperature in a low oxygen density atmosphere. In this case, the amount of NO_x generation decreases by a large margin compared to simple high-temperature combustion by raising the preheating temperature of combustion air.

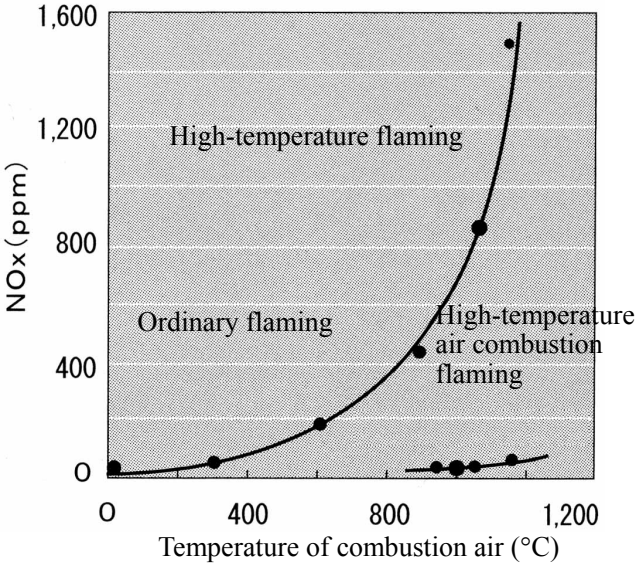
In the "Field test project on high-efficiency industrial furnace introduction,"[*2] high-temperature air combustion technology was applied to commercial furnaces. The field test, which targeted 167 industrial furnaces, confirmed an energy conservation effect corresponding to reduction of 160,000 kL of crude oil equivalent through achieving a 30% or higher energy conservation rate and 50% or higher NO_x reduction. Introduction and dissemination of high-efficiency industrial furnaces is carried out as a project for supporting business entities making efforts to rationalize energy use in the New Energy and Industrial Technology Development Organization (NEDO).

[*1] This project, which is called "development of high-efficiency industrial furnaces, etc.," consists of three sub-projects: "combustion control foundation technology," "development of high-efficiency industrial furnaces," and "high-efficiency boilers." These projects were carried out for seven years from FY1993 to FY1999 as entrusted business by the New Energy and Industrial Technology Development Organization (NEDO).

[*2] The "Field test project on high-efficiency industrial furnace introduction" of NEDO was carried out for three years from FY1998 to FY2000, receiving a governmental subsidy for one-third of the cost.



Temperature of combustion air and combustion range (conceptual diagram)



Density of NO_x emission in high-temperature air combustion

The great difficulty in introduction and popularization of the high-efficiency industrial furnaces is that the amount of facility investment is not comparable to the advantages of energy conservation efforts.

High-temperature air combustion technology, which is extremely effective in reducing CO_2 and NO_x, is distinctive of Japan and can be regarded as an innovative combustion technology that plays a leading role in carrying out effective energy use and global warming prevention measures for the world. Currently, development research to practically apply this technology to non-industrial combustion and heating facilities that consume a large amount of energy has finished and the technology is in the commercialization stage.

2) Development of high-efficiency boilers[*1]

The efficiency of existing industrial boilers is rather high, achieving 86%-90% (at the low calorific value of the fuel). The boilers' efficiency rate of energy use has also reached a high level among heat application facilities, but its energy consumption accounted for a large portion in the industrial sector. The project to develop high-efficiency boilers started in order to develop high-efficiency boilers that would contribute to reduction of exhaust combustion gas such as CO_2 and NO_x, energy conservation, and environment conservation from perspective of global warming prevention.

The development of high-efficiency boilers was carried out focusing on innovative elemental technologies such as oxygen combustion and heat-exchange appliance of condensed exhausted gas. The experiment in the pilot plant showed a greater effectiveness compared with in the existing air combustion boilers, achieving 105.73% of total heat efficiency of the boiler (based on low calorific value of the fuel, which equals to 98.9% in case of high caloric value).

[*1] This project, which is called "development of high-efficiency industrial furnaces, etc.," consists of three sub-projects: "combustion control foundation technology," "development of high-efficiency industrial furnaces," and "high-efficiency boilers." These projects were carried out for seven years from FY1993 to FY1999 as entrusted business by the New Energy and Industrial Technology Development Organization (NEDO).

Reduction of oxygen production cost (PSA oxygen supply device, etc.) in the case of oxygen combustion, and selection of low-priced dew point-corrosion-proof materials in the case of heat-exchange appliance of condensed exhausted gas (economizer using steam's latent heat recovery) are the future challenges. At the moment, they have potential for becoming effective technologies when separation and recovery of CO_2 will be required as a measure against global warming in the future.

(8) Dissemination of cogeneration and fuel cells

1) Cogeneration

Cogeneration, a combined heat and power generation system, is a system in which energy is first converted into electric energy or motive energy by activating an energy converter (driver) and the exhaust heat that is generated in the energy conversion process is then effectively used for thermal energy demand (steam, hot water, cold water). In a cogeneration system, the following appliances are used as drivers:

- Internal combustion engine: diesel engine, gas engine, gas turbine
- External combustion engine: steam turbine, stirring engine
- Fuel cell: PAFC (phosphoric-acid type), MCFC (molten carbonate type), SOFC (solid oxide type), PEFC (polymer electrolyte type)

Drivers used for cogeneration are mainly internal combustion engines. The number of the engines with cogeneration installed, the capacities, fuel used, and the main uses are shown in the table below. Gas engines and gas turbines are able to effectively use gas fuels made from solid waste and biomass. At the moment, about 60% of cogeneration systems are adopting gas firing, which emit less environmental burden including CO_2, SO_x, NO_x, etc., and are more environmentally-friendly.

Main drivers and features of cogeneration

	Diesel engine	Gas engine	Gas turbine
Number of installation	Approx. 60%	Approx. 30%	Approx. 10%
Capacity	Approx. 40%	Approx. 10%	Approx. 50%
Fuel used	Diesel oil, Crude oil	City gas, LNG	Mainly city gas, LNG
Main use	Civil use	Civil use	Industrial use

The total heat efficiency of a cogeneration system is 70 - 80%, which corresponds to 25% of the energy conservation of a thermal power generation boiler system. However, this value can be obtained under the condition that 100% of the exhaust heat is effectively used. Accordingly, the point is that the exhaust heat should be applied to facilities that are expected to demand heat, such as factories, business offices, hospitals, stores, etc.

The introduction of cogeneration is expected to be pushed forward, because it will improve energy security and contribute to measures against global warming. The future challenge is to develop compact and high-efficiency gas engines and gas turbines (micro gas turbines) for civil use. Fuel cells, which are able to generate highly efficient electricity as well as exhaust heat, can make highly effective cogeneration motors. The future challenge for fuel cells is to lower the price.

2) Fuel cells

Fuel cells work based on a chemical reaction in which the fuel cells generate electricity and water at the same time by consuming hydrogen and oxygen. This is the inverse reaction of electrolysis of water. Fuel cells have various advantages including high power generation efficiency, small emission of environmental burden, adaptability to a wide range of facility capacities, and applicability to everything from distributed power generation to mass-concentrated power generation. The table below summarizes the main types of fuel cells and their characteristics.

Main types of fuel cells and their characteristics

	PAFC (phosphoric-acid type)	MCFC (molten carbonate type)	SOFC (solid oxide type)	PEFC (polymer electrolyte type)
Charge carrier	Hydrogen ion	Carbonate ion	Oxygen ion	Hydrogen ion
Operating temperature	Approx. 200°C	600 - 700°C	Approx. 1,000°C	80 - 100°C
Facility capacity	20 - 500 kW	500 kW - 1,000 MW	50 kW – 100 MW	1 - 100 kW
Efficiency at generating end	Approx. 45%	50 - 65%	55 - 70%	35 - 45%
Main use	Distributed power sources (cogeneration)	Distributed and mass-concentrated power source substituting fire power	Distributed and mass-concentrated power source substituting fire power	Power source for household use and driving source for automobiles
Points to note	Poisoning of platinum catalyst; CO should be 1% and less.	Catalyst is not required.	Reformer is not required. Catalyst is not required.	Poisoning of platinum catalyst; CO should be 10 ppm and less.

(9) Important check points concerning technical energy conservation measures

Business category / Items		Steel	Petrochemical	Paper/pulp
(1) Operation management		Operation management of major production facilities Advanced combustion control by computers, etc.	Optimization of naphtha-cracking furnace Combustion control of furnaces such as naphtha-cracking furnace Optimization of reflux ratio of distillation towers and optimization of steam pressure Optimum operation control by computers, etc.	Optimization of temperature, pressure, and material density in each process Optimization of electricity consumption by operation control of power generation facility and processing appliances Optimization of steam pressure Reinforcing of water conservation Effective use of waste heat
(2) Additional facilities	Thermal	Conditions of waste energy recovery (sensible heat recovery for cokes and sintered ore) Introduction of high-efficiency heating furnaces Temperature control of furnace wall Moisture control of coal charge Reduction of coking time and coking temperature Optimization control of intervals of regenerative burner	Waste heat recovery from naphtha-cracking furnace Insulation of pipes and furnace casing Effective recovery of reaction heat Collection of steam drain Construction of additional high-efficiency heat exchanger	Installation of high dew point sealing hood in paper machine Installation of high-efficiency heat exchanger Installation of automatic combustion control appliances Use of heat pump Installation of waste kiln-heat recovery appliance Use of waste as fuels
	Electrical	Idling prevention and speed control of electric motor for a roller of rolling mill Power generation by exhaust gas pressure from the furnace, exhaust heat recovery power generation Introduction of CDQ steam driven expansion turbine High-efficiency of private power generation (GTCC)	High-efficiency compressor Control of number of operating units Control of rotation speed Intake air temperature control of gas turbine Rotation speed control of motor	Rotation speed control of motor Use of medium and low pressure surplus steam for power generation using mixed pressure turbine Electricity conservation of dust extracting process
(3)Production facilities		Continuous casting equipment Direct rolling equipment Continuous annealing equipment Hybrid heating (electric heating/fuel heating)	High-efficiency radiation tube of naphtha-cracking furnace Introduction status of low-temperature low-pressure process by changing catalysts (Low density polyethylene production plant Gas phase polypropylene production plant)	Sealing of process, strengthening of pressurization, raising density Heat cascade use control of paper machine
(4) Others		Utilization of waste plastics for blast/coke furnaces	Utilization of pinch technology	Efficient use of black liquor recovered from pulp processing (Multiple-effect condensed and canned black liquor High-temperature high-pressure recovery boiler) Sludge combustion boiler

Items \ Business category		Cement	Plate glass	Textiles	Automobiles
(1) Operation management		Kiln combustion control	Management of solution tank (conditions of burner)	Operation management of boilers (automatic control of O_2) Operation under the optimal conditions by attaching temperature and moisture sensor Control of dyeing heat pattern	Operation management of major production facilities (high-efficiency operation, etc.)
(2) Additional facilities	Thermal	Strengthening of thermal insulation of kiln and suspension preheater Renovation of preheater Power generation using medium-/low temperature waste heat High-efficiency clinker cooler	Installation of waste heat boiler Strengthening of thermal insulation of solution tank	Exhaust heat recovery Drain recovery Heat recovery from waste fluid Insulation for pipes Shortening pipes Operation with constant loading (accumulator)	Heat insulation of/heat recovery from oven in painting process Waste heat recovery and heat insulation of furnace in heat treatment process
	Electrical	Computer control of motive energy (rotation frequency control, etc.) Vertical mill Mill with preliminary milling High-efficiency separator	Rotation frequency control of motor	Rotation frequency control of motor Low-pressure loss type transformer	Load control of motor in machine processing process Switch from electric heating (heater, etc.) to direct heating Control of number and rotation speed of hydraulic/pneumatic motor
(3) Production facilities		NSP kiln SP kiln High-efficiency mill Fluidized bed cement calcination furnace		Short-liquor dyeing device Water-saving washer Heat setter High-efficiency dryer	Reduction of air circulation amount in painting booth in painting process Reduction of standby electricity by conversion of hydraulic/pneumatic driving into electric driving Prevention of generating surplus electricity by rapid high-precision control of welding current Rationalization of painting/drying process Hybrid heating
(4) Others			Improvement of defect rate in quality control	Installation of distribution type boiler Introduction of cogeneration system	Heat recovery of solid waste incinerator Introduction of cogeneration system

Source) Survey by the Energy Conservation Center, Japan

(10) Challenges in typical energy conservation technology development

Business category	Future challenges in energy conservation technology development		
	Points for attention	Typical techniques	Problems
Steel	Rationalization of production process	Integration of high-speed continuous casting process and hot rolling process	Development of zero defect mold casting technology
	Cut-down of reduction energy	Utilization of scrap (electric furnace, cold iron-resource melting furnace)	Production of virgin iron for dilution of electric furnace (DR, IC)
	Exhaust heat recovery	Lateral production of iron and hydrogen	Establishment of optimal process
	Development of new iron producing method	Direct iron ore melting reduction technology	Establishment of optimal process
	Development of new coke production method	Future generation coke making technology	Establishment of optimal process
	Development of materials for enabling high-efficiency	Multi-purpose converter	Establishment of optimal process
		Material technology for extremely high temperature/highly critical turbine	Improvement in extremely high temperature tolerance/durability based on hyperfine structure observation technology
Petro-chemical	Rationalization of production process	Gas phase polypropylene production technology	Development of low-temperature, low-pressure, and high selectivity catalyst
	Development of low energy decomposition technology	Separation by membrane, extraction, and absorption	Development of optimal process for high-performance membrane separation
	Reduction of environmental load	Development of catalytic cracking process of naphtha	Analysis and evaluation technology using bio-technology/extremely critical catalyst
		Green chemistry	
Textile	Minimization of circulating stain solution	Nozzle-type dyeing device	Stabilization of dyeing quality
		Airborne dyeing device	Dyeing measures for fabrics with heavy weigh per unit
	Minimization of washing water	Counter-current washer	Removal of impurities such as lint
	Use of drying heat cascade	Vacuum drying system	Establishment of decompressing process
	Non-aqueous system processing	Processing technology using plasma	Improvement of treatment capacity, etc.
	Non-heating processing	Dyeing processing technology under the condition of critical CO_2 density	Development of treatment appliance
	Change in dyeing processing system	Processing equipment using ozone	Improvement of treatment capacity, etc.
		Ink-jet printing technology	Improvement of productivity, etc.
Paper/pulp	Change in paper making process	Improvement of dehydration/draining efficiency	Development/introduction of new draining technology
	Improving efficiency of paper making method	High-density paper making technology	Maintenance of paper quality
	Improving efficiency of causticizing process, omission of caustic kiln	Direct causticizing technology	Prevention of lowering of strength of pulp
		High-temperature high-pressure causticizing technology	Development of gout removal/filtration technology in high temperature
	Energy conservation of pulping process	Cooking using preliminary treatment of microbes in chips	Searching for lignin-decomposing fungi and enzymes and increasing their reaction speed, and consideration of their application to industrial technology
	Increase in amount of power generation by high-efficiency use of black liquor	Bio-bleaching technology	Development of recovered lignin utilization and improvement or efficiency in recovering chemicals
		Increase in amount of power generation by gasification technology and re-powering	Decrease in energy required for gasification

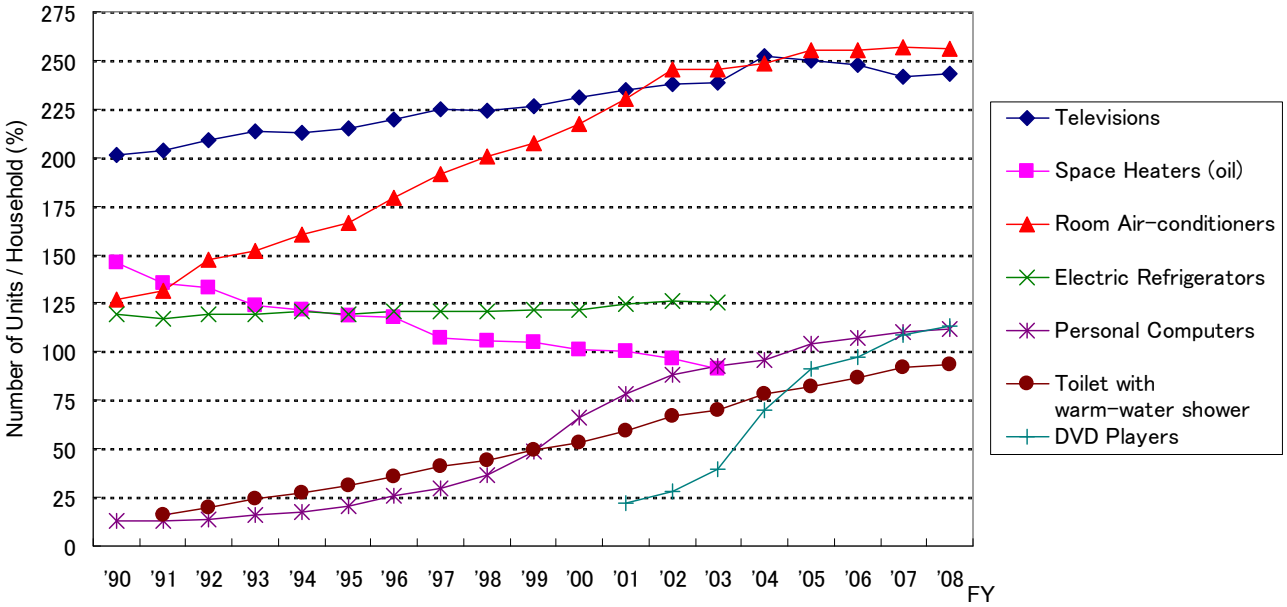
Source) Survey by the Energy Conservation Center, Japan

4.2 Equipment

(1) Energy situation for equipment

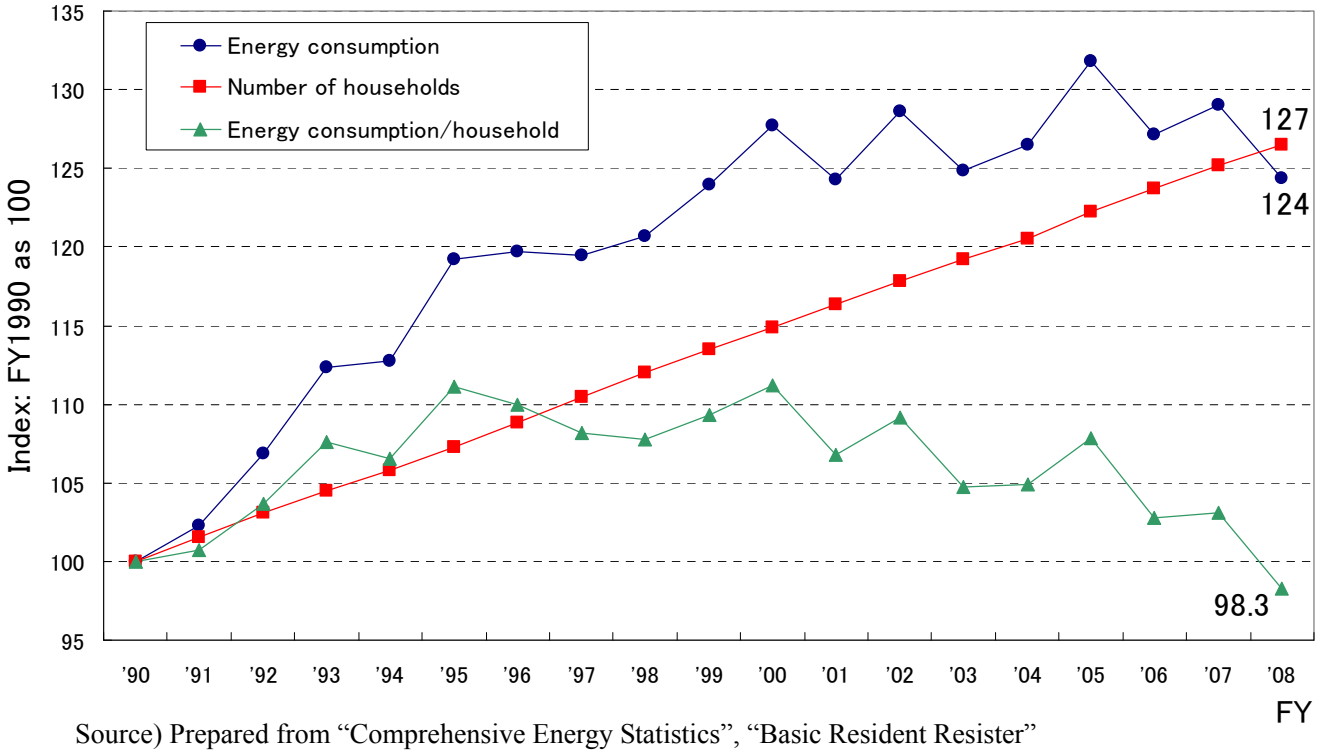
In Japan in the field of equipment, the per-household energy consumption has increased, thus contributing to the country's steady increase in the household sector. This trend is regarded caused by the country's societal factors such as lifestyle change leading to more energy consumption, individual's multiple ownerships of home appliances, and so on.

Recent trend of appliance ownership rate at household (1990 to 2008)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

Evolution of energy consumption and number of households



Source) Prepared from "Comprehensive Energy Statistics", "Basic Resident Resister"

Annual energy consumption of products (estimation)

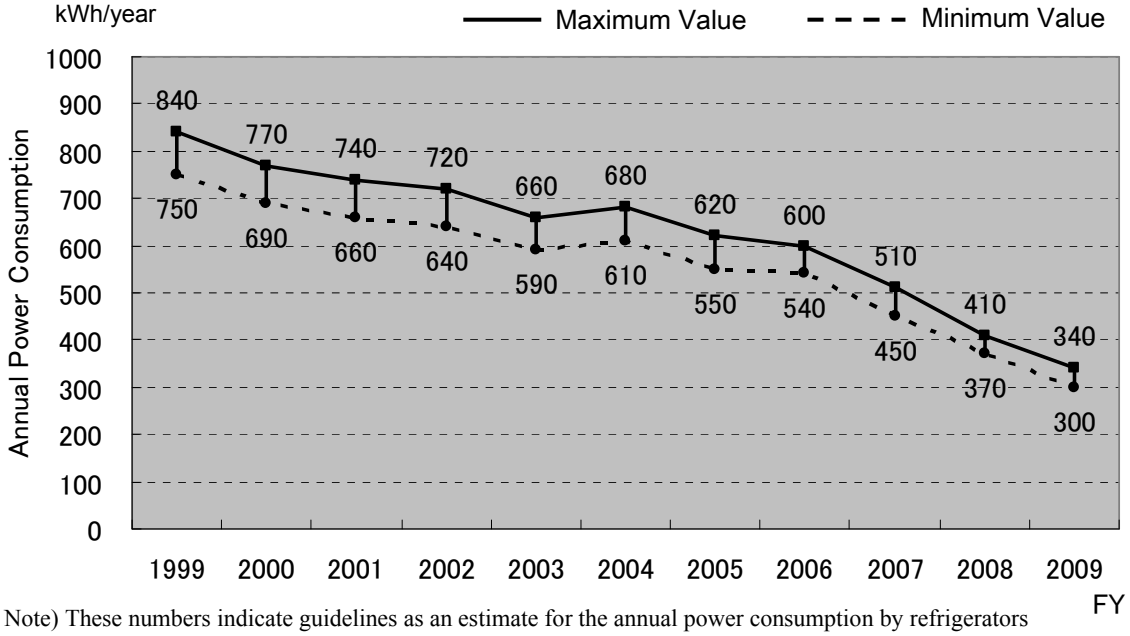
Ranking	Products	Data in 2004		
		Number of owned units (10^3units)	Shipment volume (10^3units)	Energy Consumption (crude oil equivalent: 10^3kl)
1	Passenger vehicles	56,288	4,534	51,582
2	Freight vehicles	18,459	1,070	35,085
3	Air conditioners	109,449	7,455	11,521
4	Gas water heaters	35,930	3,427	8,300
5	Space heaters	45,446	5,606	6,895
6	Fluorescent lighting fixtures	384,144	40,705	6,781
7	Transformers	12,921	330	6,374
8	Electric refrigerators & freezers	54,255	4,590	2,906
9	Oil water heaters	4,518	530	2,755
10	Gas cooking appliances	49,444	7,531	2,489
11	TV sets	98,771	8,572	1,264
12	Incandescent lighting fixtures	197,259	19,888	1,095
13	Electric hot-water pots	29,743	4,656	599
14	Vending machines	2,645	366	589
15	Electric toilet seat with warm-water-shower	15,585	2,988	406
16	Routers	10,657	3,319	401
17	Electric rice cookers	37,224	6,310	385
18	Printers, Monitors	46,532	14,386	373
19	Elevators	580	34	333
20	Electric space heaters (including warm-air type)	6,926	881	300
21	CPU, Personal computers	36,347	12,609	254
22	Microwave ovens	32,057	3,475	233
23	Showcases	1,174	158	227
24	Refrigerator-freezers, Freezers, Refrigerators (commercial use)	1,004	180	181
25	Electric carpets	8,643	1,058	166
26	Telephones	60,019	6,515	154
27	Laundry machines, Clothes dryers	40,178	4,487	152
28	Dishwashers (including those with dryers)	4,110	927	116
29	Electric irons	12,733	1,927	112
30	Stereo sets	40,663	1,663	97
31	Ventilators	57,515	7,624	89
32	Copyng machines, MFDs	4,190	728	83
33	Video cassette recorders	64,140	1,663	76
34	Hair dryers	26,173	4,033	76
35	Vacuum cleaners	39,571	5,863	72
36	Fax machines	16,257	3,432	50
37	Dehumidifiers	4,285	679	44
38	Electric fans	11,193	1,419	37
39	Magnetic disk units	39,600	27,550	30
40	DVD players	19,415	3,192	25
41	Electric clothes dryers	1,432	154	21
42	Electric pans	5,918	927	12
43	Electric massagers	10,752	1,283	4
*	DVD recorders	25,557	4,381	98

* The value are shown here as reference only because DVD recorders are included in VCRs.

Notes) : Current target products under Top Runner Program

Contrarily, the energy efficiency of home electronics equipment and office equipment have largely improved comparative to earlier energy performances in equipment, such as air-conditioners, refrigerators/freezers, TVs, and VCRs.

Estimate of annual power consumption trends for electric refrigerators (401 – 450L)



Note) These numbers indicate guidelines as an estimate for the annual power consumption by refrigerators with the rated capacity of 401 to 450 liters for each fiscal year, and do not indicate the annual power consumption by specific refrigerators.

Source) Prepared from the data by The Japan Electrical Manufacturers' Association

(2) Energy conservation policies and measures for equipment - Top Runner Program

1) Outline of top runner program

(a) Background

To diffuse highly energy efficient appliances and vehicles, the revised energy conservation law makes it obligatory for manufacturers and importers to ensure their products to meet energy-saving target standards. The government launched the Top Runner Program based on the 1999 amended law under which the standards are set based on the most energy efficient product commercially available in a given category. For each manufacturer and importer, the weighted average efficiency of all units shipped within the same category must meet the standards for that category by the target year decided for each category.

(b) Designated products

Target products are ones designated as machinery and equipment which are commercially used in large quantities in Japan, consume significant amount of energy on use and intensively required with "energy consumption efficiency".

(c) Target standard values

As for the designated products, manufacturers and importers etc. are obliged to meet the target standard values concerning "energy consumption efficiency". Target standard values are set based on the most energy efficient product commercially available in the market in a given category.

(d) Classification of target standard values

Target standard values are set in classifications considering a variety of models with different sizes and functions etc. for each product.

(e) Target fiscal years

Target fiscal years by which the target standard value must be achieved are set up through taking into consideration of future technological development forecasts and the development period of products and so on, usually in the range of 4 to 8 years from the base fiscal year.

(f) Judgment methods of achievement

In the target fiscal year, achievement of the target is judged based on such indicators as a weighted average of shipment by product for each product category per manufacturer and importer etc. Top Runner Standards are different from the concept of MEPS.

(g) Measurement methods

The measurement method primarily uses JIS (Japan Industrial Standards).

(h) Indications

Responsibility is assigned to indicate the "energy consumption efficiency" of the device in catalogs, on the device itself, etc.

2) Target achievement verification procedures

For each of the companies that manufactures or imports machinery and equipment specified in the Top Runner Standard, each machinery and equipment category's weighted average value must achieve a standard value by the target fiscal year. To confirm the achievement of standards, questionnaires are distributed to machinery and equipment manufacturers soon after the target fiscal year and information are obtained on numbers of units shipped, energy consumption efficiency, and the like in the target fiscal year. The surveys are conducted by the Agency for Natural Resources and Energy that is responsible for enforcing the Energy Conservation Law.

Weighted average energy efficiency = the sum of {(the number of units shipped domestically for each product name and type) × (energy consumption efficiency per unit)} ÷ the total number of units shipped domestically.

To confirm display implementation, product catalogues, as the primary source for displays, are periodically and continuously collected. For displays on products themselves, submission of name plates, etc. or retail store surveys are conducted to confirm the implementation.

3) Measures to be taken when the target values are not achieved

If the results obtained from the energy efficiency surveys mentioned in the previous paragraph appear to be remarkably low compared to judgment standards and a need to make suitable improvements in energy efficiency is recognized at the time, the Minister of Economy, Trade and Industry (in cases involving cars, the Minister of Economy, Trade and Industry and the Minister of Land, Infrastructure and Transportation) offer recommendations to the manufacturer in question as required. Further, if this advice is not followed, the recommendations are made public

and the manufacturer may be ordered to follow the recommendations.

Manufacturers subject to these recommendations and advice should be limited to those whose improvements in manufacturing and imports of equipment are considered to have a substantial impact on energy consumption in Japan. Targets should be limited to manufacturers whose organizational capacity is economically and financially firm enough, that is, limited to manufacturers for which there will be no problems regarding social appropriateness. For each machinery or equipment product covered by the Top Runner Standard, a cutback in shipping volume will be set according to production and import volume as stipulated by the government decree. If there are categories that partially fail to achieve goals among the many items, it will not be appropriate to advise the manufacturer immediately. Instead, reasons why goals were not achieved, other companies' achievement records in the same field, achievement records in other categories of the company in question, and percentages of categories that have not achieved target standards in overall categories, and other factors will be comprehensively evaluated. These measures are implemented for manufacturers that do not adhere to display rules. For displays, cutbacks based on manufacturers' production and import volume are not applied and all companies are subject to these measures in spite of small volume in production and import.

4) Standards of Judgment for machinery and appliances under top runner program

The standards of judgment, etc. for manufacturers, etc. regarding improvement of the performance of "Designated Machineries" pursuant to the provision in Chapter 6 of the Law Concerning the Rational Use of Energy (the latest amendment in 2008) are defined and notified by the category of machinery and appliance. The details of the standards of judgment for machinery and equipment are shown in the web-site of ECCJ.

(http://www.asiaeec-col.eccj.or.jp/top_runner/index.html)

5) Designated products and its expected energy conservation effects by the target fiscal year

Equipment			Target Fiscal Year	Base Fiscal Year	Efficiency Improvement (Expectation)
1	Passenger Vehicles	Gasoline, Diesel	2015	2004	23.5%
		LP Gas	2010	2001	11.4%
		Small Buses	2015	2004	7.2%
		Route Buses, Ordinary Buses	2015	2002	12.1%
2	Freight Vehicles	Gasoline, Diesel	2015	2004	12.6%
		Trucks, Tractors	2015	2002	12.2%
3	Air Conditioners	for residential use	2010/2012	2006	15.6%
		for service use	2015	2006	18.2%
4	TV Sets	LCD, Plasma	2012	2008	37.0%
5	Video Cassette Recorders		2003	1997	58.7%
6	Lighting Equipment	Fluorescent Light Equipment	2012	2006	7.7%
		Bulb-shaped Fluorescent Lamps	2012	2006	3.2%
7	Copying Machines		2006	1997	30.8%
8	Computers		2011	2007	78.0%
9	Magnetic Disc Units		2011	2007	76.0%
10	Electric Refrigerators		2010	2005	21.0%
11	Electric Freezers		2010	2005	12.7%
12	Space Heaters	Gas	2006	2000	1.4%
		Oil	2006	2000	3.8%
13	Gas Cooking Appliances	Burner Section	2006	2000	13.9%
		Grill Section	2008	2002	27.4%
		Oven Section	2008	2002	20.3%
14	Gas Water Heaters	Gas Instant Water Heaters, Bath Tub Gas Water Heaters	2006	2000	4.1%
		GWH for Space Heating (with no Hot Water Supply Function)	2008	2002	3.3%
		GWH for Space Heating (with Hot Water Supply Function)	2008	2002	1.1%
15	Oil Water Heaters		2006	2000	3.5%
16	Electric Toilet Seats		2012	2006	9.7%
17	Vending Machines	(Addition of Paper Container, Cups)	2012	2005	33.9%
18	Transformers	Oil-filled	2006	1999	30.3%
		Molded	2007	1999	
19	Microwave Oven		2008	2004	8.5%
20	Electric Rice Cookers		2008	2003	11.1%
21	DVD Recorders	incompatible with TDB	2008	2004	22.4%
		compatible with TDB	2010	2006	20.5%
22	Routers		2010	2006	16.3%
23	Switching Units		2011	2006	37.7%

Source) Prepared from a brochure "Top Runner Program (March 2010)" by METI

6) Efficiency improvement achieved by top runner products

Product Category	Target Fiscal Year	Base Fiscal Year	Efficiency Improvement (initial expectation)	Efficiency Improvement (result)
TV sets (using CRTs)	2003	1997	16.4%	25.7%
Video Cassette Recorders	2003	1997	58.7%	73.6%
Air Conditioners #	2004*	1997**	66.1%	67.8%
Electric Refrigerators	2004	1998	30.5%	55.2%
Electric Freezers	2004	1998	22.9%	29.6%
Passenger Vehicles (Gasoline) #	2010	1995	22.8%	22.8% (FY2005)
Freight Vehicles (Diesel) #	2005	1995	6.5%	21.7%
Vending Machines	2005	2000	33.9%	37.3%
Fluorescent Light Equipment #	2005	1997	16.6%	35.6%
Copying Machines	2006	1997	30.8%	72.5%
Computers #	2007	2001	69.2%	80.8%
Magnetic Disc Units #	2007	2001	71.4%	85.7%
Electric Toilet Seats	2006	2000	10.0%	14.6%

*2004 freezing year => Oct. 1, 2003 through Sep.30 2004, **1997 freezing year => Oct.1, 1996 through Sep.30, 1997

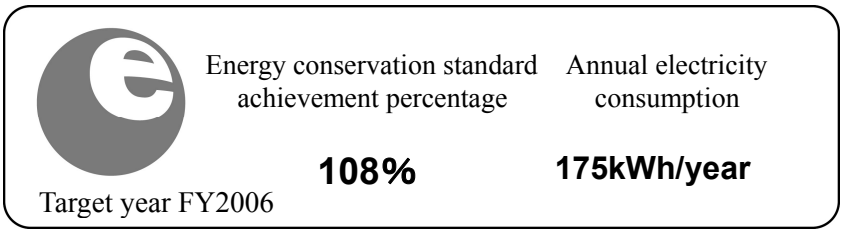
Source) Prepared from a brochure "Top Runner Program (March 2010)" by METI

For the product categories marked with #, energy efficiency standard values are defined by the energy consumption efficiency (e.g. km/l), while those without # mark are by the amount of energy consumption (e.g. kWh/year). In the above table, values of the "Energy efficiency Improvement" indicate the rate of improvement calculated based on each standard. Example: If the efficiency is improved from 10 km/l to 15 km/l, the improvement rate is calculated as 50%. (It is not calculated as the improvement of fuel consumption by 33% from 10 liters down to 6.7 liters for a 100km drive.) ; and if the efficiency is improved from 10 kWh/year to 5 kWh/year, the improvement rate is 50%.

(3) Dissemination and outreach measures for equipment

1) Energy labeling program

The energy-saving labeling system introduced as JIS standard in August 2000 started to give better information for consumers of energy efficiency of home appliances. As of July 2010, the labeling is applied to 18 products detailed in the below table. Target years are set per product category.



The labeling is colored in orange for a product which doesn't achieve the target standards of energy efficiency, while the labeling is colored in green for a product that achieves over 100% of the target standards. The "achievement rate of energy efficiency standards" is given as a percentage indicating how far the product's energy efficiency is improved from the target value with the special definitions given as follows for each indication of the labeling information: Energy efficiency: Measurement process is set per product category. The indicated values are more efficient with the higher rate of energy performance rate and less energy efficient with the lower rate of energy performance rate.

2) New appliance labeling program

Following the introduction of the original labeling program referred as above, the government revised the energy conservation law to include the new information requirement of the appliances' expected electricity cost or fuel usage information. The new comparative rating system which is presented as five-star rating provides consumers with comparative purchasing with other products in the same category. Cost information is now required for the designated three products.

Target products for the labeling programs

Category*	Energy Labeling Program	The new "Multi-Stage Rating System" (Uniform Energy-saving Label)	Indication of "Expected Annual Electricity Bill" Information
Air conditioners	○	○	○
Electric refrigerators	○	○	○
Electric freezers	○		○
Lighting equipment	○	○	○
Electric toilet seats	○	○	○
TV sets	○	○	○
Computers	○		
Magnetic disk units	○		
Space heaters	○		
Gas cooking appliances	○		○（Fuel）
Gas water heaters	○		○（Fuel）
Oil water heaters	○		○（Fuel）
Transformers	○		
Electric rice cookers	○		○
Microwave ovens	○		○
Video cassette recorders			○
DVD recorders	○		○
Routers	○		
Switching units	○		

*Only TR products are targeted.
*Second hand products are not targeted.

3) Energy efficient product retailer assessment program

The new retailer commendation program was introduced, expected to contribute to further energy efficient product sales. Selecting appliance retailers who are active in selling and promoting energy-efficient products, the program awards a label to the store called as the "Top Energy Efficient Product Retailing Promotion Store". The selection indicators include shop assistants' knowledge, in-company training histories, etc. In FY 2009, 485 large-scale stores and 210 small-scale stores were certified as excellent stores. From those stores, a total of 6 stores were given Minister of Economy, Trade and Industry Award, Minister of the Environment Award, Director-General, Agency for Natural Resources and Energy Award and Chairman of ECCJ Award.

4) International energy star program

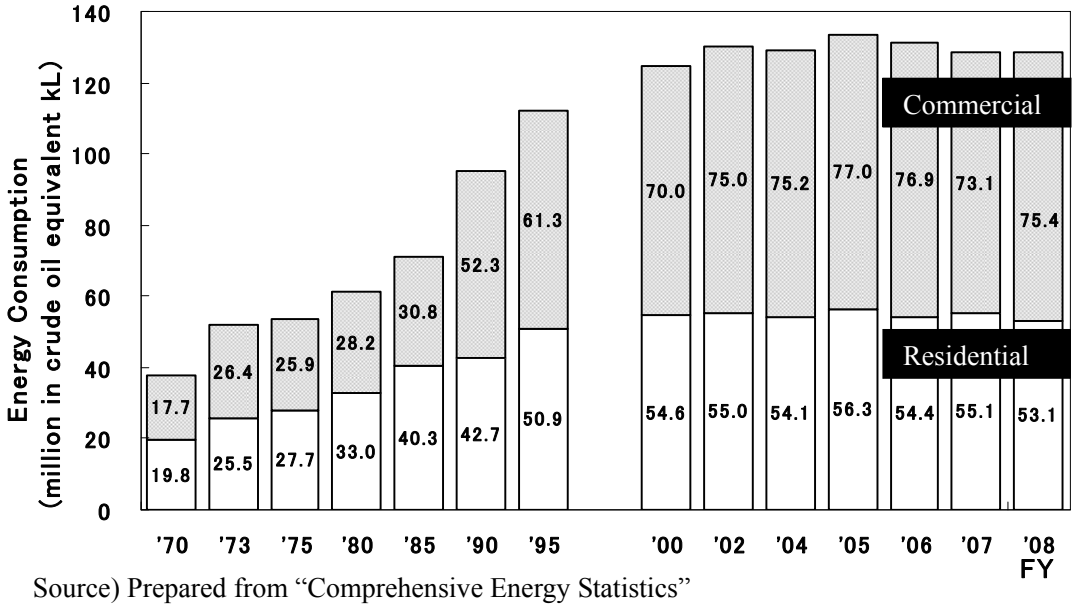
Established in the US in 1992, the international Energy Star program is a voluntary product labeling program designed to promote energy-efficient products. The US program has much wider application including programs for buildings, housings, domestic appliances and more. Japan joined in 1995 and only participates in the office equipment application. The target equipment includes personal computers, monitors, printers, fax machines, copying machines, scanners, multifunction devices, and digital printing press.

4.3 Commercial/Residential Sector

(1) Energy situation for the commercial/residential sector

As referred in the previous equipment chapter, the significant improvements in the equipment energy efficiency have been monitored in Japan. However, contrary to the trend, the country's final energy consumption of the commercial/residential sector has been rising. This trend is regarded attributable to the increasing the number of households, convenience and affluence thriving lifestyles, the increase of multiple appliances ownership per household, bigger size trend in appliances, and the increase of high-tech appliances, which use energy heavily.

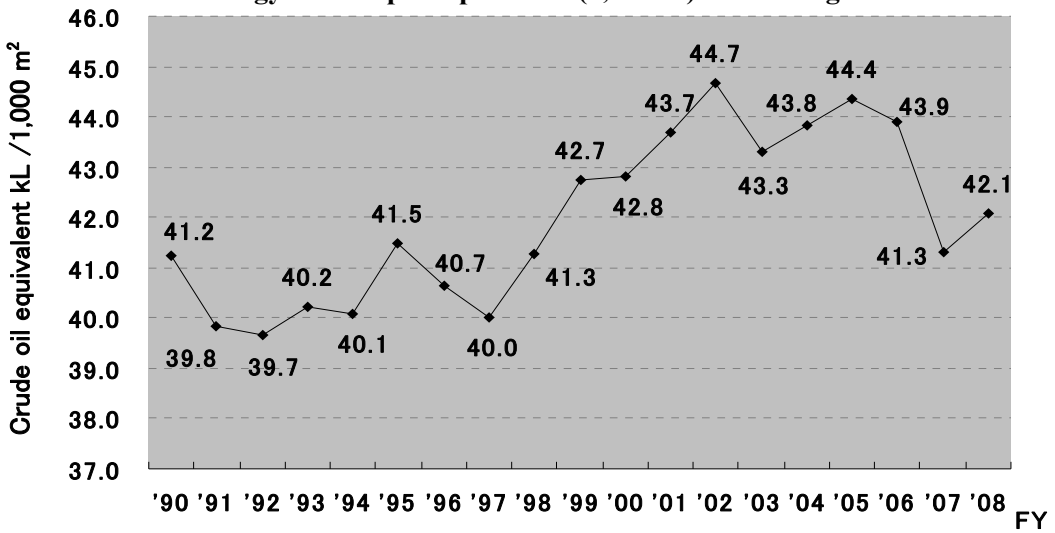
Commercial /residential sector final energy consumption



Source) Prepared from "Comprehensive Energy Statistics"

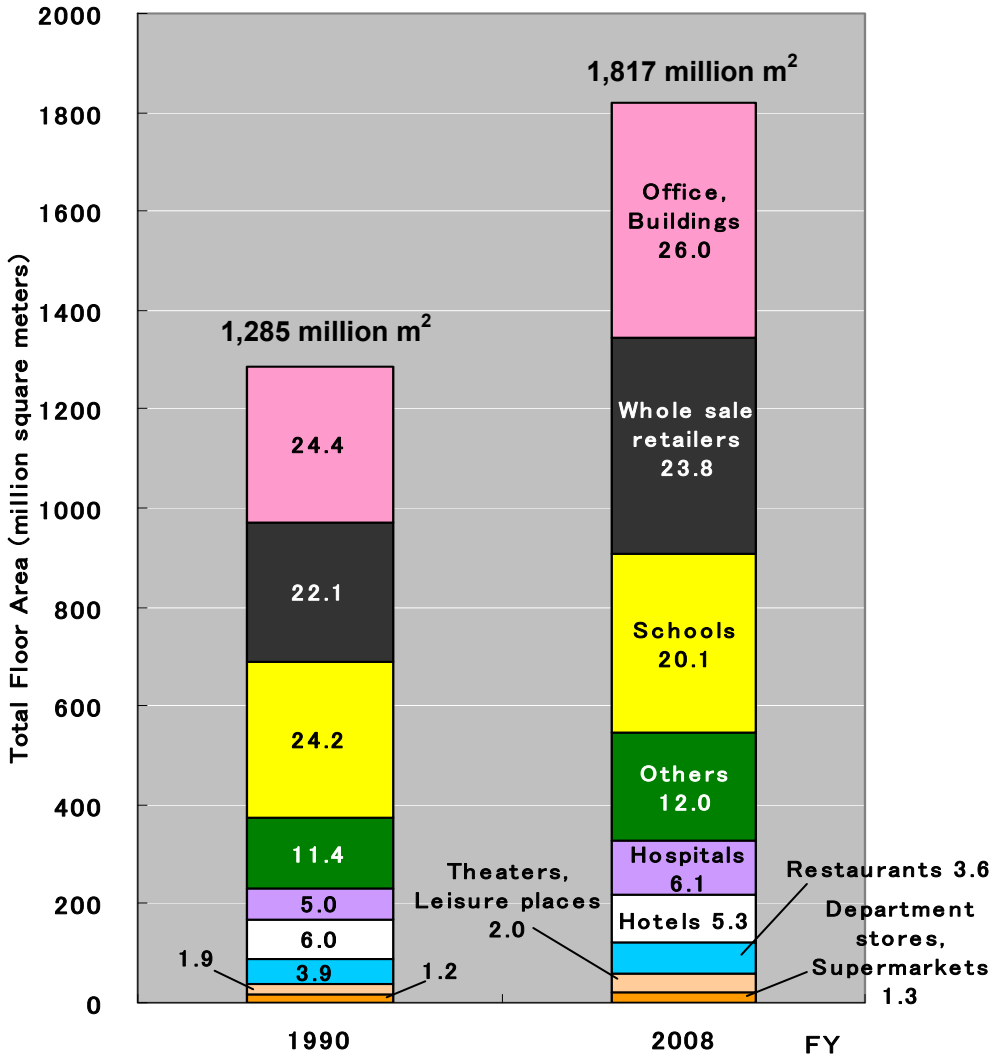
In the commercial sector, the energy demand has still been increasing in this sector, although the per-floor space energy intensity has remained roughly flat in recent years shown as below. This is due to the increase of the total floor-spaces and in FY2008, it showed approximately 41.4% rise from FY1990 in the country in all business types as shown in the next page.

Energy consumption per-floor (1,000m^2) of buildings



Source) Prepared from "Comprehensive Energy Statistics", "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

Buildings floor space share by business type (FY1990 and 2008)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

(2) Energy conservation policies and measures for the residential sector

1) Outline of the policies and measures for the residential sector

Although the household sector has made a progress in terms of energy efficiency of appliances, its energy demand is also increasing due to the increasing ownership of new appliances and the growing public demands to seek for more comfortable and convenient lifestyle.

In order to deal with this trend, following collective measures have been launched: the first measure focuses on improving energy efficiency in machinery and equipment, the second measure aims to improve the heat insulation performance in residences and buildings and the third one manages the total energy demand.

In terms of the first one, strict standards have been set by introducing the Top-Runner Program. At first it targeted the appliances specified in the energy conservation law such as air conditioners and TVs. Later, the target range was extended to include gas and oil appliances/equipment, vending machines, etc. with the revision of the law in December, 2004. Moreover, in the field of the hot water supply system, which accounts for 30% of energy consumption in the households,

more energy-efficient system has been developed and commercialized. And the support programs to make a smooth introduction in the market are underway.

As for the second measure, the activities to promote the energy conservation labeling program for residences and the subsidy programs for residences conforming to the energy conservation standards are being conducted.

The third measure supports the publicity activities to disseminate energy conservation at home, for instance, on how to best choose energy efficient appliances. And it is backing the testing and demonstration of home energy management system (HEMS).

2) Relevant legislation, etc.

a) Measures based on the Law Concerning the Rational Use of Energy

- Standards of Judgment for Construction Clients and Owners of Specified Buildings on the Rational Use of Energy for Houses (Announcement No.1 of METI and MLIT on 30 January, 2009)
- Standards of Judgment for Residential Construction Clients on the Improvement of Performance Required for Specified Residence (Announcement No.2 of METI and MLIT on 30 January, 2009)
- Guidelines for Design, Construction and Maintenance on the Rational Use of Energy for Houses (Announcement No.118 of MLIT on 30 January, 2009)

b) Supporting measures for houses

Extra financing from the Japan Housing Finance Agency is provided for energy conservation-oriented houses

c) Dissemination and publicity activities on energy conservation

- In order to promote energy conservation as a nationwide activity, the government has established "Energy Conservation Day" on **the 1st of every month**, "Energy Conservation Month" in **February** and "General Check-up Day for Energy Conservation" on the **1st of August and December** which were decided by the Conference to Promote Energy and Resources Conservation Measures.
- Educational and publicity activities are conducted in cooperation with the local governments and private companies through the energy conservation measures in summer and winter.
- Preparation and distribution of posters and pamphlets, conduction of symposiums, implementation of a house heat insulation construction engineers' lecture course, and information supply through mass media
- Implementation of an Energy Conservation Grand Prize, as a system to commend energy conservation-type equipment for the Commercial/residential sector.
- Preparation for Energy Conservation Performance Catalogue (including 8 appliances: air conditioners, TVs, DVD recorders, electric refrigerators, electric rice cookers, microwave ovens, lighting equipment, and electric toilet seats.)

(3) Energy conservation policies and measures for the commercial sector

1) Outline of the policies and measures for the commercial buildings

In the commercial sector, the main factor of the increase of energy consumption stems from the growing floor space of office and commercial buildings, which is triggered by the industrial structure change. Nevertheless, the awareness to control the energy intensity is relatively low compared to the industrial sector, whose energy cost directly affects their production costs. In order to address this problem, like the household sector, following measures have been taken to improve the energy conservation performance in buildings: (i) establishing energy conservation standards based on the energy conservation law, (ii) offering low interest loans to the buildings which perform high energy conservation, (iii) introducing the Top Runner program to help promote energy efficiency for office appliances, and (iv) implementing the Energy Star program that sets energy conservation standards for office equipment.

In June 2002, the Energy Conservation Law was revised and the clause 'industries subjected to the "Type 1 Designated Energy Management Factory" was extended to the commercial sector such as office buildings, large-scale retail stores, hotels, hospitals, etc.

Moreover, regulatory structure was changed from regulating each factory or workplace to regulating the company wide management in 2008. The amendment obliged a company who uses a certain amount of energy as the whole company to regulate all of its factories and workplaces it has (the regulation is also introduced to a franchise chain such as convenience stores and restaurants, considering it to be a single company). Consequently, the regulatory coverage of total energy consumption in the commercial sector is expected to increase from approximately 10% to 50%. (Refer to Page 68 for "Energy conservation measures for the commercial buildings")

2) Relevant legislation, etc.

a) Measures based on the Law Concerning the Rational Use of Energy

i) Standards of Judgment for Construction Clients and Owners of Specified Buildings on the Rational Use of Energy for Buildings (Announcement No. 3 of METI and MLIT on 30 January, 2009)

ii) Release of Thermal Insulation Performance Value of Building Materials (MITI on 8 April, 1999)

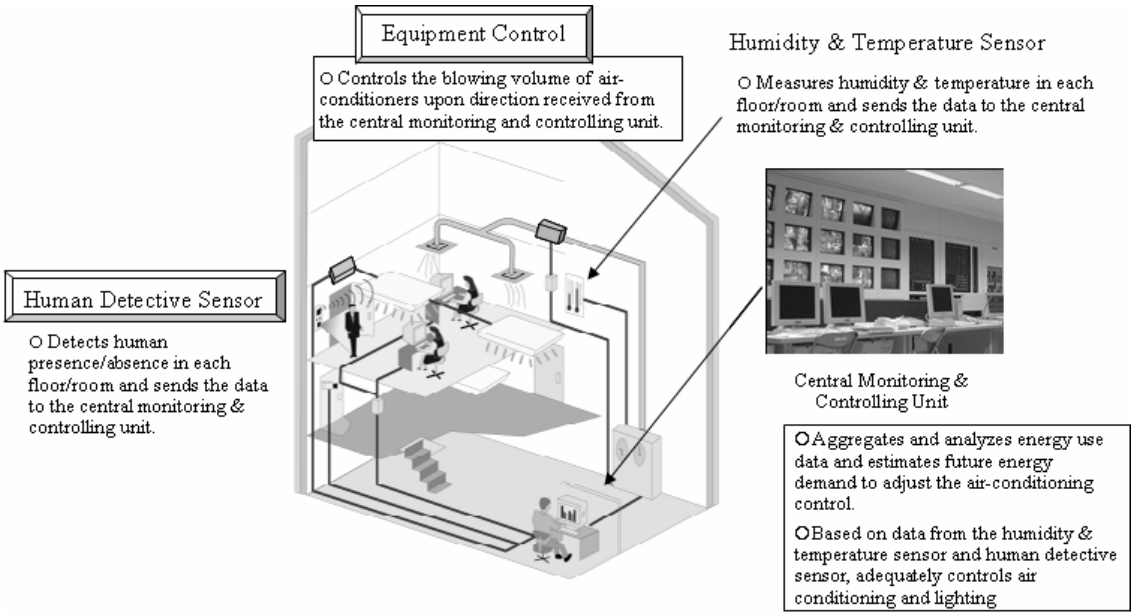
b) Supporting measures

i) As to buildings for business that meet the effort guidelines in standards of judgment for buildings: acknowledgement on equipment investment plans, low-interest financing, and grants for paying a fixed interest rate, based on the Energy Conservation and Recycling Support Law

ii) Financing by the Development Bank of Japan toward environmentally low-burden-type buildings ("eco-care" buildings) (Ministry of Land, Infrastructure and Transport)

(4)Promotion of commercial building energy management system (BEMS) (thorough energy management utilizing IT)

By using IT technology, BEMS system promotes and facilitates energy demand management for commercial buildings. The system ensures recognizing real-time room conditions in buildings by temperature sensors and/or the optimal operation of lighting and air-conditioning responding to conditions in the room. BEMS image is shown below:



Energy conservation measures for the commercial buildings

Classification	Operation control/simple remodeling	Equipment remodeling
Air-conditioning (1)Reduction of heating and cooling load	· Reduction of sunlight Window shade operation, attachment of solar control film · Reduction of space load Installation of wind shield room, revolving door, use of airtight sash · Concentration of air-conditioned operation area	· Prevention from heat entering buildings through outer wall or windows. · Reduction of window space, adoption of layered glass, insulation of internal (external) walls, installation of eave/balcony, etc., adoption of air flow system
Air-conditioning (2)Efficiency improvement of equipment system	· Reduction of outdoor air load Reduction of surplus open air intake Cut of open air during preheating/pre-cooling · Heat source efficiency operation control Unit control according to load, schedule control, water supply temperature change · Change of indoor temperature/humidity set · Zero energy band control Increase of using temperature deference (flow rate /wind volume) · Free cooling · Cleaning of heat exchanger coil filter, etc.	· Efficient use of heat source Adoption of high-efficiency heat pump, introduction of co-generation, heat storage system · Use of natural energy Use of solar heat, outdoor air cooling, night purge · Use of waste heat Attachment of total heat exchanger Heat pump system using waste heat (use of wasted heat from air cooler, & wasted water from drainage, river, etc.) · Outdoor air intake control (CO_2 control)
Air-conditioning (3) Management of equipment or overall system	· Measurement and record for improvement of energy efficiency · Periodical maintenance check · Maintenance check of automatic control devices	· As heat source, adoption of equipment with high part-load efficiency or heat storage system. · Adoption of BEMS (humidity/temperature meter for improving the efficiency of air-conditioning, sensor system) · Heating appliance with far-infrared ray
Material Transfer	· Control of fan operation time · Inspection/repair of duct air leakage · Adoption of pump unit control · Adoption of inverters · Air volume control with various sensors for power for ventilation	· Adoption of VAV (variable air volume) system · Adoption of high efficient fan · Improvement of duct pressure damage · Adoption of VWV (Variable water volume) system · Improvement of friction loss of pipe · Adoption of great temperature gap system
Lighting	· Putting out light near window · Putting out light when unnecessary (manual switch, timer) · Light color finishing of interior · From incandescent bulb fluorescent lamp · Periodical replacement, cleaning of lamp	· Adoption of HID lamp, optical duct system · Adoption of Hf-type lighting equipment · Task and ambient lighting · Introduction of Daylight sensor, human sensor
Boiler and Hot water supply	· Control of hot water temperature set · Utilizing rest water of storage type boiler · Control of steam pressure ·Heating loss prevention of steam (hot water) pipe	· Adoption of suitable boiler high efficiency, small type boiler, suitable capacity · Optimization of pipe design Minimal length, suitable diameter · Heat pump-type hot water heater · Condensation heat recovery method water heater

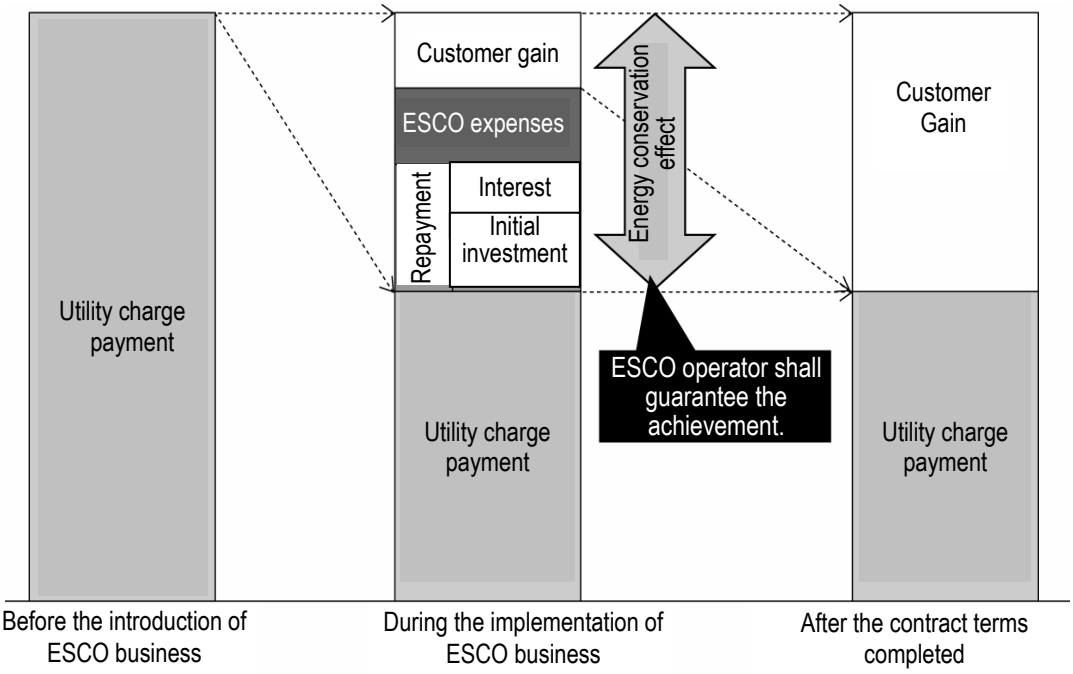
Classification	Operation control/simple remodeling	Equipment remodeling
Lifting equipment	· Efficient operation of escalators etc. with sensors detecting the presence of a person	· Adoption of group control system
Cooking	· Prevention of water left running (opening and closing water tap) · Replacement of damaged packing · Heat control · Cleaning of equipment ·Preventing unnecessary preheating of range/oven	· Adoption of energy conservation type equipment (electromagnetic cooking device, gas cooking device, pressure cooker, steamer) · Adoption of water conservation top · Adoption of bubble maker tap · Adoption of single lever mix tap · Adoption of double tank sink
Washroom	· Replacement of damaged packing · Adjustment of wash basin water stop tap · Water control of feces stool flush valve · Installation of imitation sound devices	· Adoption of water conservation tap · Adoption of self closing tap · Adoption of water conservation feces stool · Examination of urinal cleaning system (water supply time control by timer, light sensor equipment automatic water supply system, light switch connection system, etc.)
Freezer/Refrigerator/ Showcase	· Control of cooling temperature · Reduction of door opening (number, time) · Prevention of too much food storage · Letting hot food cool before storage · Putting out showcase light after closing time · Frost removal · Check/repair of door packing · Periodical cleaning of condenser · Night cover, night set for showcase	· Adoption of air cooled type freezer (water conservation) · Attachment of back system · Adoption of energy conservation type showcase (double layer air curtain type, swing door, etc.)
Vending machine	· Speedy door opening/closing · Allowing back space (10cm or more) · Exact change of "hot" and "cold" · Switch off during non-business, non-store hours	· Adoption of energy conservation type vending machine (automatic switch for fluorescent lamp, energy conservation timer, peek cut function, reinforcement of insulation, etc.)
Electricity reception	· Cutting transformer at source side · Checking ventilation of electricity reception room (prevention of efficiency decline due to high temperature)	· Adoption of transformer with suitable capacity · Adoption of cell facility for power storage · Improvement of power factor (Installation of condenser) · Adoption of demand control system · Adoption of low-less transformer · Adoption of 400 volt class wiring equipment
Equipment maintenance	· Repair/replacement of automatic control equipment Damage, bad placement of valve, damper, sensor, etc. · Improving precision of thermometer · Additional attachment of measuring device · Examination of energy consumption (by fiscal year, by equipment type)	

Source) "Energy Conservation Equipment Summary, 2004 Edition, Judgment Standards for Business Operators Regarding Rational Use of Energy at Factories" (Notification of the Ministry of International Trade and Industry, May 2006), "Energy Conservation Handbook for Small Scale Service Industry", etc. (the Energy Conservation Center Japan)

(5) Promotion of ESCO business

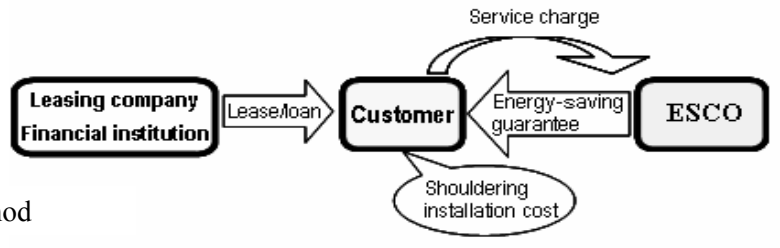
1) Outline of ESCO business

ESCO is a business that offers comprehensive services on energy conservation to clients, who in return will offer part of their energy saving gains (saving on utility bills, etc.) The business has two forms: “Guaranteed savings agreement”, where customers cover business costs, and “Shared savings agreement”, where the ESCO business covers business costs. These options enable service provision according to customer needs. * ESCO stands for Energy Service Company.

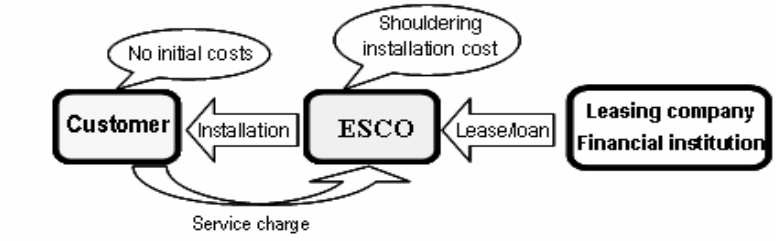


There are two methods of ESCO business as follows.

(a) Guaranteed method



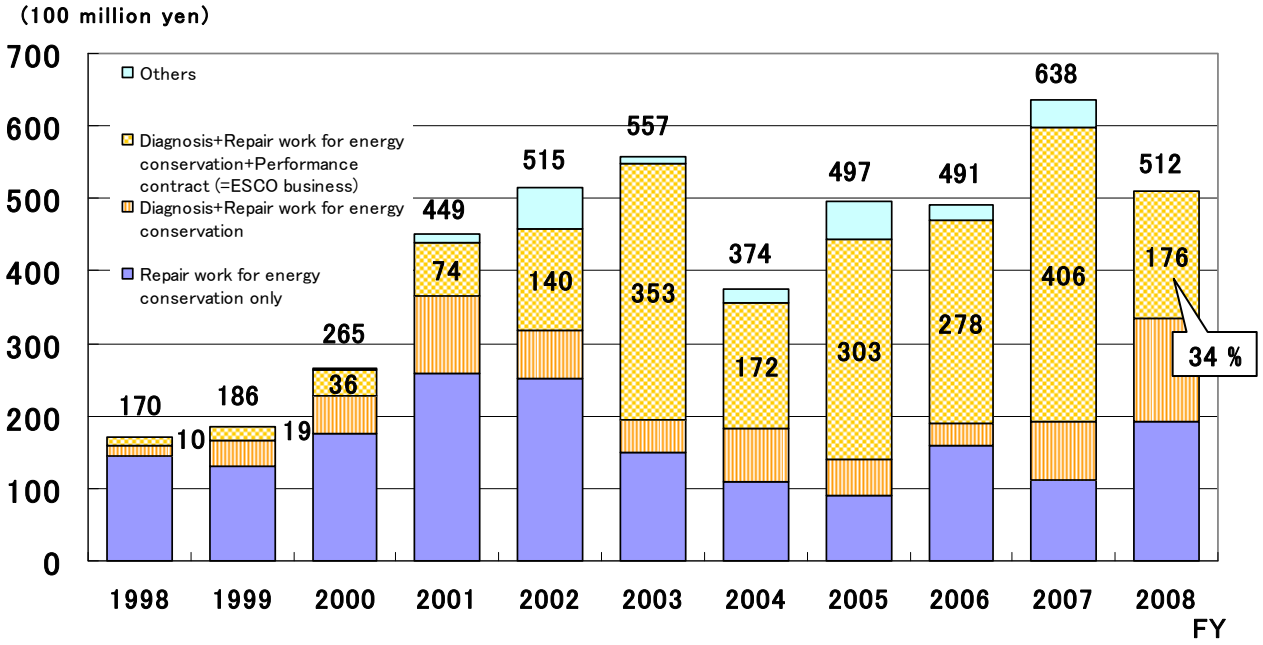
(b) Shared method



2) Size of the ESCO-related market

In FY 2008, the total amount of repair work for energy conservation decreased by 20% compared to the previous fiscal year. The order volume of ESCO business substantially decreased from 23 billion yen in the previous year to 17.6 billion yen, but ESCO business still accounts for 34%. The scale of the potential market is expected 2,470 billion yen according to the ESCO Business Introduction Promotion Study Group of The Energy Conservation Center, Japan. In the U.S., the scale of market is approx. $2 billion (2000).

Market size of repair work for energy conservation including ESCO business



Source) Prepared from the data by Japan Association of Energy Service Companies

3) Future challenge

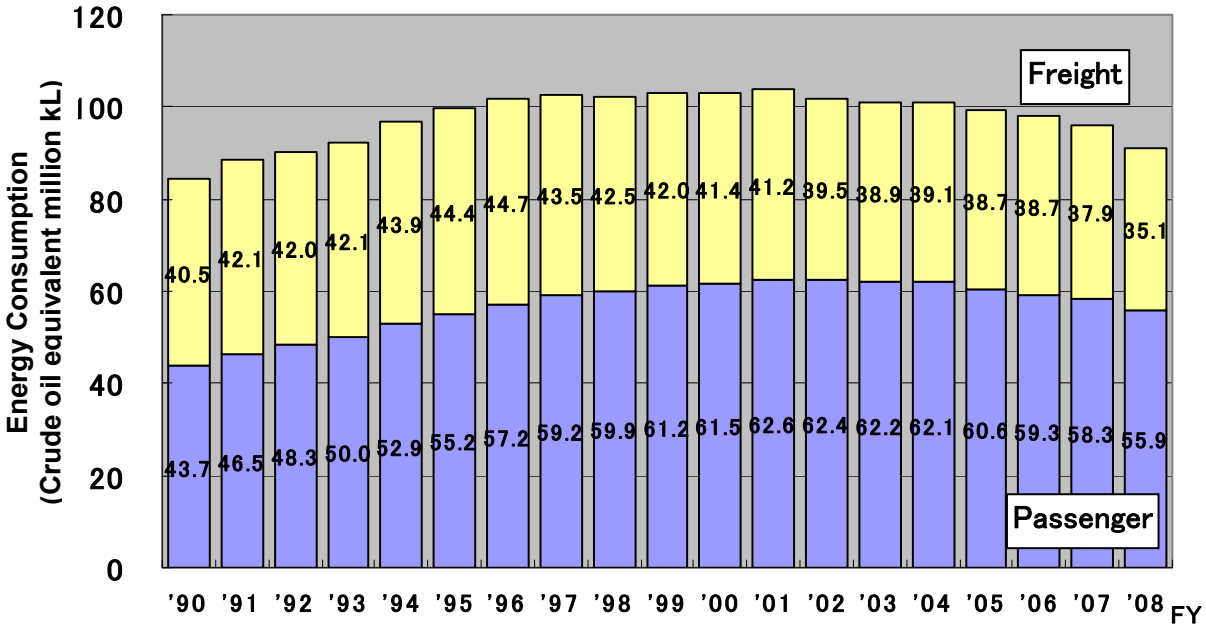
For further promotion of ESCO business, we have to make efforts to (1) promote the ESCO business in the public sector, (2) facilitate fund procurement, and (3) improve the recognition of the business. With respect to the item (1), we carried out the ESCO business as a model case at the Ministry of Economy, Trade and Industry in 2004. Furthermore, we will prepare an ESCO introduction manual for municipalities and hold meetings to explain the guidelines at municipalities. With respect to the item (2), we will promote the use of the low-interest loans of Development Bank of Japan and the project financing method. With respect to the item (3), we will hold ESCO business explanation meetings throughout Japan to promote introduction.

4.4 Transportation Sector

(1) Energy situation for the transportation sector

The energy consumption in Japan's transportation sector had increased until FY1996 since the oil crisis, but the recent data shows that the previous increasing trend stopped and almost leveled off its consumption. Its major factor is attributed to the increasing number of the ownership of passenger vehicles. The energy consumption by passenger vehicles accounts for 83 % of the total fuel consumption in the passenger transportation.

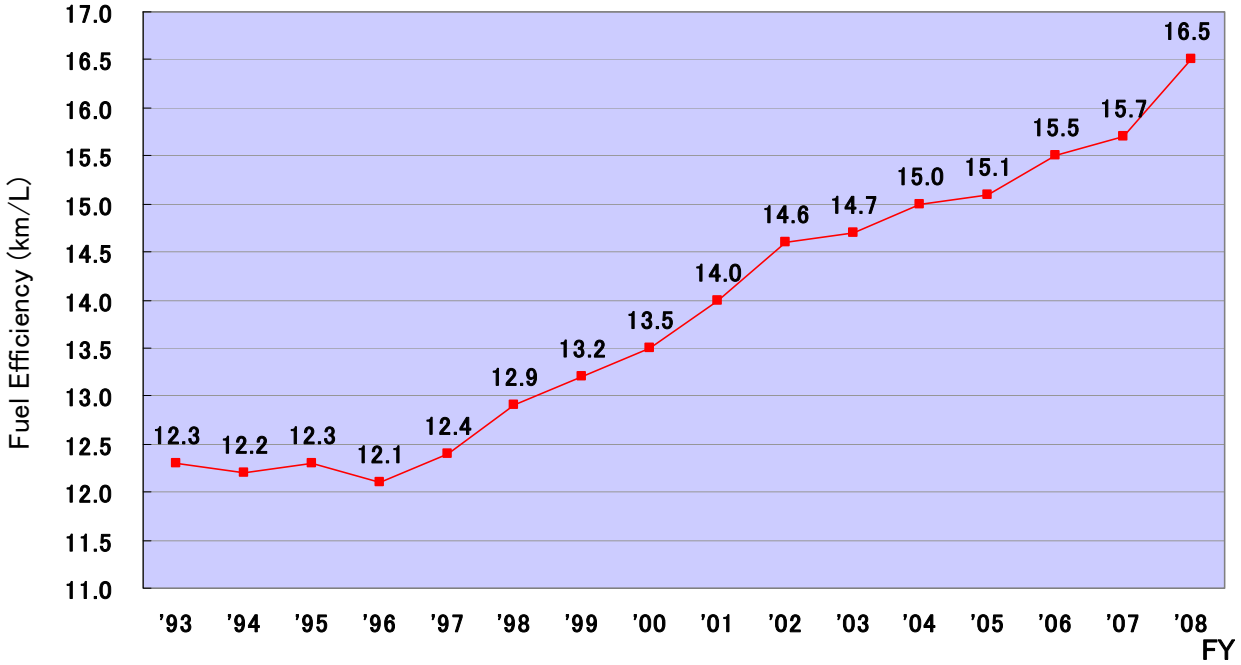
Evolution of energy consumption in freight and passenger transportation



Source) Prepared from "Comprehensive Energy Statistics"

Japan's vehicle energy performance has significantly improved specifically since the introduction of a new standard setting process applied for appliances and vehicles called Top Runner Program. As mentioned in the equipment chapter, as a result of cooperative effort made by manufacturers under the program, the great improvement in fuel efficiency in those vehicles can be monitored comparative to earlier energy performances as shown in the below figure.

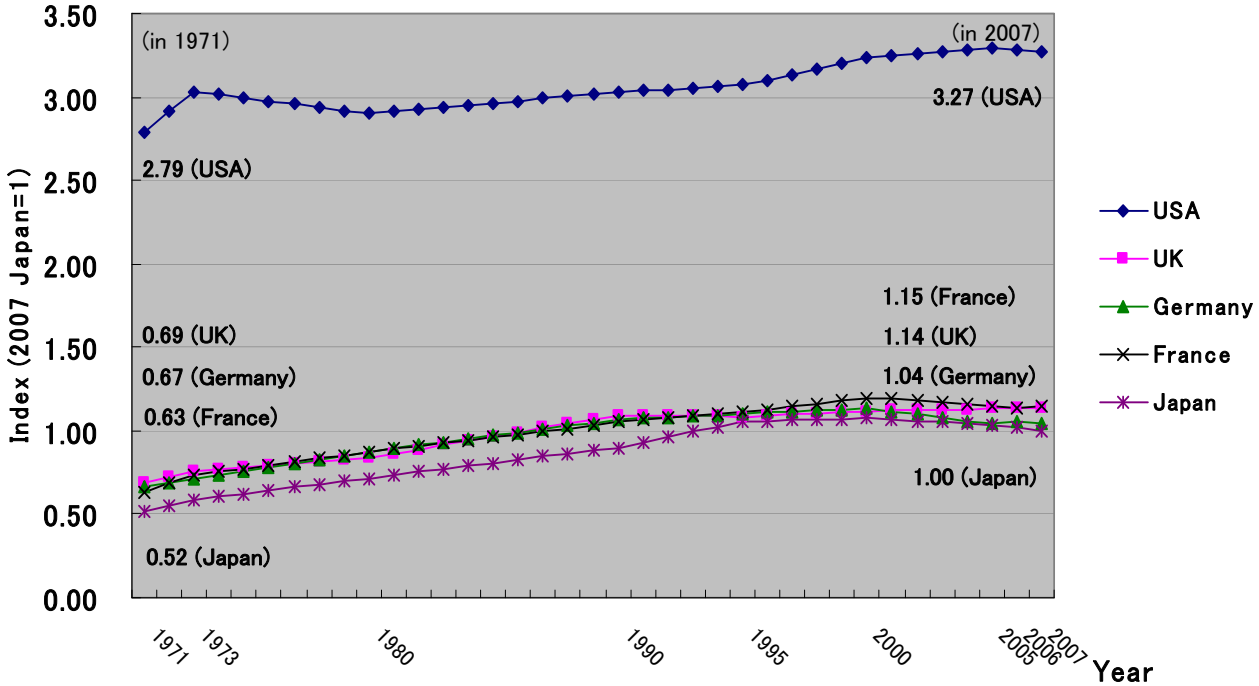
Evolution of passenger vehicles' average fuel consumption (10・15 modes)



Source) Prepared from "Vehicle Fuel Consumption List" by Ministry of Land, Infrastructure, Transport and Tourism

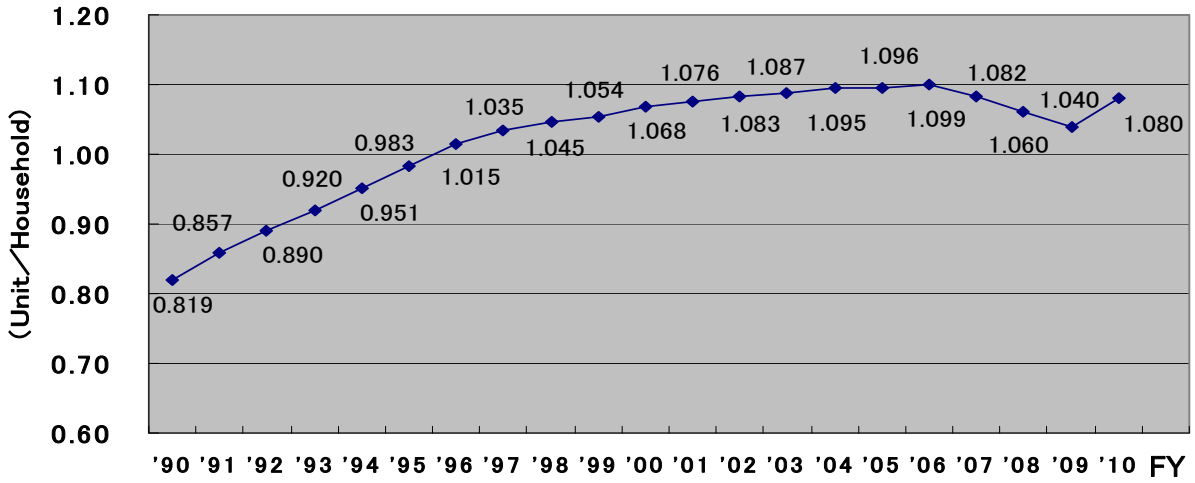
As shown in the below figure, Japan's per-capita transportation energy consumption marked lower compared to other major selecting countries, but those countries have successfully lessened the consumption level, as shown that Germany coming closer to Japan's lowest level.

Transition of per-capita energy consumption in the transportation sector



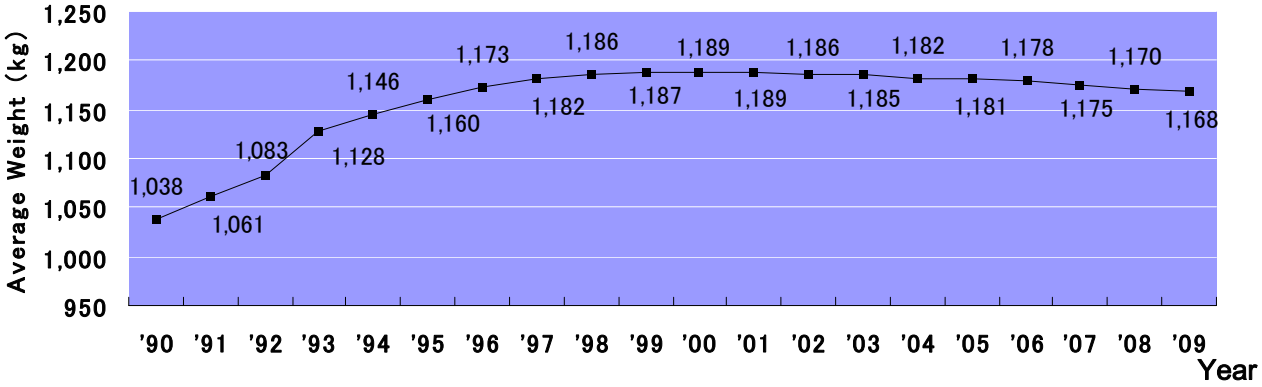
Note) To prepare this figure, actual numbers were used for only the year indicated, '73, '80, '90, '95, '00, '05-'07.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

Car ownership per household (1990-2010)



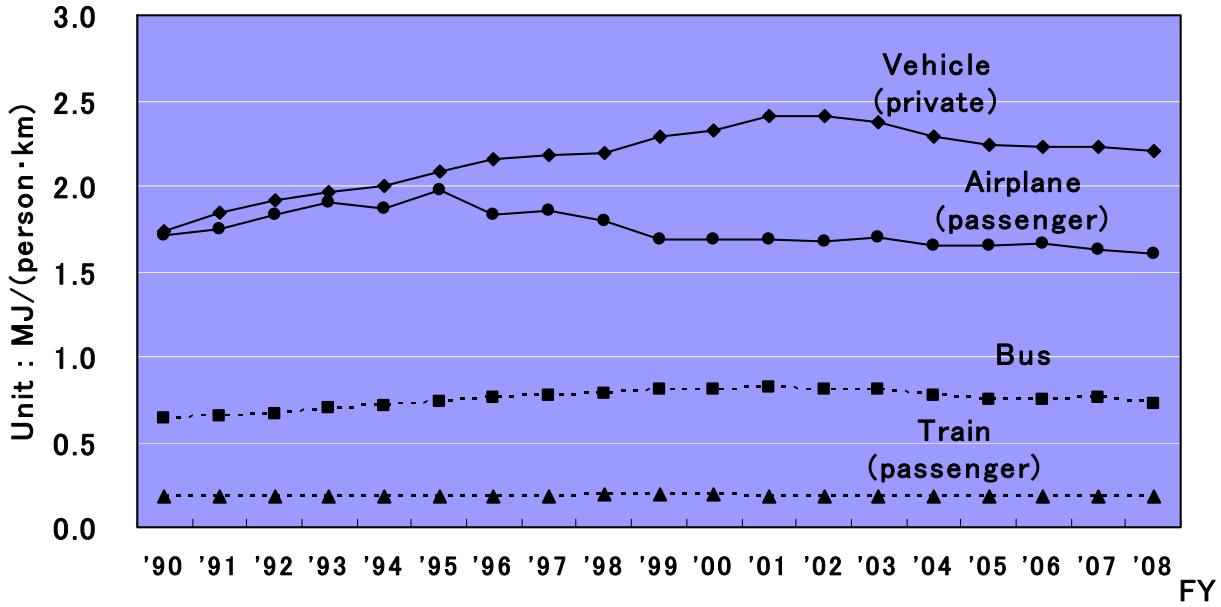
Source) Prepared from "Basic Residential Resister" and "Website of Automobile Inspection & Registration Information Association"

Average weight of owned vehicles (1990-2009)



Source) Prepared from "Website of Automobile Inspection & Registration Information Association"

Energy consumption intensity by transportation (1990-2008)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)

(2) Energy conservation policies and measures for the transportation sector

1) Outline of energy conservation measures in the transportation sector

Since the energy consumption by passenger vehicles accounts for 83 % of the total fuel consumption in the passenger transportation, implementing measures focusing on passenger vehicles is crucial. The Law Concerning the Rational Use of Energy designates gasoline- and diesel-powered automobiles as specified equipment, aiming to improve automobiles fuel consumption. Energy conservation target values are established for them and indication of their energy consumption efficiency is required.

2) Relevant legislation, etc.

a) Measures based on the Law Concerning the Rational Use of Energy

Under the revised version of the law in 2006, new obligations were imposed on carriers (freight, passenger) and consigners: submission of plans for energy saving and submission of periodical reports on energy use.

b) Supporting measures

i) Spreading and promotion of automobiles which use clean energy as fuel Preferential tax measures for purchasing low-fuel-consumption cars and low-air-pollution cars

ii) Financial aid will be offered to help promote the purchase of clean-energy-automobiles and low-air-pollution cars, and low-fuel-consumption cars, and for the development of the related technology.

iii) Implementation of investment and financing for improvement of energy efficiency of individual transportation equipment and introduction of energy efficient equipment.

c) Dissemination and publicity on energy conservation

i) Dissemination by posters and pamphlets, holding symposiums, media campaigns participated by related ministries, agencies, and various actors in different fields.

ii) Implementation of activities to acknowledge and enlighten about idling-stop during waiting at stoplights through Idling-Stop Caravan: cross over Japan, brochures for effects of fuel consumption reduction, etc.

APPENDIX

1. ENERGY DATA

1.1 World Energy Data

(1) Energy resource reserves

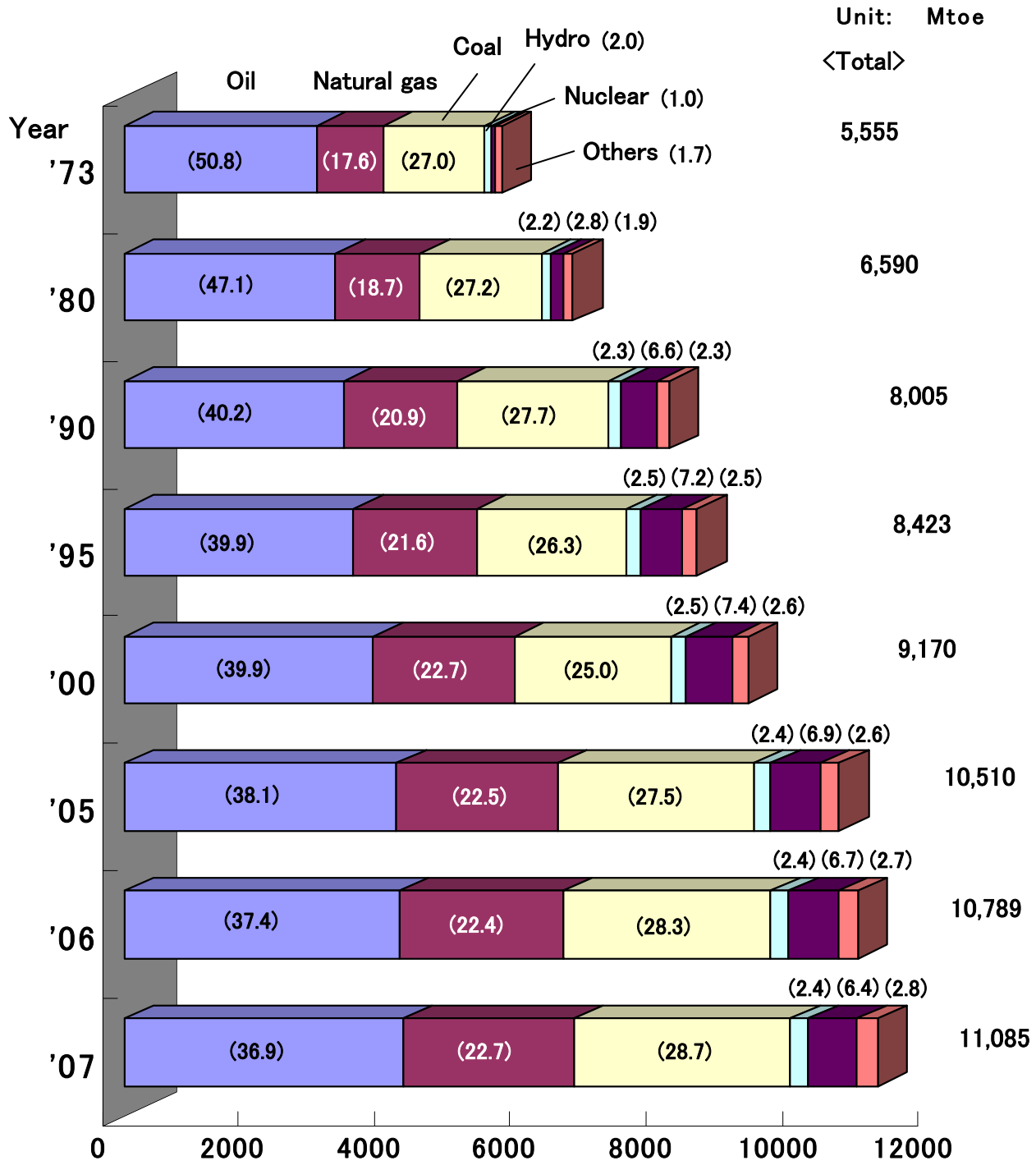
(in 2009)

		Oil	Natural gas	Coal	Uranium
Proved recoverable reserves (R)		1.333 trillion barrels	187.49 trillion m^3	826 billion tons	5.40 million tons
Allocation by region	North America	5.5%	4.9%	29.8%	13.0%
	Central & South America	14.9	4.3	1.8	5.0
	Europe	1.1	2.5	5.6	-*
	Former Soviet Union	9.2	31.2	27.4	25.0
	Middle East	56.6	40.6	0.2	2.0
	Africa	9.6	7.9	3.9	15.0
	Asia / Pacific	3.2	8.7	31.4	36.5
Annual production (P)		29.2 billion barrels (79.9 million barrels/day)	2.99 trillion m^3	6.94 billion tons	51,000 tons
Recoverable years (R/P)		45.7 years	62.7 years	119 years	**140 years
Source		BP statistics (year 2010)			【Reserves】 OECD・ NEA&IAEA Uranium (year 2009) 【Production】 World Nuclear Association

*With regard to Uranium, there is not “Europe” in the category of allocation by region, and 3% is allocated to “Others”.

** The recoverable years for Uranium is obtained by dividing proved recoverable reserves by annual demand.

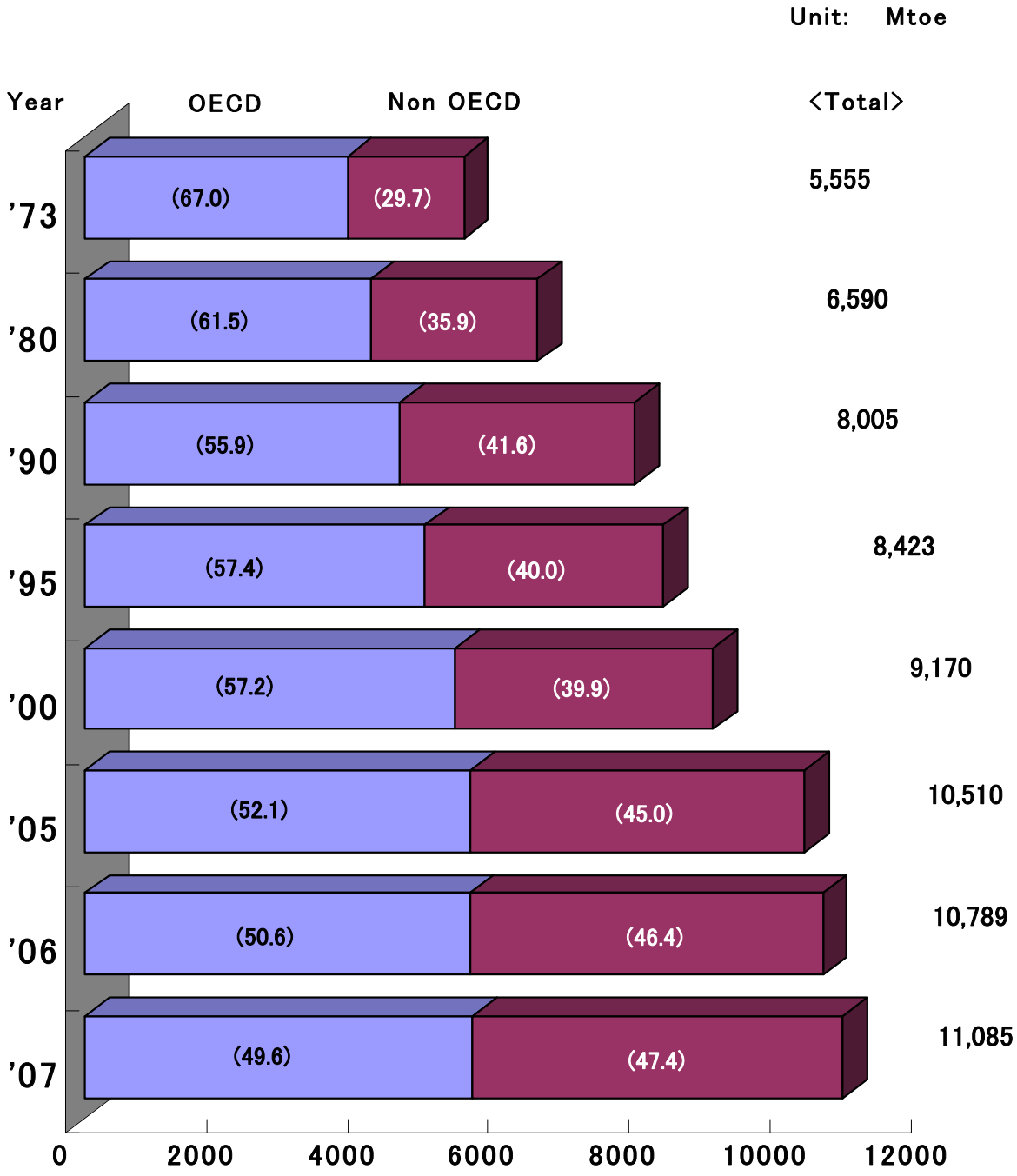
(2) Primary energy consumption by energy resource



Note) Figures in parenthesis represent percentage.
The figure includes international marine and aviation bunkers.

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

(3) Primary energy consumption by region

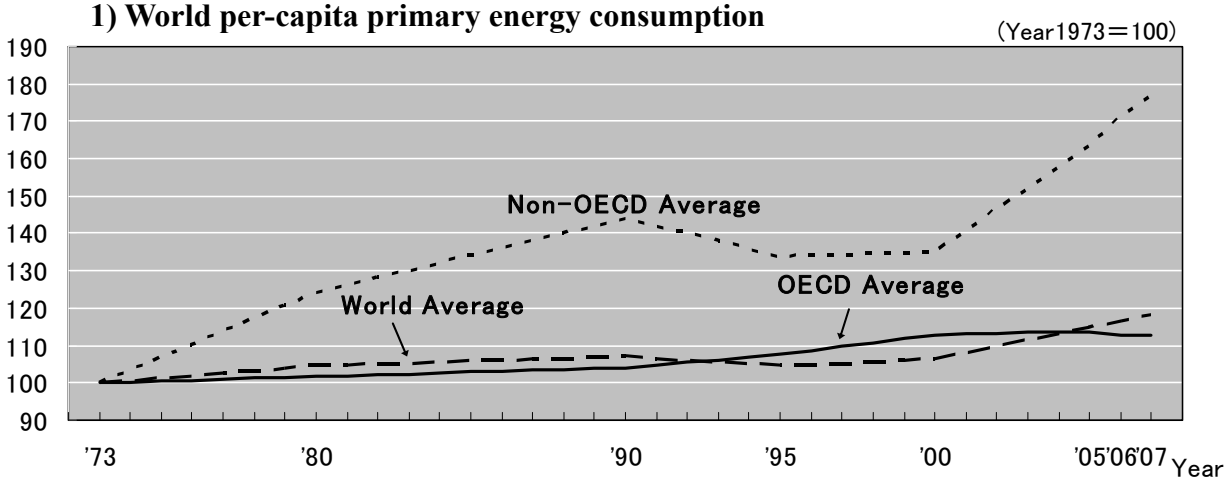


Note) Figures in parenthesis represent percentage.
The figure includes international marine and aviation bunkers.

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

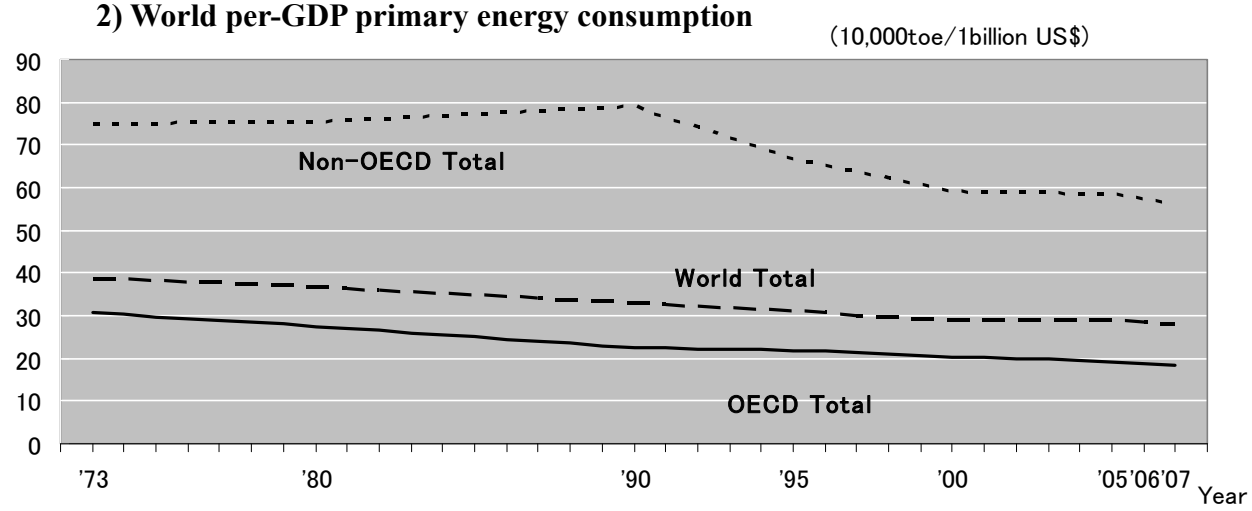
(4) Trend of primary energy consumption

1) World per-capita primary energy consumption



Note) To prepare this figure, actual numbers were used for only the year indicated, '73, '80, '90, '95, '00, '05-'07.

2) World per-GDP primary energy consumption



Note) To prepare this figure, actual numbers were used for only the year indicated, '73, '80, '90, '95, '00, '05-'07.

3) World energy consumption, GDP, and population (2007)

	Primary Energy Consumption			Real GDP (2000US $ standard)			Population		
	Mtoe	Y/Y Growth Rate	Avg. Growth Rate (1973-2007)	Billion US$	Y/Y Growth Rate	Avg. Growth Rate (1973-2007)	Million	Y/Y Growth Rate	Avg. Growth Rate (1973-2007)
OECDTotal	5,497	0.65%	1.15%	30,018	2.48%	2.70%	1,182	0.70%	0.79%
Non-OECD Total	5,257	4.94%	3.47%	9,435	8.22%	4.38%	5,406	1.26%	1.74%
World Total	11,085	2.74%	2.05%	39,453	3.80%	3.02%	6,587	1.15%	1.55%

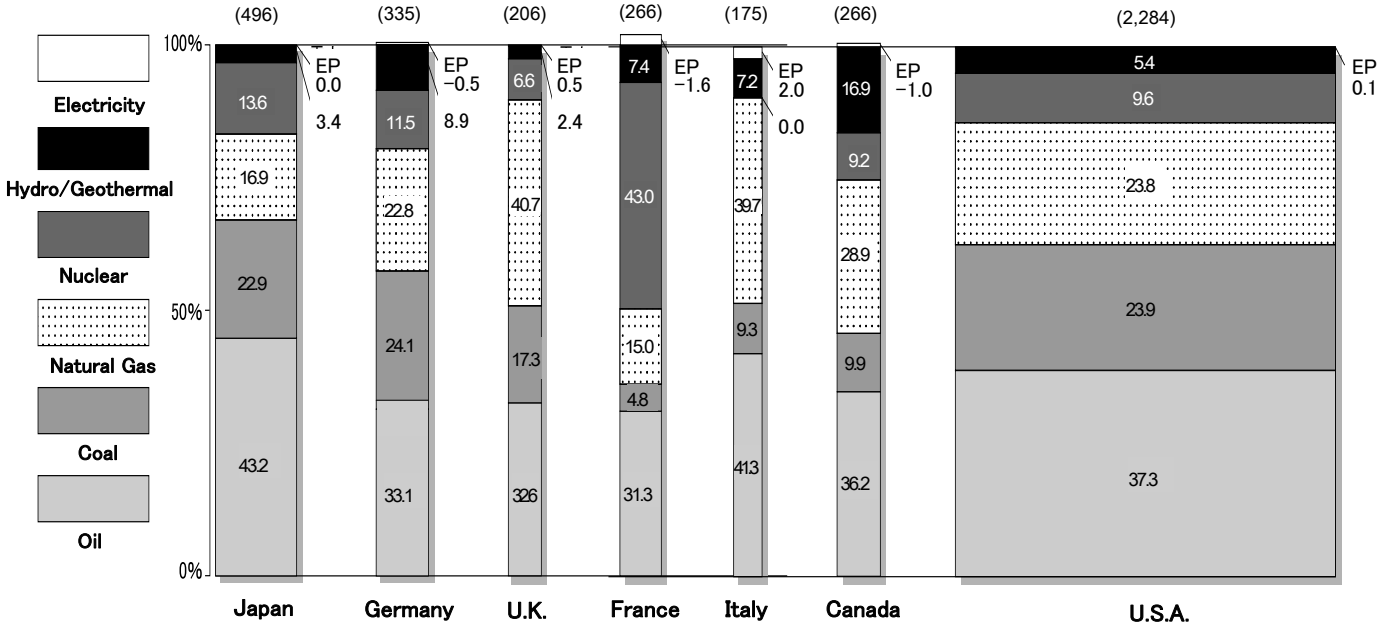
Note) World Total includes international marine and aviation bunkers (not included in OECD Total and Non-OECD Total).

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

(5) Energy supply in major countries

1) World total primary energy supply (TPES) and shares of energy sources (2008)

Unit: %, Figures in parentheses are Million toe



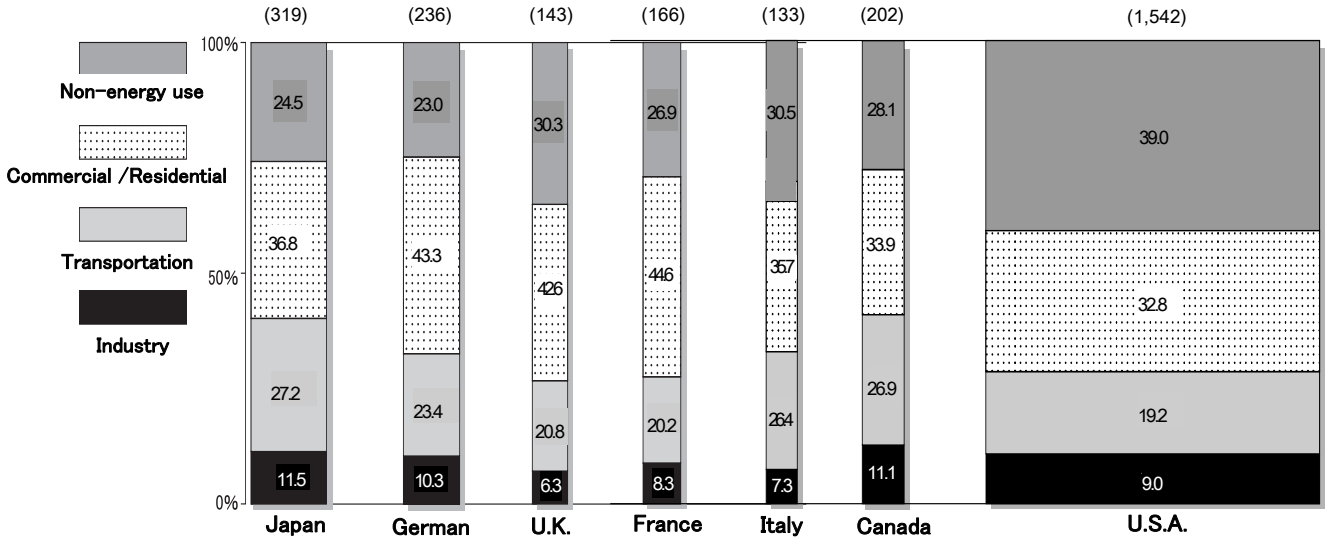
Note) 1) The import and export of electric power are also included in the primary energy supply.
(“minus” in the chart represents excess of export.)
2) Coal includes other solid fuels.

Source) Prepared from “Energy balance of OECD Countries 2010” (IEA)

Comment) 1) The share of oil is especially high in Japan and Italy, accounting for about 40%.
2) In Japan, the U.S.A. and Germany, the share of coal is as high as about 20%.
3) In Canada, the share of hydraulic power is as high as 17%.
4) In France, the share of nuclear power is especially as high as 43%.

2) World sector shares in final energy consumption (2008)

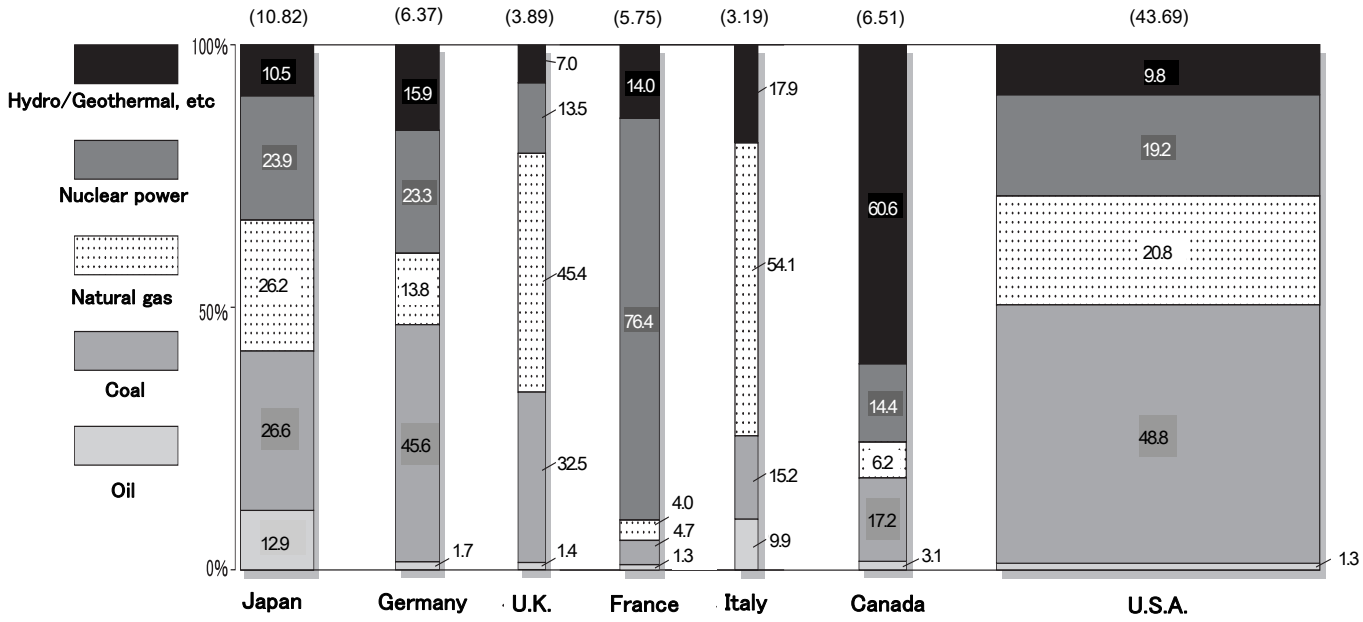
Unit: %, Figures in parentheses are Million toe



Source) Prepared from “Energy balance of OECD Countries 2010” (IEA)

3) World total electricity generated and shares of power (2008)

Unit: %, Figures in parenthesis represent 100 billion kWh



Source) Prepared from "Energy balance of OECD Countries 2010" (IEA)

(6) Energy consumption in major countries

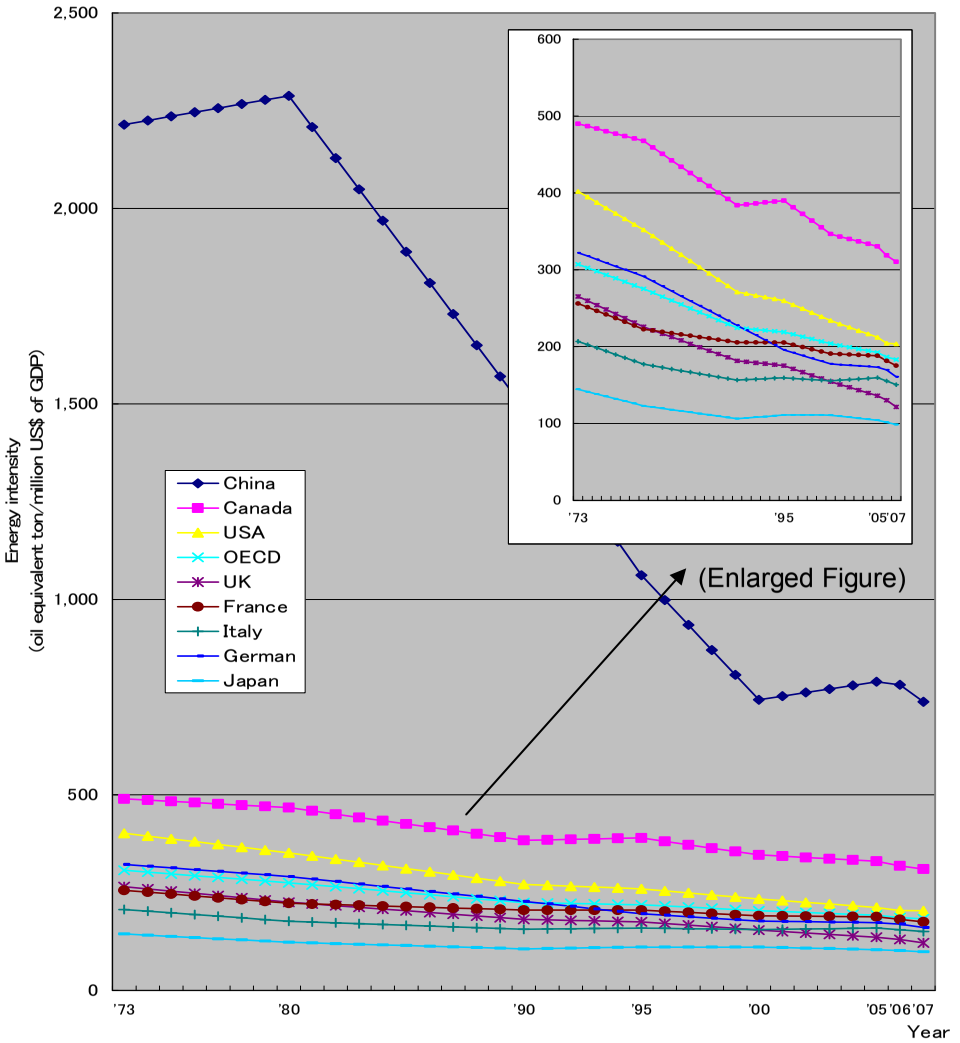
1) World trend of energy consumption, GDP, oil consumption and dependency

(Unit:%)

	Real GDP growth rate (year-over-year)		Energy consumption increase rate (year-over-year)		Oil consumption increase rate (year-over-year)		Oil dependence rate	
	2006	2007	2006	2007	2006	2007	2006	2007
US	2.9	2.0	-0.9	1.6	-1.5	-1.2	40.0	38.9
UK	2.9	3.0	-1.5	-3.7	-1.0	-5.0	33.0	32.6
Germany	2.9	2.5	0.8	-2.9	0.0	-10.4	34.2	31.5
France	2.2	2.2	-1.4	-1.5	-1.3	-2.1	31.8	31.6
Italy	1.8	1.5	-1.0	-1.6	-1.4	-4.0	43.1	42.1
Russia	7.4	8.1	2.9	0.3	3.6	-1.1	20.2	19.9
China	11.6	13.0	10.5	6.7	8.0	3.9	20.7	20.1
Japan	2.4	2.1	-0.1	-0.9	-3.9	-1.7	45.1	44.8

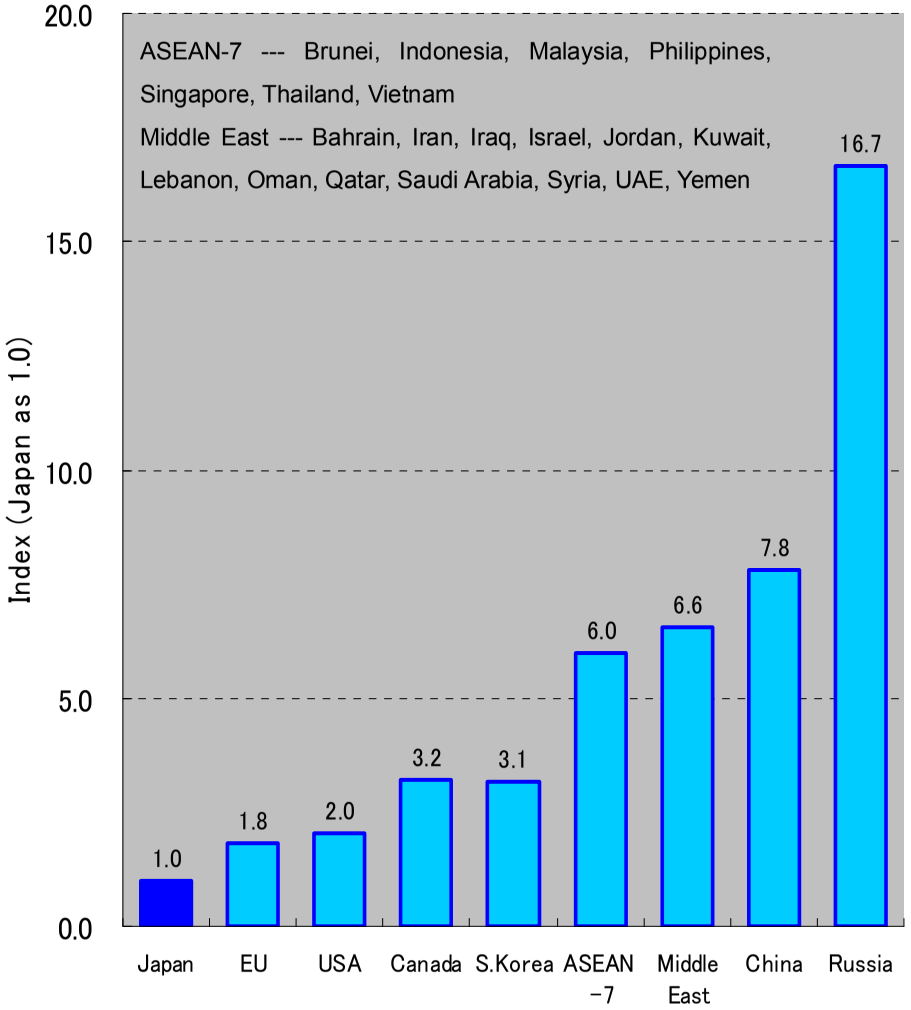
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

2) World energy intensities



Note) To prepare this figure, actual numbers were used for only the year indicated, '73, '80, '90, '95, '00, '05-'07.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

3) Primary energy consumption per unit of GDP of countries

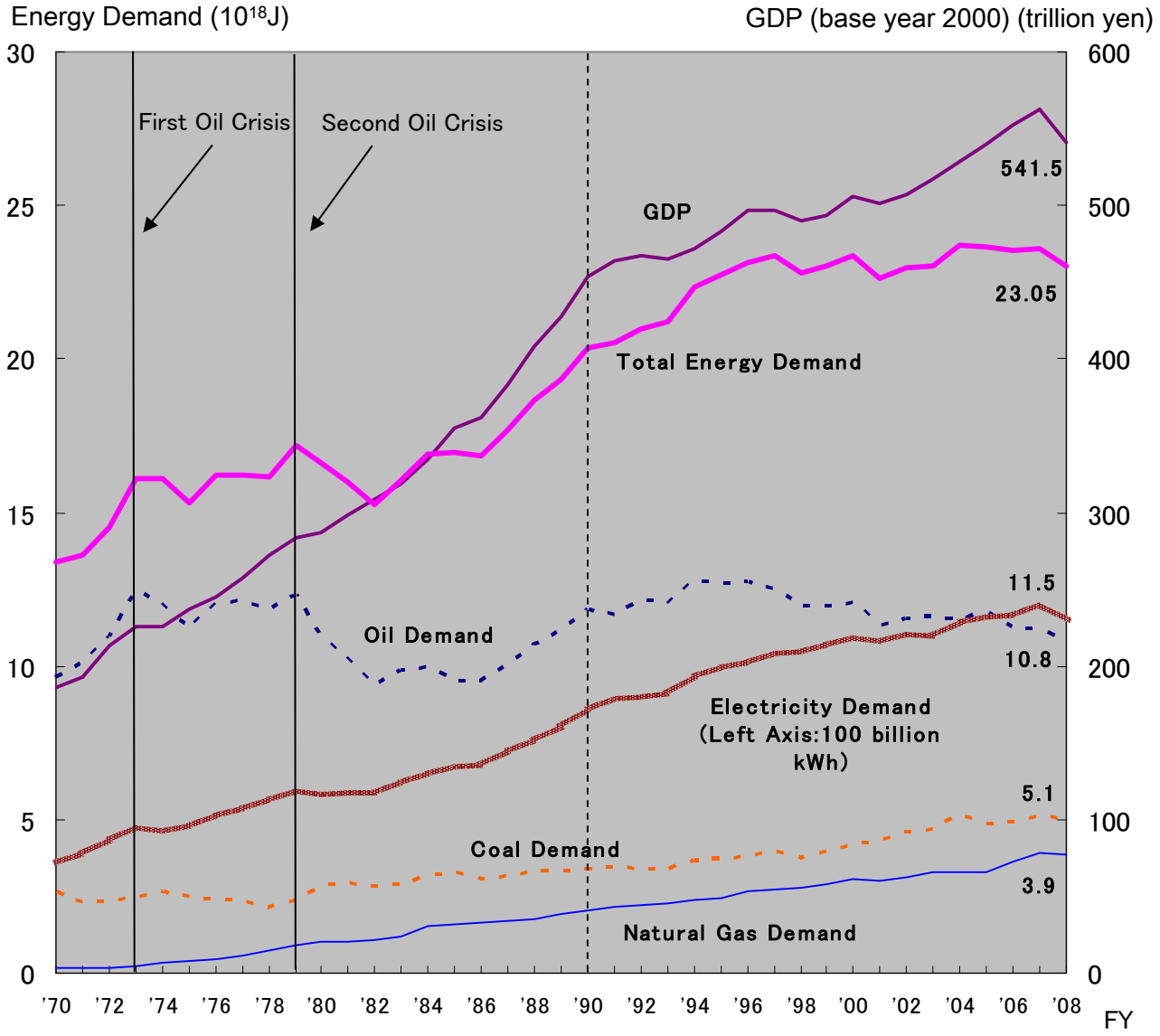


Note) Calculated as Japan set at 1 for the primary energy consumption (oil equivalent) /GDP (price set at 2000 US dollar).
Source) Prepared from "IEA Energy Balance 2010"

1.2 Domestic Energy Data

(1) Demand of energy sources and GDP

1) Energy demand by energy sources and GDP



2) Changes in energy/GDP elasticity

Fiscal Year	1965～73	1973～80	1980～90	1990～2000	2000～08
Annual Average Growth Rate of GDP	9.06%	3.49%	3.97%	1.16%	0.86%
Annual Average Growth Rate of Primary Energy Demand	10.86%	0.43%	2.04%	1.40%	-0.18%
Energy/GDP Elasticity	1.20	0.12	0.51	1.21	-0.21

Source) Prepared from “EDMC Handbook of Energy & Economic Statistics in Japan (2010)”

(2) Outlook of energy consumption and supply

1) Final energy consumption

(Unit : million kL of crude oil equivalents)

Items \ Fiscal Year	2005 (Actual)		2020 (Projected)				2030 (Projected)			
			Current Measures		Maximum Additional Measures		Current Measures		Maximum Additional Measures	
		%		%		%		%		%
Final Consumption Total	413	100%	421	100%	375	100%	424	100%	346	100%
Industrial Sector	181	44%	180	43%	177	47%	179	42%	174	50%
Civil Sector	134	32%	149	35%	121	32%	154	36%	103	30%
Household Sector	56	14%	61	14%	52	14%	66	16%	47	14%
Commercial Sector etc.	78	19%	88	21%	68	18%	87	21%	56	16%
Transportation Sector	98	24%	92	22%	78	21%	91	22%	69	20%

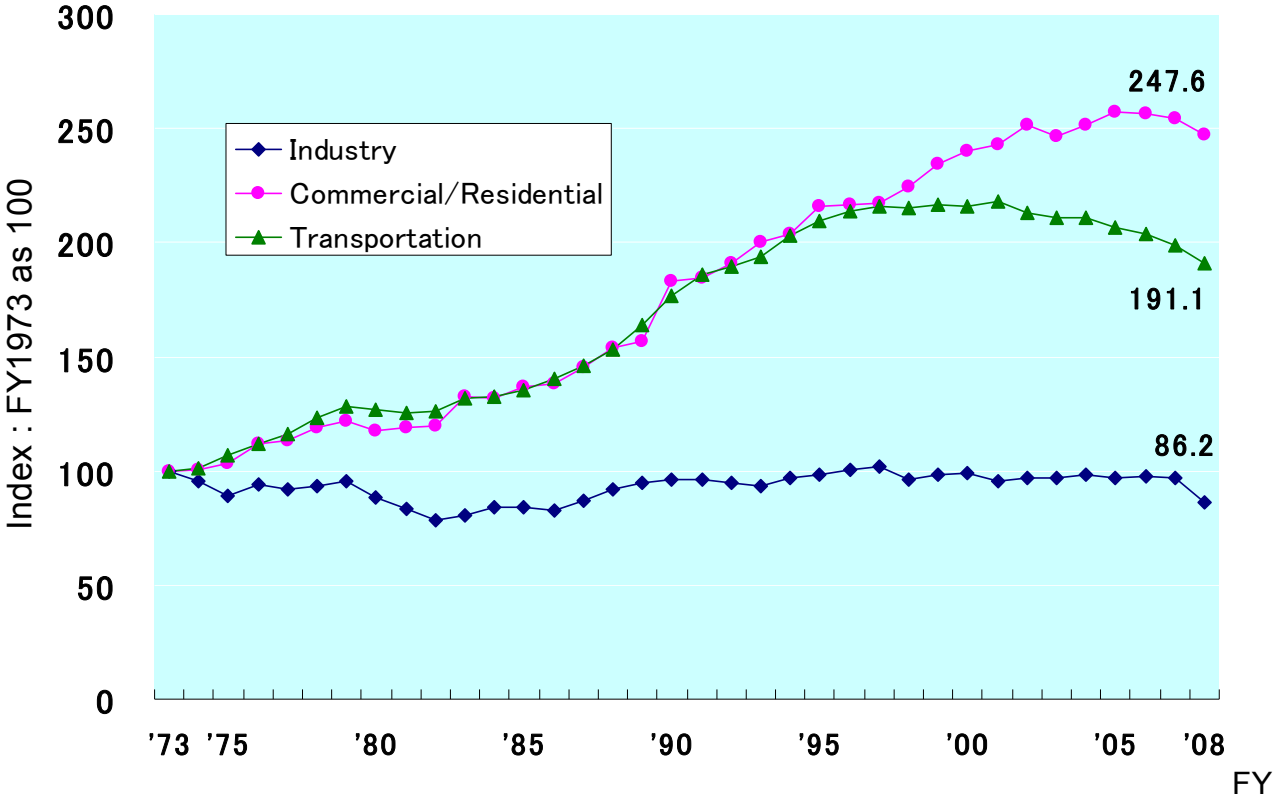
2) Primary energy supply

(Unit: million kL of crude oil equivalents)

Items \ Fiscal Year	2005 (Actual)		2020 (Projected)				2030 (Projected)			
			Current Measures		Maximum Additional Measures		Current Measures		Maximum Additional Measures	
Primary Energy Supply	588		627		553		637		515	
Fuel	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Oil	255	43%	227	36%	190	34%	220	35%	265	52%
L P G	18	3%	18	3%	18	3%	18	3%	19	4%
Coal	123	21%	128	20%	107	19%	131	21%	85	17%
Natural Gas	88	15%	114	18%	89	16%	112	18%	54	11%
Nuclear power	69	12%	99	16%	99	18%	107	17%	49	10%
Hydro power	17	3%	19	3%	19	34%	19	3%	22	4%
Geothermal	1	0%	1	0%	1	0%	1	0%	0	0%
New Energy,etc	16	3%	22	3%	30	5%	29	5%	13	3%

Source) Prepared from the report of "Long-term Outlook of Energy Demand and Supply (recast)" issued by the Demand &Supply Subcommittee of the Advisory Committee for Natural Resources and Energy in August 2009.

3) Final energy consumption by sector



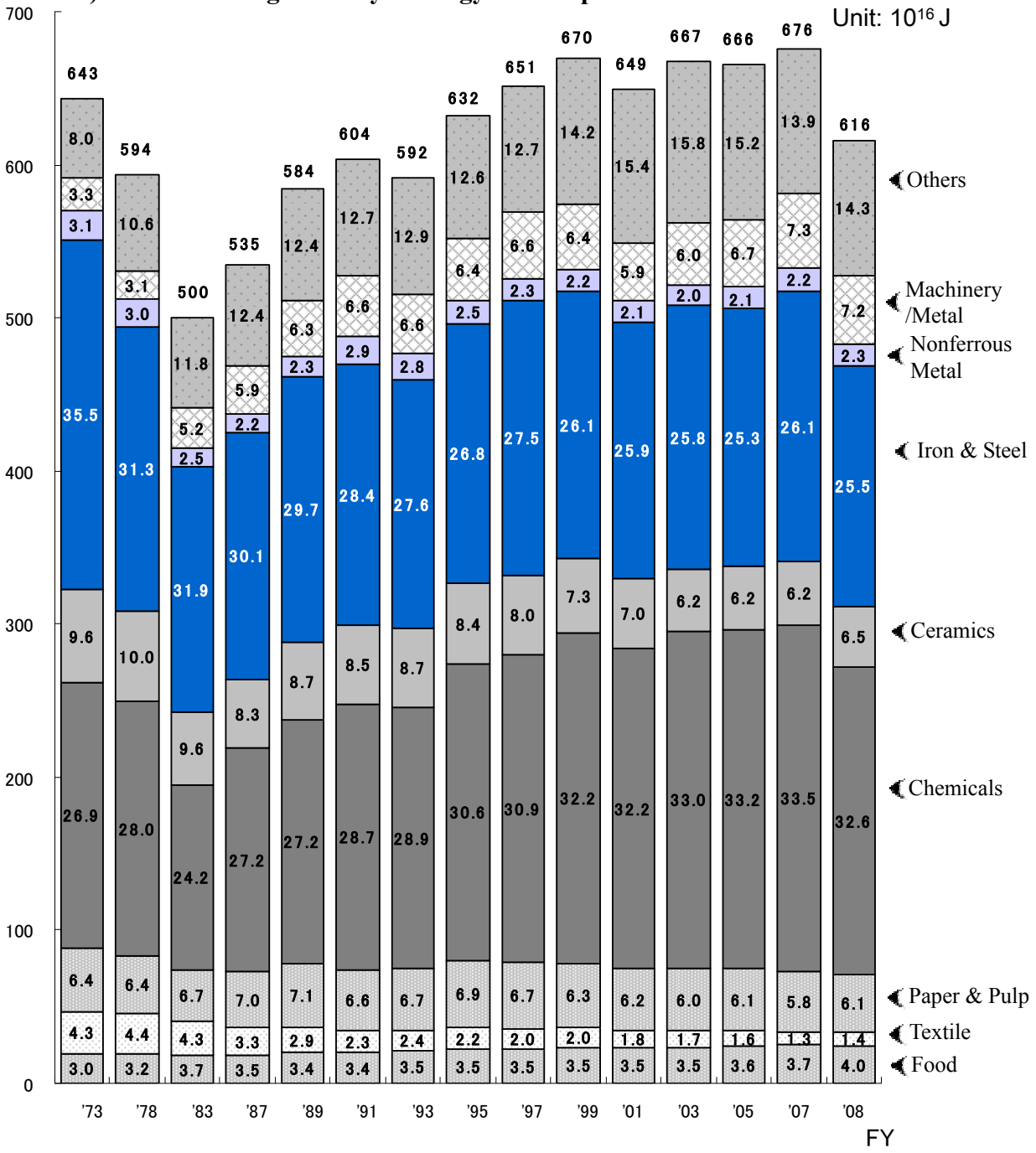
Note) Due to revision of the aggregation method in Energy Balance Tables in Japan, values for FY1990 onwards and values for preceding years are the results of utilizing different methods.

Source) Prepared from “Comprehensive Energy Statistics”

1.3 Domestic Sectoral Energy Data

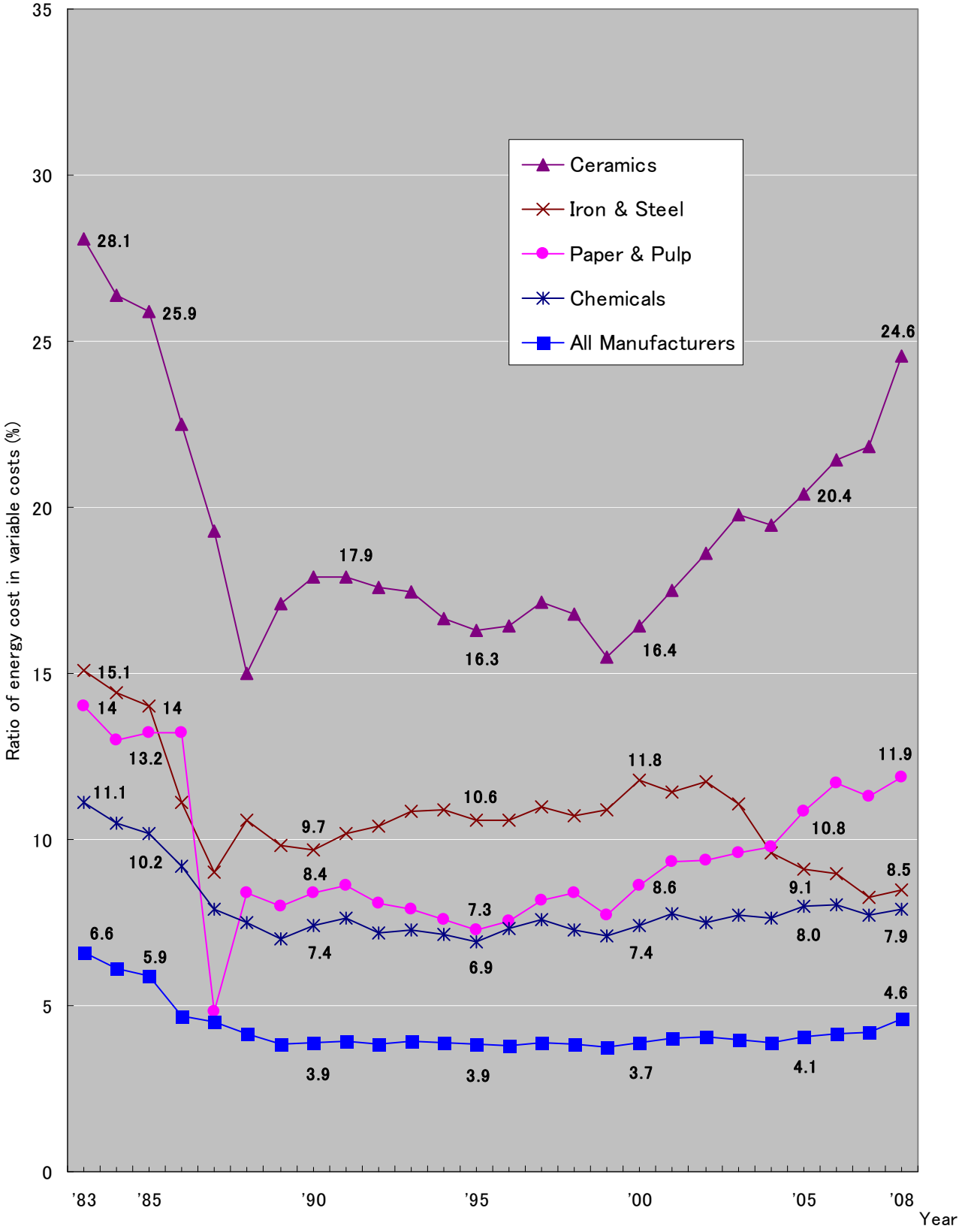
(1)Industrial sector

1) Manufacturing industry's energy consumption



Note) Units in the bars represent percentage.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

2) Major industries' energy costs to variable costs

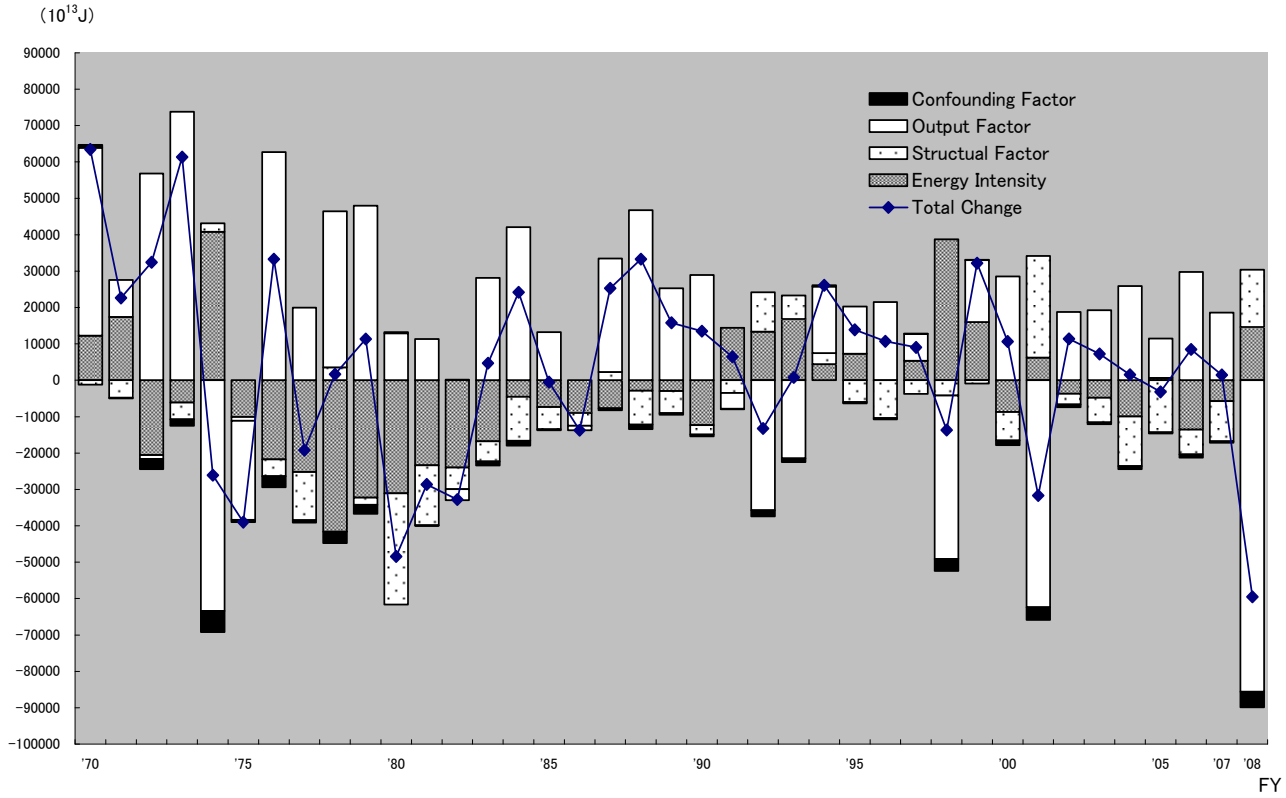


Note) Variable costs = raw materials cost + fuel cost + electric power cost
Energy costs = fuel cost + electric power cost

Source) Prepared from "Industrial Statistics Table (Industry Section) 2008" announced by Ministry of Economy, Trade and Industry in April 2010

3) Energy demand analysis for the industrial sector

a) Factors affecting manufacturing industry energy consumption



b) Trend of factors of manufacturing sector energy consumption change

(Unit: 10^{16} J)

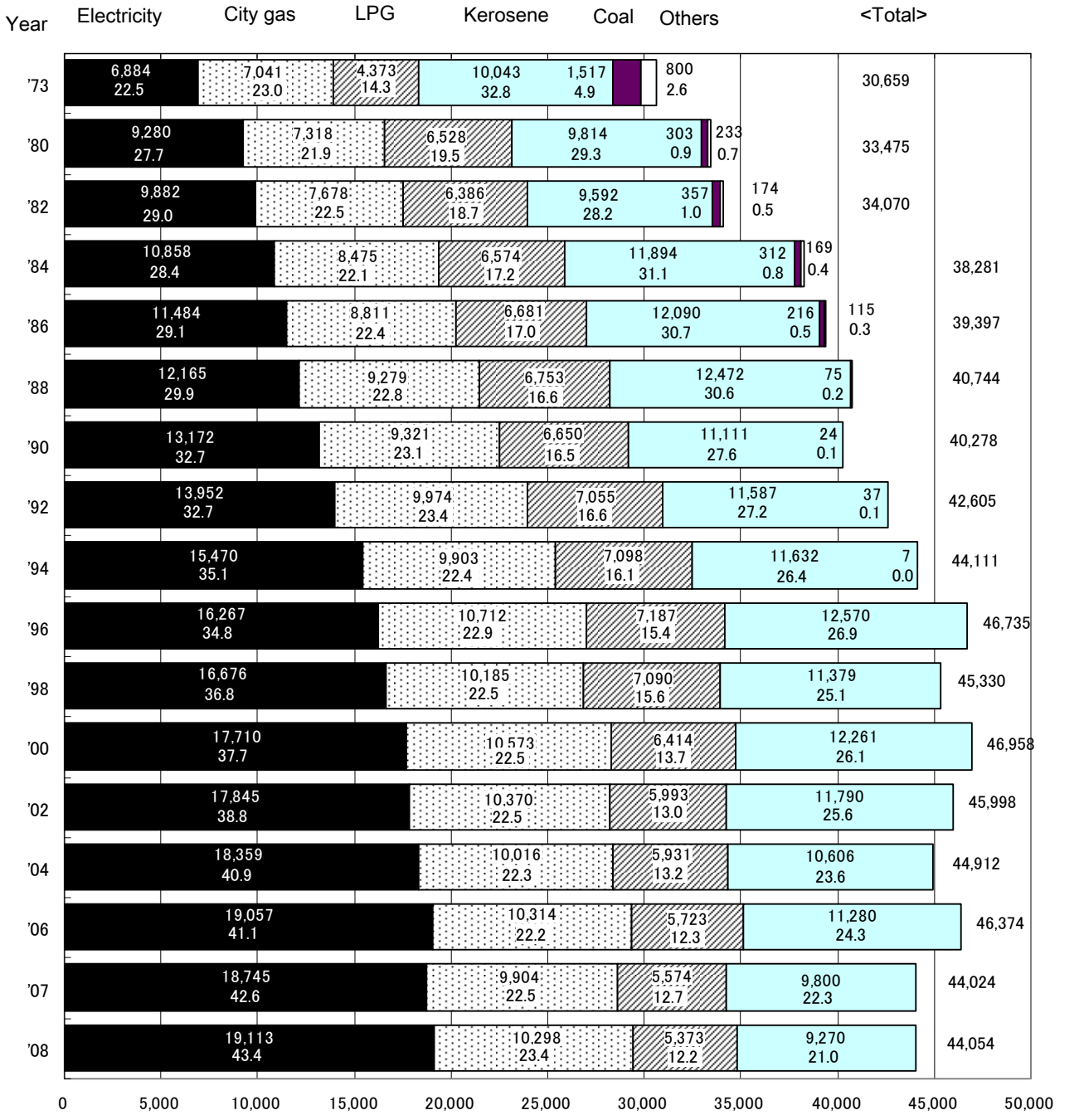
Fiscal Year		'90	'92	'94	'96	'98	'00	'02	'04	'06	'08
Energy Consumption Changes		13.5	-13.3	26.1	10.7	-13.7	10.7	11.4	1.5	8.5	-59.6
Factor	Output Effect	28.9	-35.7	18.3	21.4	-44.9	28.5	18.8	25.9	29.7	-85.6
	Structure Effect	-2.6	10.7	3.0	-10.4	-4.2	-7.8	-3.0	-13.6	-6.8	15.7
	Intensity Effect	-12.3	13.4	4.4	0.1	38.7	-8.7	-3.7	-10.0	-13.6	14.6

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)"

(2) Residential sector

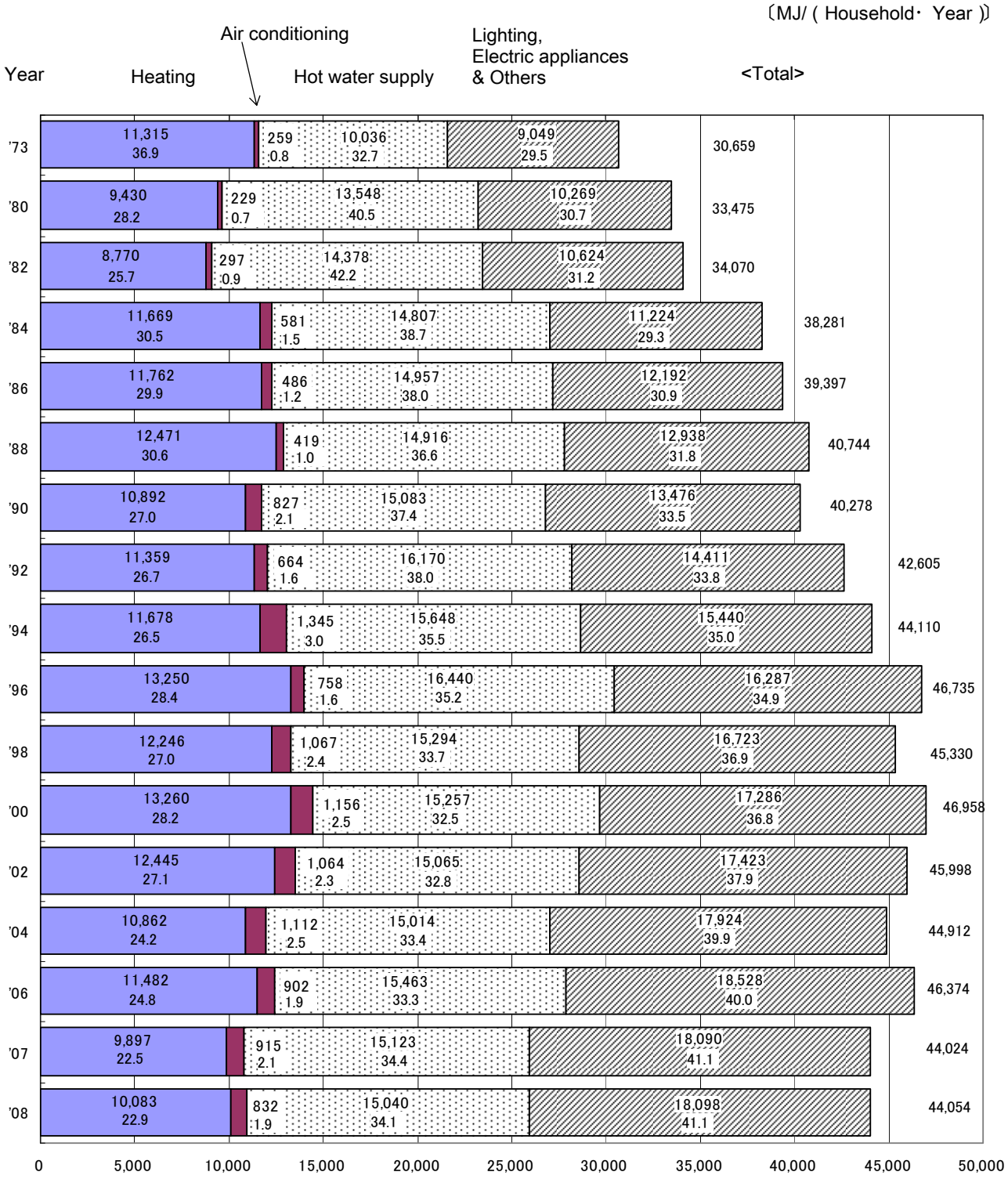
1) Per household energy consumption (by energy sources)

〔MJ/ (Household・ Year)〕



Note) The lower figures in the bar represent percentage distribution.
Source) Prepared from “Domestic Energy Statistics Annual Report” (Residential Environment Planning & Research Center)

2) Per household energy consumption (by usage)



Note) The lower figures in the bar represent percentage distribution.
Source) "Domestic Energy Statistics Annual Report" (Residential Environment Planning & Research Center)

3) Rate of home appliance stock owned by household

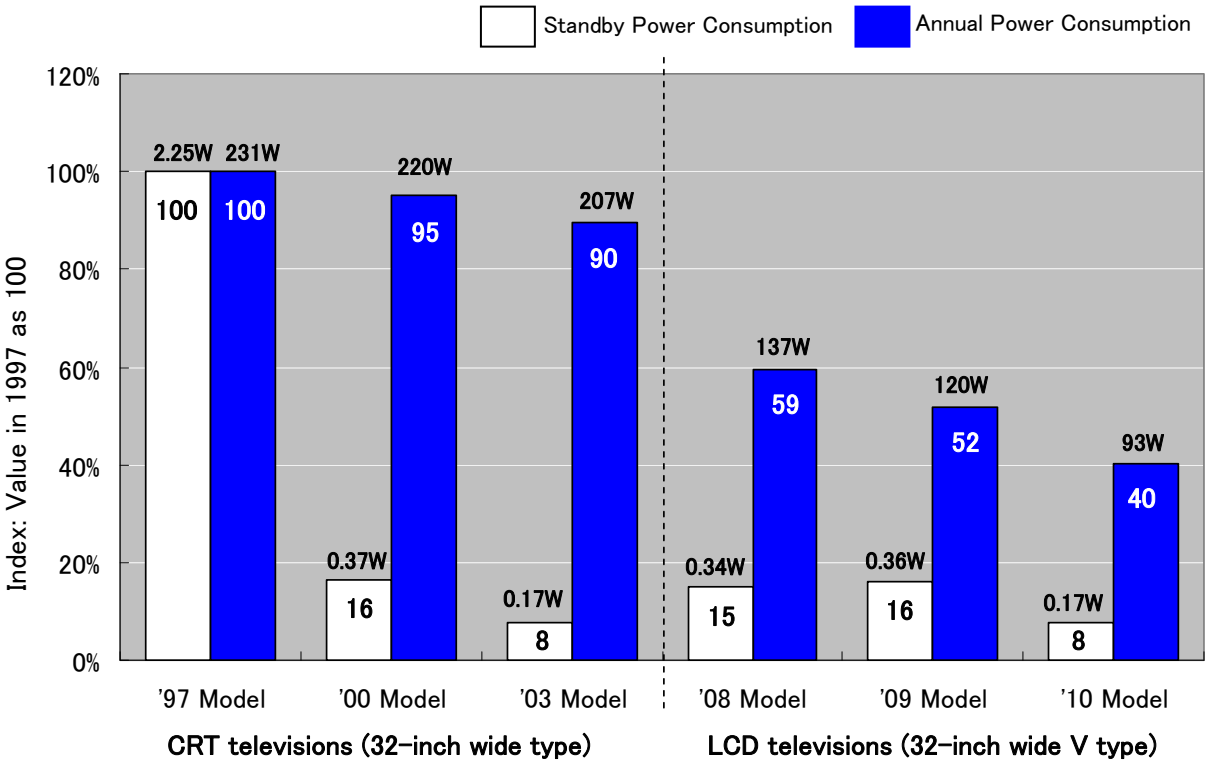
(unit/100households)

Appliances \ Fiscal Year	1970	1980	1990	2000	2004	2008	2009	2010
Warmed toilet Seat (with warm water shower)	-	-	-	49.2	69.7	91.7	93.5	96.7
Refrigerator	91.1	114.2	116.2	121.6	125.6	-	-	-
Microwave oven	2.2	33.6	71	98.8	102.7	-	-	-
Washing machine	92.7	103.9	108	108.6	109.1	-	-	-
Electric clothes dryer	-	-	15	21.9	22.7	31.7	30.1	30.8
Electric futon dryer	-	15	26.8	38	39.9	-	-	-
Vacuum cleaner	70.1	109.5	130.8	140.9	146.2	-	-	-
Air conditioner	6.8	51.8	114	207.6	245.3	257.1	256	263.1
Electric carpet	-	-	53.8	94.6	91.9	-	-	-
Color television	26.9	141.1	196.4	226.2	238.4	241.5	243.1	243.0
Dishwasher	-	-	-	-	-	27.9	29.4	30.5
Personal computer	-	-	11.2	48.6	92.6	110.1	111.8	118.2

Source) Prepared from "Annual Report on Consumer Confidence Survey" by Cabinet Office

4) Example for improvement of energy efficiency of home electric appliances (TVs)

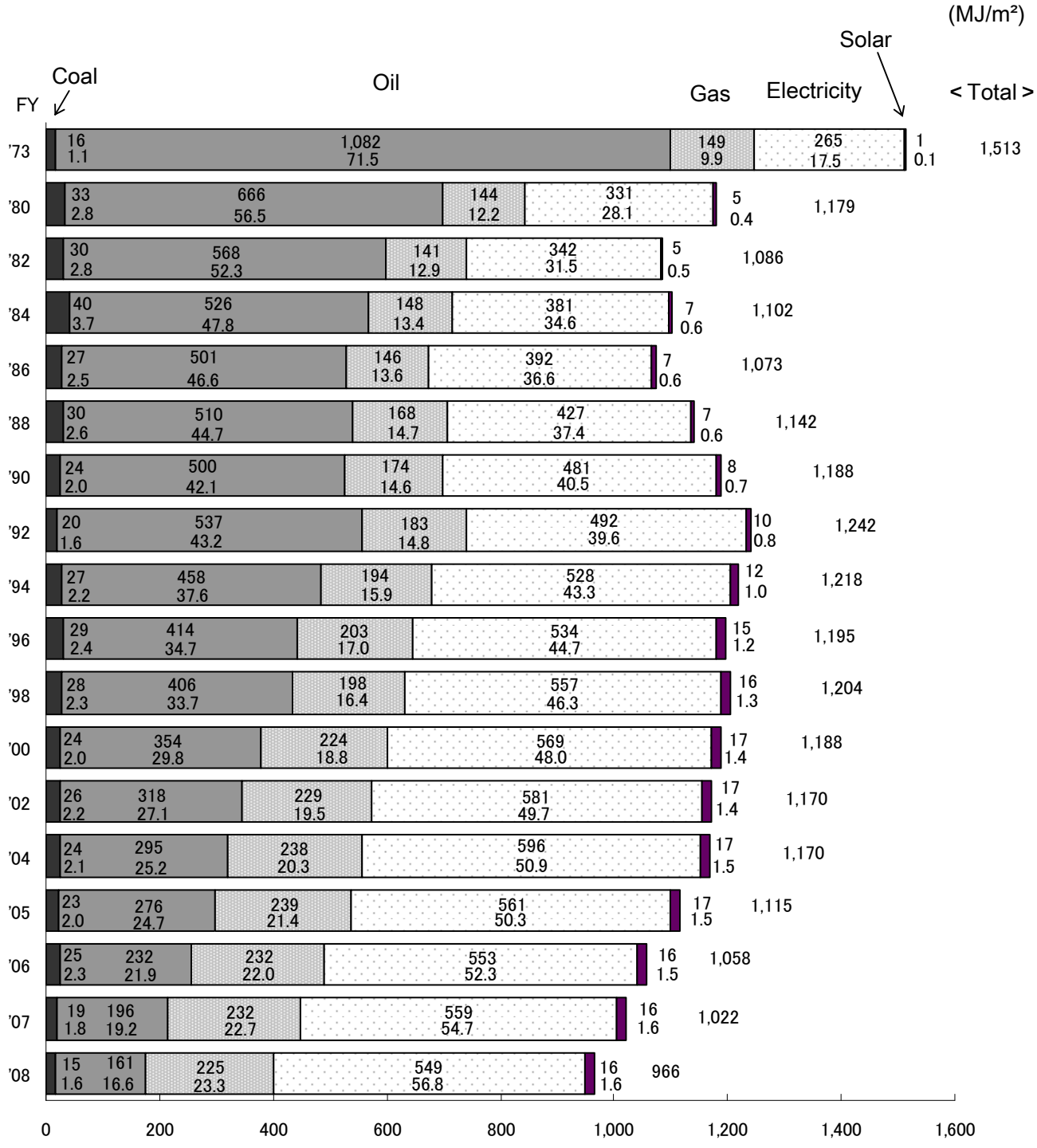
Simple average values of the products (1997-2010 Models)



Source) Prepared from "Catalog of Energy Efficiency Performance (summer and winter version of each fiscal year)" by METI

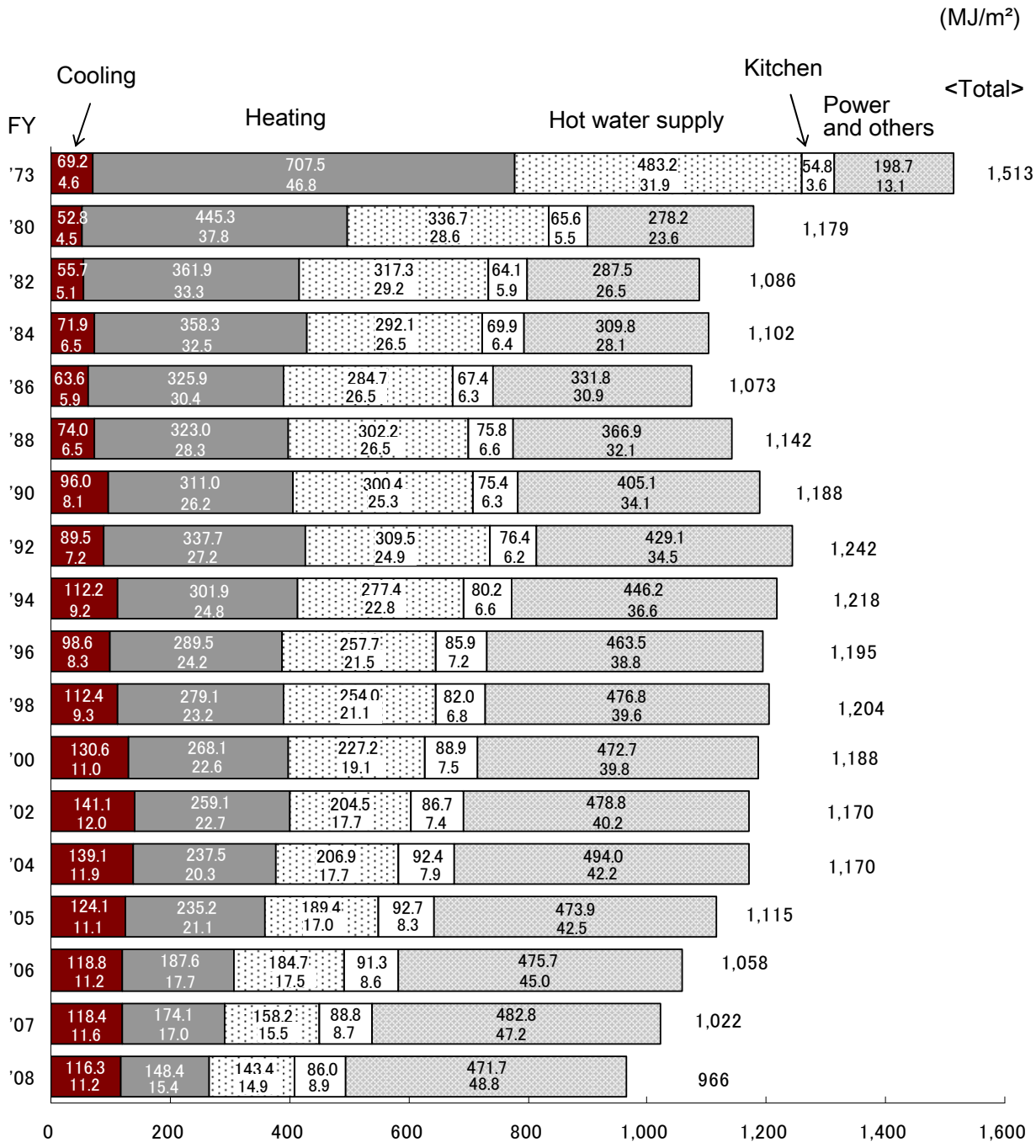
(3) Commercial sector

1) Per-floor energy consumption in commercial buildings (by energy sources)



Note) Lower figures in the bars represent percentage.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)

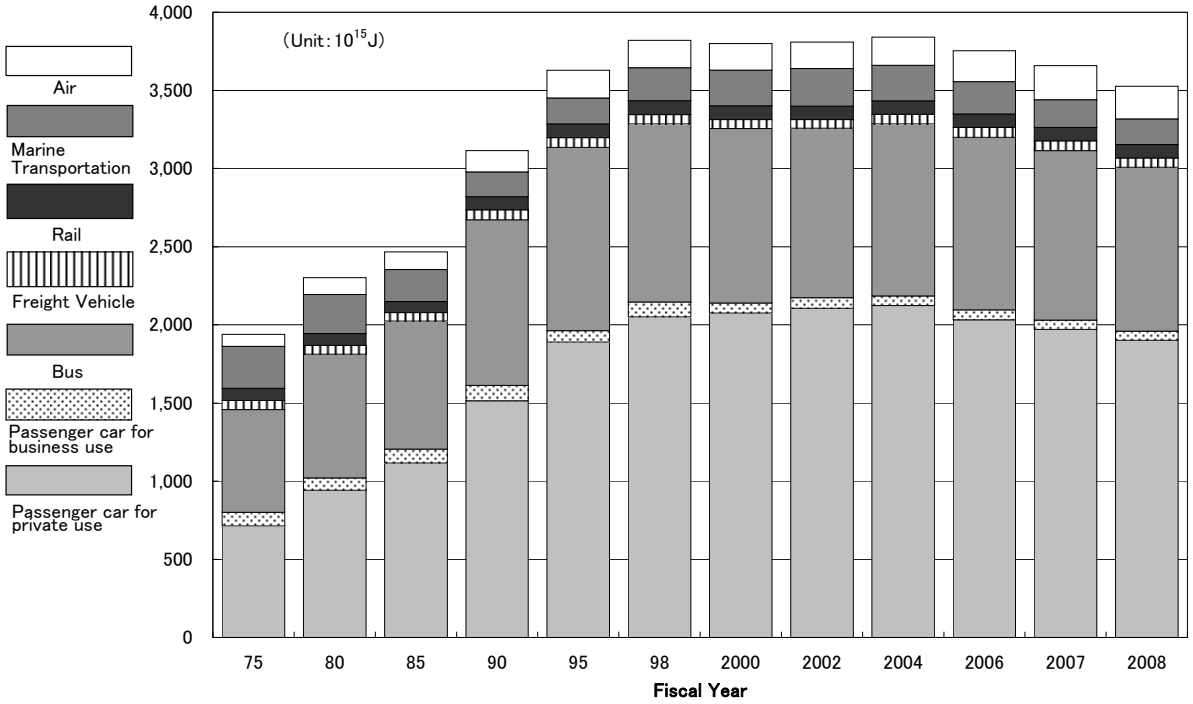
2) Per-floor energy consumption in commercial buildings (by usage)



Note) Lower figures in the bars represent percentage.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2010)

(4) Transportation sector

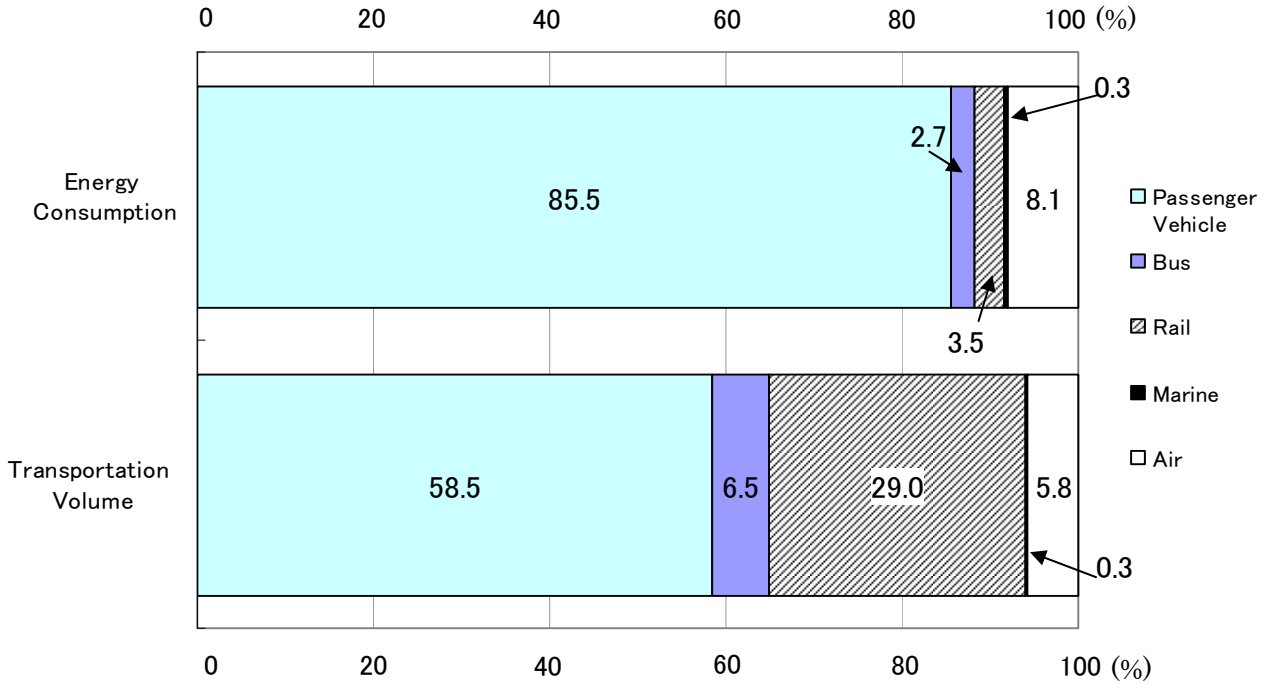
1) Transportation energy consumption (by type of transport)



	75	80	85	90	95	98	2000	2002	2004	2006	2007	2008
Grand total of Transport sector energy consumption	1,938	2,302	2,465	3,114	3,627	3,820	3,798	3,817	3,839	3,756	3,657	3,525
	(5.3)	(-1.2)	(2.4)	(4.5)	(3.1)	(1.1)	(-2.2)	(0.1)	(1.0)	(-1.2)	(-2.5)	(-3.6)
Total of passenger sector energy consumption	996	1,244	1,424	1,880	2,269	2,449	2,432	2,465	2,493	2,422	2,373	2,292
	(7.4)	(0.9)	(3.6)	(8.0)	(3.4)	(1.7)	(-2.6)	(0.0)	(1.2)	(-1.9)	(-1.9)	(-3.4)
Passenger car for private use	713	942	1,116	1,513	1,891	2,050	2,075	2,106	2,122	2,032	1,970	1,902
Passenger car for business use	87	78	88	100	73	94	64	67	63	62	60	58
Bus	59	56	54	64	63	61	58	57	62	64	64	61
Rail	61	63	64	77	82	82	81	80	80	80	80	80
Marine transportation	6	5	4	7	6	8	9	7	8	7	6	7
Air	70	99	98	119	155	154	145	147	157	176	193	185
Total of freight sector energy consumption	941	1,058	1,041	1,233	1,358	1,372	1,366	1,352	1,346	1,334	1,284	1,233
	(3.1)	(-3.7)	(0.9)	(-0.5)	(2.7)	(0.1)	(-1.5)	(0.2)	(0.6)	(0.2)	(-3.7)	(-3.9)
Motor truck	657	791	819	1,058	1,171	1,140	1,116	1,085	1,101	1,105	1,083	1,047
Rail	17	13	8	7	6	6	6	6	6	6	6	5
Marine transportation	262	244	200	151	159	203	221	239	217	199	171	157
Air	5	9	14	17	22	22	24	22	23	24	25	23

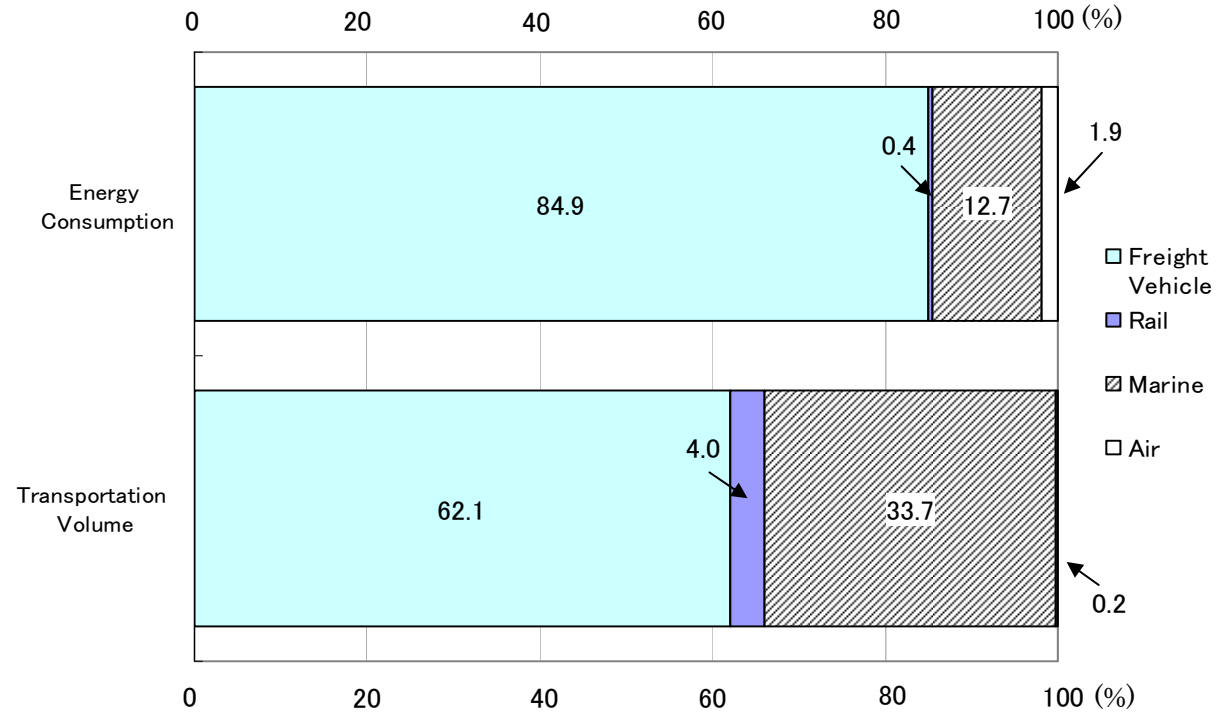
Note) Values in parentheses represent the increase rate (%) compared with the previous fiscal year.
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in JAPAN (2010)"

2) Energy consumption and transportation volume share (FY 2008)
(by type of passenger transport)



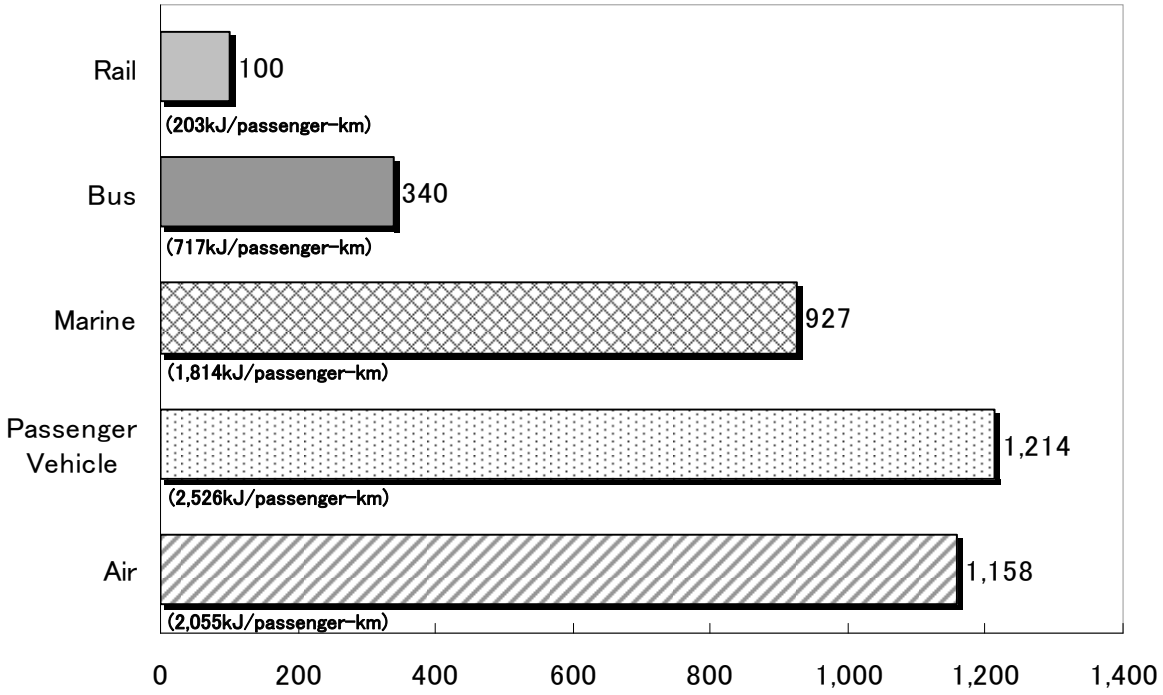
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2010)"

3) Energy consumption and transportation volume share (FY 2008)
(by type of freight transport)



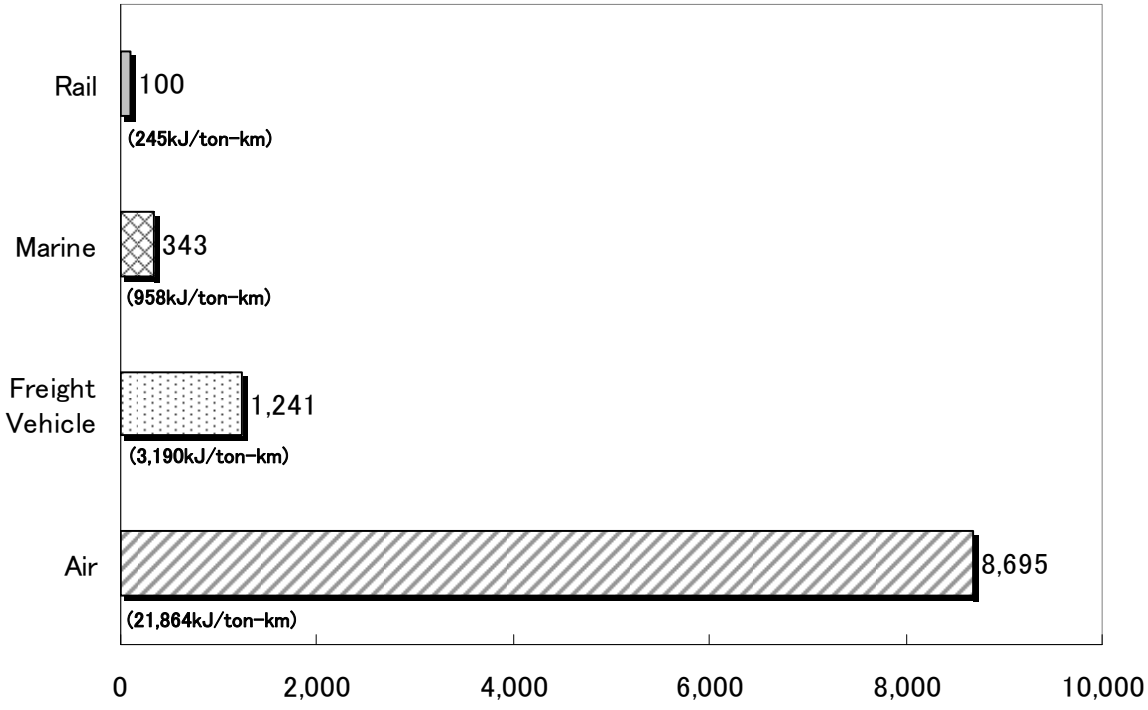
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2010)"

4) Energy intensity by type of transport (FY 2008)
(Energy consumption per passenger-kilometer)



Note) Index Rail =100
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2010)"

5) Energy intensity by type of transport (FY 2008)
(Energy consumption per freight ton-kilometer)



Note) Index Rail =100
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2010)"

2. STANDARDS OF JUDGMENT

2.1 Standards of Judgment for Factories etc. on Rational Use of Energy

(Announcement No.66 of Ministry of Economy, Trade and Industry on 31 March 2009)

(Note) The following table is prepared based on "Standards of Judgment for business operators on the rational use of energy at factories etc.".

Standards Components	Business operators should make the following efforts to appropriately manage energy, while thoroughly manage energy by the factories, etc. and facilities in detail and comply with various standard for their factories, etc. Chain business operators should do the same as above for factories, etc. they are affiliated with. A. To promote a management system for efficient and effective energy conservation as a whole. B. To place a person in charge of the management system. C. To set policies on efforts for energy conservation, including targets and policies to install new facilities or replace existing ones. D. To check and evaluate the policies on efforts and observance status, and to make improvements based on the evaluation. E. To regularly investigate the evaluation method of the policies on efforts and observance status and to improve them, if necessary. F. To grasp the situation, by creating, updating, and maintaining a document that describes the names, locations, and energy usage amounts related to factories, etc.
Target Components	- Set a target to reduce energy consumption intensity of each factory, etc. or factories, etc. as a whole by one percent or more on an annual average in medium- and long-term. - Make technically and economically reasonable efforts to achieve the target components. - Business operators specified in Table(8) shall make efforts to improve or reduce benchmark indexes and make technically and economically reasonable efforts to bring these indexes to the level described in the table. - Chain business operators shall make efforts to achieve targets and measures within the range of adhesive terms and conditions of the chain business. - Lessor and lessee shall cooperate to promote energy conservation activities and make efforts to establish mechanisms, etc. to reflect effects to the method of sharing monetary burden. - Business operators shall explore efforts to contribute to others' promotion of energy conservation through provision of technologies, advice, and coalition of business, etc.

(1) Items related to rational use of energy in factories, etc. that are exclusively used for office or other similar applications

		1. Air-conditioning Facilities and Ventilation Facilities
Standards Components	Management	(1) Management of air-conditioning facilities and ventilation facilities A. Zone of air-conditioning shall be limited to reduce air-conditioning load and control operational time of the facilities and indoor temperature, etc. [Management Manual] The temperature of air-conditioning levels shall be referred to the government's recommended levels. [Management Manual] B. For heat source facilities that burns (absorption chillers, Chilled/hot water generators, etc.), air ratio shall be controlled. [Management Manual] C. The heat source facilities, heat transfer facilities, air-conditioning facilities shall be managed in a way that the efficiency will be comprehensively improved based on seasonal weather changes, etc. [Management Manual] D. The heat source facilities composed of multiple heat source facilities shall be managed in a way that the facilities efficiency will be comprehensively improved based on seasonal weather changes. [Management Manual] E. Multiple pumps of heat transfer facilities shall be managed in a way that the efficiency of facilities will be comprehensively improved, such as by adjusting the number of units operating based on the load change, etc. [Management Manual] F. The air-conditioning facilities composed of multiple air-conditioning units in one section shall be managed in a way that the facilities efficiency will be comprehensively improved based on load conditions, etc. [Management Manual] G. Ventilation facilities and equipment shall be managed in a way that zone of ventilation is limited, and ventilation volume, operational time, and temperature, etc. shall be managed. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to air-conditioning facilities and ventilation facilities A. The temperature and humidity levels, etc. shall be measured and recorded for each of the operational zone. [Management Manual] B. All factors that contribute to improvement of the facilities' collective efficiency and each unit's efficiency shall be measured and recorded. [Management Manual] C. Temperature and carbon dioxide concentration, etc. shall be measured and recorded for each operational zone to grasp the condition of air and to improve ventilation efficiency. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of air-conditioning facilities and ventilation facilities A. Air-conditioners shall be inspected and maintained to improve the each air-conditioner's efficiency and the facilities' total efficiency improvement. [Management Manual] B. The automatic controlling devices that are installed in the air-conditioning facilities and ventilation facilities shall be inspected and maintained to keep in good condition. [Management Manual] C. Ventilation facilities shall be inspected and maintained, including removing clogging, to keep the efficiency of each unit and the facilities' total efficiency in a good condition. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new air-conditioning facilities and ventilation facilities A. When installing new air-conditioning facilities, the following measures shall be enforced to improve the efficiency of energy use: (a) Each air-conditioner shall respond to the heat demand change and be independently controlled by each operational area. (b) High efficiency heat source such as heat pumps, etc. shall be introduced. (c) High efficiency operation system such as controlling the number of the operational units, etc. shall be introduced. (d) Variable air volume and variable flow rate system such as controlling the number of rotation, etc. shall be introduced. (e) Total heat exchanger, outdoor air cooling control, water humidification shall be introduced. (f) The heat transfer facilities with large lifting height that receives heat from heat storage system and regional air-conditioning system shall introduce heat exchanger to reduce lifting height. (g) When installing outdoor unit of an air-conditioner, insulation and ventilation conditions, etc. shall be considered. (h) Measuring devices and sensors, etc. shall be installed in each air-conditioning section and BEMS shall be introduced for appropriate control and analysis of air-conditioning. B. Air-conditioning facilities and ventilation facilities that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced. C. Facility architecture of ventilation facilities and equipment shall be able to respond to change of load.
Target Components	Improvement of Existing Facilities	- Improvement of thermal insulation where air-conditioning is done shall be investigated. In addition, shielding insulation shall be also investigated. - Reducing load of outside air processing by air-conditioning facilities shall be investigated. Introducing free cooling shall be investigated. - Introducing large temperature difference systems that can reduce air flow rate and circulation water volume shall be investigated. - Improvement of thermal insulation of pipes and ducts shall be investigated. - For engines for ventilation, introducing air flow control shall be investigated.
	New Installation and Update of Facilities	- Introducing heat storage heat pump system, gas cooling system, etc. for air- conditioning facilities shall be investigated. In addition, when both cooling and heating exist, introducing heat recovery system shall be investigated. Furthermore, introducing heat recover heat pumps and exhaust heat driven heat source units shall be investigated.

2. Items related to Boiler Facilities and Hot Water Supply Facilities

(1) Management of boiler facilities and hot water supply facilities

A. Air ratio shall be managed according to the boiler capacities and fuel types. [Management Manual]

B. Air ratio shall be reduced referencing the Table(1). [Standard]

C. For boiler facilities, pressure and temperature of steam etc. and operating hour shall be managed. [Management Manual]

D. Quality of water supplied to boilers shall be managed. [Management Manual]

E. For multiple boilers, number of units operated shall be managed for comprehensive efficiency. [Management Manual]

F. For hot water supply facilities, areas to supply water shall be limited according to seasons and work, and temperature and pressure, etc. of the supplied hot water shall be managed. [Management Manual]

G. The heat source facilities for hot water supply facilities shall be managed in a way that the comprehensive efficiency of the facilities including the heat source units and pumps, etc. is increased according to change of load. [Management Manual]

H. Hot water supply facilities composed of multiple heat source units shall be managed in a way that the comprehensive efficiency is increased according to change of load by adjusting the number of units operated. [Management Manual]

(2) Measurement and recording related to boiler facilities and hot water supply facilities

A. For boiler facilities, fuel supply, steam pressure, temperature of hot water, residual oxygen content in exhaust gas, temperature of exhaust gas, water volume supplied by boilers, etc. shall be measured and recorded. [Management Manual]

B. For hot water supply facilities, supplied water volume, temperature of supplied hot water, etc. shall be measured and recorded. [Management Manual]

(3) Maintenance and inspection of boiler facilities and hot water supply facilities

A. For boiler facilities, all factors that contribute to improvement of the facilities' efficiency shall be inspected and maintained. [Management Manual]

B. Boiler facilities shall be inspected and maintained to maintain thermal insulation and to prevent leak of steam from steam trap. [Management Manual]

C. Hot water supply facilities shall be inspected and maintained to maintain efficiency of supplying hot water and to maintain automatic controlling devices in a good condition. [Management Manual]

(4) Measures in installing new boiler facilities and hot water supply facilities

A. When the temperature of waste gas from the boiler facilities exceed the value indicated in Table(2), the waste heat shall be utilized. Waste heat from the steam drain shall be recovered and used.

B. For boiler facilities, actual record and future trend of demand of steam, etc. shall be thoroughly investigated to determine appropriate facility capacity. Economizers etc. shall be installed.

C. If change in load of boiler facilities is expected, high efficiency operation system such as controlling the number of the operational units, etc. shall be introduced.

D. When installing new hot water supply facilities, the following measures shall be enforced to improve the efficiency of energy use:

(a) Operation according to change of hot water supply load

(b) Localizing system for sections where demand for hot water is low

(c) Introduction of heat pump systems and/or heat source facilities with latent heat recovery

E. Boiler facilities and hot water supply facilities that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.

- Efforts to lower air ratio of boiler facilities to the "target value" in Table(1) shall be made.
- Efforts to lower the waste gas temperature of boiler facilities to the "target value" in Table(2) shall be made to increase waste heat recovery.
- When hot water supply facilities are installed, improvement of efficiency such as introduction of both heat pump system and condensing heat recovery method, etc shall be investigated.

(1) Items related to rational use of energy in factories, etc. that are exclusively used for office or other similar applications

		3. Items related to Lighting Systems, Elevators, and Engine Facilities
Standards Components	Management	(1) Management of lighting systems and elevators A. Lighting systems shall be managed referring to the provisions specified in the JIS, etc. Dimming and turning-off using dimmer control shall be managed. [Management Manual] B. Elevators shall be managed for limitation of floors to stop, the number of operational units, etc. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to lighting systems - For lighting systems, luminance of the workplace, etc. to be lighted shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of lighting systems, elevators, and engine facilities A. Lighting systems shall be inspected and maintained including cleaning and replacement, etc. [Management Manual] B. Elevators shall be inspected and maintained to reduce machine loss. [Management Manual] C. Engine facilities shall be inspected and maintained to reduce machine loss including plumbing installations and mechanic parking facilities. [Management Manual] Liquid machines such as pumps, etc. shall be inspected and maintained to prevent leaks and pipes, etc. shall be inspected and maintained to reduce resistance. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new lighting systems and elevators A. When installing a new lighting system, the following measures shall be enforced referring to the items related to lighting system of the standards of judgment for buildings to improve the efficiency of energy use: (a) Energy conserving facilities such as fluorescent lighting using inverters, etc. shall be considered for the installation. (b) High efficiency lamps such as HID lamps, etc. shall be introduced. (c) Maintenance factors such as cleaning, etc. shall be considered for the installation. (d) Comprehensive energy efficiency factors including efficiency of lighting circuits or lighting fixtures, etc. shall be considered. (e) For places where natural lighting can be used, separate circuits shall be considered for the installation. (f) Installation of motion sensors, utilization of timers, and coordination with maintenance facilities shall be considered. B. Machineries, office equipment, and commercial equipment relating to lighting systems that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced. C. For elevators, efficiency of energy use shall be improved referring to the items related to elevators of the standards of judgment for buildings.
Target Components	Improvement of Existing Facilities	- For escalators, efficient operation by motion sensors, etc. shall be considered.
	New Installation and Update of Facilities	- Selecting lighting systems with dimming capability or adopting automatic controlling system of lighting or luminance offset lighting shall be considered. - Adopting LED (light-emitting diode) lighting systems shall be considered.

4. Items related to Power Receiving and Transforming Facilities and BEMS

(1) Management of power receiving and transforming facilities

A. Transformers and uninterruptible power systems shall be managed by adjusting the number of operating units and appropriate load dispatch so that the comprehensive efficiency is improved. [Management Manual]

B. Phase advance capacitors, etc. shall be managed so that the phase factor at the receiving end shall be 95% or higher. [Management Manual]

(2) Measurement and recording related to power receiving and transforming facilities

- Power consumption, voltage and current, etc. of the power receiving and transforming facilities shall be measured and recorded. [Management Manual]

(3) Maintenance and inspection of power receiving and transforming facilities

- Power receiving and transforming facilities shall be inspected and maintained to keep in good condition. [Management Manual]

(4) Measures in installing new power receiving and transforming facilities and BEMS

A. When introducing power receiving and transforming facilities, equipment with low energy loss shall be adopted, actual record and future trend of power demand shall be investigated, and layout of power receiving and transforming facilities, power distribution voltages, and facility capacities shall be optimized.

B. Power receiving and transforming facilities that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.

C. Introducing BEMS shall be considered.

- Energy management shall be enforced as time-series, considering past result to grasp consumption trend.
- Comprehensive energy conservation control including air-conditioning facilities and electrical facilities, etc. shall be considered.
- Grasping deterioration of equipment and facilities and timing of maintenance, etc. shall be considered.
- Keeping the power factor at the receiving end 98% or higher shall be considered.(refer to Table(6) for equipment to be applied)

- Introducing motors with higher efficiency than the "target value" in Table(7) shall be considered.

(1) Items related to rational use of energy in factories, etc. that are exclusively used for office or other similar applications

		5. Items related to Dedicated Power Generation Facilities and Cogeneration Facilities
Standards Components	Management	(1) Management of dedicated power generation facilities and cogeneration facilities A. Proper operational management shall be achieved for high efficiency of the facilities. [Management Manual] Facilities that are in parallel operation shall be managed to appropriately distribute load so that the comprehensive efficiency is improved. [Management Manual] B. Operation of cogeneration facilities shall be controlled so that the comprehensive efficiency is improved according to load increases and decreases. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to dedicated power generation facilities and cogeneration facilities - All factors that contribute to improvement of the facilities' collective efficiency including accessories, etc. shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of dedicated power generation facilities and cogeneration facilities - Facilities shall be inspected and maintained to keep in the condition with high thermal efficiency including accessories, etc. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new dedicated power generation facilities and cogeneration facilities A. The actual result and future trends of electricity demand shall be considered and the facilities shall have optimal capacity size. B. The generation efficiency of new dedicated power generation facilities shall not be significantly lower than the level of the annual average generation efficiency of the domestic power generation facilities. C. The actual result and future trends of electricity and heat demands shall be considered and the facilities shall have optimal capacity size.
Target Components	Improvement of Existing Facilities	
	New Installation and Update of Facilities	- Installing cogeneration facilities shall be considered.

6. Items related to Office Equipment and Commercial Equipment	7. Items related to Industrial Equipment	8. Items related to Other Rational Use of Energy
(1) Management of office equipment Office equipment shall be managed to prevent unnecessary operation, etc.	(1) Management of industrial equipment - Industrial equipments including kitchen equipment and industrial refrigerators, etc. shall be managed for required items including seasons, days of the week, time slots, loads, non-operational hours, etc. [Management Manual]	Lessor and lessee shall cooperate to promote energy conservation activities. Lessor shall provide lessee with information on energy consumption (measured values or estimated figures)
(2) N/A	(2) Measurement and recording related to industrial equipment - All factors that contribute to understanding and improvement of operation of the professional use equipment shall be measured and recorded. [Management Manual]	
(3) Maintenance and inspection of office equipment Office equipment shall be inspected and maintained as required.	(3) Maintenance and inspection of industrial equipment - Industrial equipment shall be inspected and maintained to keep in good condition. [Management Manual]	
(4) Measures in installing new office equipment and commercial equipment Office equipment and commercial equipment that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.	(4) Measures in installing new professional use equipment A. Industrial equipment with high energy efficiency shall be selected. B. For equipments that produce heat, limiting air-conditioning zones, restricting outdoor air, and direct emission of heat to outside of air-conditioned zones shall be considered. C. Industrial equipment that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.	
	- For automatic vending machines, stopping operation during non-selling hours shall be considered.	

(2) Items related to rational use of energy in factories

		1. Rationalization of Fuel Combustion
Standards Components	Management	(1) Management of fuel combustion A. Air ratio shall be managed according to the type of fuel combustion facility and fuel types. [Management Manual] B. Air ratio of the facility shall be reduced referencing Table(1). [Standard] C. For multiple facilities, the total thermal efficiency shall be managed by adjusting the load. [Management Manual] D. Operational conditions shall be managed according to fuel properties. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to fuel combustion - Amount of supplied fuel, temperature of exhaust gas, residual oxygen present in exhaust gas, etc. shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of combustion facilities - The combustion facilities shall be maintained and inspected to keep in good condition. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new combustion facilities A. The combustion equipments shall be able to adjust the fuel amount and air ratio according to the load change. B. The ventilation system shall be able to adjust the airflow rate and combustion chamber pressure.
Target Components	Improvement of Existing Facilities	- Efforts to lower air ratio to the "target value" in Table(1) shall be made. - For combustion equipments such as burners, etc. adopting facilities that are able to adjust the fuel amount and air ratio shall be considered. - For ventilation facilities, adopting facilities that are able to adjust the airflow rate, etc. shall be considered.
	New Installation and Update of Facilities	- For combustion controlling equipment, adopting equipment that is able to control air ratio shall be considered. - When replacing or newly installing burners, adopting regenerative burners shall be considered. - Measurement devices shall be installed for each combustion facility, and appropriate combustion management shall be enforced by using computers.

2. Rationalization of Heating, Cooling, and Heat Transfer (2-1) Heating Equipment, etc.

(1) Management of heating, cooling, and heat transfer

A. For the facilities using heat media, the temperature, pressure, and volume of the medium shall be controlled. [Management Manual]

B. For industrial furnaces, the thermal efficiency shall be improved to improve the heat patterns. [Management Manual]

C. The amount of heated or cooled objects and the positioning inside the furnace shall be managed to prevent overloads or under loads. [Management Manual]

D. When multiple facilities are used, the loads shall be adjusted to maximize the comprehensive efficiency. [Management Manual]

E. For repetitive processes, the waiting time between processes shall be reduced. [Management Manual]

F. Intermittent operation shall be streamlined. [Management Manual]

G. Quality of water supplied to boilers shall be managed. [Management Manual]

H. For steam facilities, valves shall be shut off when not in use.

I. Dryness of steam in heating facilities shall be kept at an appropriate level.

J. Factors related to heating, including heated or cooled objects, heat media, etc. shall be managed. [Management Manual]

(2) Measurement and recording related to heating

- The temperature, pressure, flow rate, etc. of heat media, such as steam, etc. used for heated or cooled objects shall be measured and recorded. [Management Manual]

(3) Maintenance and inspection of heating facilities

- Heat-transferring parts shall be maintained and inspected including removal of soot, dust, and scale, etc. of boilers and heat exchangers, etc. and prevention of deterioration of heat transfer performance, etc. [Management Manual]

(4) Measures in installing new heating facilities

A. Materials with high thermal conductivity shall be used for heat exchanging parts.

B. Heat exchangers shall be aligned appropriately to improve comprehensive thermal efficiency.

- Increasing dryness of steam shall be considered.
- Improving emissivity of walls, etc. of industrial furnaces shall be considered.
- Improving heat conductivity of heat-transfer surfaces shall be considered.
- Using materials with high heat conductivity for heat exchanging parts shall be considered.
- Directly heating heated objects shall be considered.
- Increasing the stages of multiple-effect evaporators shall be considered.
- Increasing the efficiency of distillation tower shall be considered.
- Improving comprehensive thermal efficiency of heat exchangers shall be considered.
- Combination of industrial furnaces that enables multistep utilization of heat shall be considered.
- Efforts to improve the method to control heating facilities shall be made.
- Serialization, integration, cut down, and partial elimination of heating processes shall be considered.
- Preliminary processing of heated materials shall be considered.
- Heating using vacuum steam media shall be considered.

- When installing facilities that use heat such as boilers, etc., distributed arrangement and installing heat storage facilities shall be considered.
- When installing heating facilities, adopting facilities with high thermal efficiency shall be considered.

(2) Items related to rational use of energy in factories

		2. Rationalization of Heating, Cooling, and Heat Transfer (2-2) Air Conditioning Facilities and Hot Water Supply Facilities
Standards Components	Management	(1) Management of air-conditioning facilities and hot water supply facilities A. For air-conditioning to maintain manufacturing and workplace environment, air-conditioned zones shall be limited to lower air-conditioning load, and operation conditions shall be managed. [Management Manual] B. Zone of air-conditioning in the factories and offices, etc. shall be limited to reduce air-conditioning load and control operational time of the facilities and indoor temperature, etc. [Management Manual] The temperature of air-conditioning levels shall be referred to the government's recommended levels. [Management Manual] C. The heat source facilities, heat transfer facilities and air-conditioning facilities shall be managed in a way that the efficiency will be comprehensively improved based on seasonal weather changes, etc. [Management Manual] D. The heat source facilities composed of multiple heat source facilities shall be managed in a way that the facilities efficiency will be comprehensively improved based on seasonal weather changes, etc. [Management Manual] E. Multiple pumps of heat transfer facilities shall be managed in a way that the efficiency of facilities will be comprehensively improved, such as by adjusting the number of units operating based on the load change, etc. [Management Manual] F. The air-conditioning facilities composed of multiple air-conditioning units in one section shall be managed in a way that the facilities efficiency will be comprehensively improved based on load conditions, etc. [Management Manual] G. For hot water supply facilities, areas to supply water shall be limited according to seasons and work, and temperature and pressure, etc. of the supplied hot water shall be managed. [Management Manual] H. The heat source facilities for hot water supply facilities shall be managed in a way that the comprehensive efficiency of the facilities including the heat source units and pumps, etc. is increased according to change of load. [Management Manual] I. Hot water supply facilities composed of multiple heat source units shall be managed in a way that the comprehensive efficiency is increased according to change of load by adjusting the number of units operated. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to air-conditioning facilities and hot water supply facilities A. The temperature and humidity levels, etc. shall be measured and recorded for each of the operational zone. [Management Manual] B. All factors that contribute to improvement of the facilities' collective efficiency and each unit's efficiency shall be measured and recorded. [Management Manual] C. For hot water supply facilities, all factors that contribute to improvement of the efficiency as well as the volume and temperature, etc. shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of air-conditioning facilities and hot water supply facilities A. Air-conditioners shall be inspected and maintained to improve the each air-conditioner's efficiency and the facilities' total efficiency improvement. [Management Manual] B. Hot water supply facilities shall be inspected and maintained to improve efficiency. [Management Manual] C. Automatic controlling devices of air-conditioning and hot water supply facilities shall be inspected and maintained. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new air-conditioning facilities and hot water supply facilities A. When installing new air-conditioning facilities, the following measures shall be enforced to improve the efficiency of energy use: (a) Each air-conditioner shall respond to the heat demand change and be independently controlled by each operational zone. (b) High efficiency heat source such as heat pumps, etc. shall be introduced. (c) High efficiency operation system such as controlling the number of the operational units, etc. shall be introduced. (d) Variable air volume and variable flow rate system such as controlling the number of rotation, etc. shall be introduced. (e) Total heat exchanger, outdoor air cooling control, water humidification shall be introduced. (f) For facilities that produce heat, heat shall be directly emitted to outside of air-conditioned zones. (g) Local air-conditioning, radiant heating, reduction of volume, etc. to be air-conditioned shall be considered. (h) Gaps and openings of buildings shall be closed wherever possible. (i) When installing outdoor unit of an air-conditioner, insulation and ventilation conditions, etc. shall be considered. (j) Measurement devices, etc. required for improvement of efficiency shall be installed for each air-conditioning zone; Air-conditioning shall be appropriately controlled and analyzed by introducing factory energy management system, etc. B. When installing new hot water supply facilities, the following measures, etc. shall be enforced to improve the efficiency of energy use: (a) Operation according to change of hot water supply load (b) Localizing system for sections where demand for hot water is low (c) Introduction of heat pump systems and/or heat source facilities with latent heat recovery C. Air-conditioning facilities and hot water supply facilities that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.
Target Components	Improvement of Existing Facilities	- Improvement of thermal insulation where air-conditioning is done shall be investigated. In addition, shielding insulation shall be also investigated. - Reducing load of outside air processing by air-conditioning facilities shall be investigated. Introducing free cooling shall be investigated. - Introducing large temperature difference systems that can reduce air flow rate and circulation water volume shall be investigated. - Improvement of thermal insulation of pipes and ducts shall be investigated. - For engines for ventilation, introducing air flow control shall be investigated.
	New Installation and Update of Facilities	- Introducing heat storage heat pump system, gas cooling system, etc. for air conditioning facilities shall be investigated. In addition, when both cooling and heating exist, introducing heat recovery system shall be investigated. Furthermore, introducing heat recover heat pumps and exhaust heat driven heat source units shall be investigated. - When hot water supply facilities are installed, improvement of efficiency such as introduction of both heat pump system and condensing heat recovery method shall be investigated. - For hot water supply facilities used for heating or drying facilities, etc., heat pump systems and/or heat source facilities with latent heat recovery shall be considered.

3. Waste Heat Recovery and Usage

(2) Standards of waste heat recovery and usage

A. Exhaust gas temperature or waste heat recovery rate shall be controlled according to the facility. [Management Manual]

B. Waste gas temperature and waste heat recovery rate shall be managed referencing Table(2) and (4). [Standard]

C. Temperature, volume, and property of steam drain shall be controlled. [Management Manual]

D. For recovery and utilization of sensible heat, latent heat, pressure, and combustible constituents of heated solid or liquid, range of recovery shall be controlled. [Management Manual]

E. Waste heat shall be utilized in an appropriate manner according to its temperature and facilities operational conditions, etc.

(3) Measurement and recording related to waste heat

- Temperature, heat quantity, components, etc. shall be measured and recorded to grasp situation of waste heat and promote its utilization. [Management Manual]

(4) Maintenance and inspection of waste heat recovery facilities

- Waste heat recovery facilities shall be inspected and maintained including cleaning of the heat transfer surface, etc. and prevention of heat media leakage, etc. [Management Manual]

(5) Measures in installing new waste heat recovery facilities

A. Waste heat temperature of the flues and piping, etc. of the waste heat recovery facilities shall be maintained.

B. Properties and shapes of heat transfer surfaces shall be improved to increase waste heat recovery rate; measures to increase heat-transfer area, etc. shall be enforced.

- Efforts shall be made to lower inlet temperature of coolers and condensers for efficient heat recovery.
- Efforts to lower the waste gas temperature and to increase waste heat recovery rate to the "target value" in Table(2) and (4).
- Implementing measures to keep the waste heat temperature high in the flues, etc. shall be considered.
- Measures to improve heat-transfer efficiency of waste heat recovery facilities shall be considered.
- Methods to effectively utilize waste heat shall be investigated and considered.
- Methods to utilize sensible heat, latent heat, pressure, etc. that heated solid has shall be considered.

- Installing heat storage facilities for waste heat shall be considered.

(2) Items related to rational use of energy in factories

		4. Rationalization of Conversion of Heat to Motive Power, etc. (4-1) Dedicated Power Generation Facilities
Standards Components	Management	(1) Management of dedicated power generation facilities A. Proper operational management shall be achieved for high efficiency of the facilities. [Management Manual] Facilities that are in parallel operation shall be managed to appropriately distribute load so that the comprehensive efficiency is improved. [Management Manual] B. If pressure can be lowered when partial load is put on the steam turbines of thermal electricity plants, it shall be managed so that it is optimized. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to dedicated power generation facilities - For dedicated power generation facilities, comprehensive efficiency shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of dedicated power generation facilities - Dedicated power generation facilities shall be inspected and maintained so that the comprehensive efficiency is maintained high. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new dedicated power generation facilities A. The electricity demand and future trends shall be considered and the facilities shall have optimal capacity size. B. The generation efficiency of new dedicated power generation facilities shall not be significantly lower than the level of the annual average generation efficiency of the domestic power generation facilities (Dedicated power generation facilities in electricity suppliers shall have the highest level of gross efficiency among general-purpose machines).
Target Components	Improvement of Existing Facilities	
	New Installation and Update of Facilities	

4. Rationalization of Conversion of Heat to Motive Power, etc.
(4-2) Cogeneration Facilities

(1) Management of cogeneration facilities

A. Operation of cogeneration facilities shall be controlled so that the comprehensive efficiency is improved according to load increases and decreases. [Management Manual]

B. When bleeding gas/back pressure turbines are used for cogeneration facilities, allowable minimum levels of bleeding gas/back pressure shall be controlled. [Management Manual]

(2) Measurement and recording related to cogeneration facilities

A. The thermal efficiency shall be measured and recorded. [Management Manual]

B. When operating turbines at minimum pressure, inlet and outlet pressures, bleeding gas pressure, back pressure, etc. shall be measured and recorded. [Management Manual]

(3) Maintenance and inspection of cogeneration facilities

- Cogeneration facilities shall be inspected and maintained to keep in the condition with high thermal efficiency. [Management Manual]

(4) Measures in installing new cogeneration facilities

- The actual result and future trends of electricity and heat demands shall be considered and the facilities shall have optimal capacity size.

- Modification of bleeding gas turbines or back pressure turbines to improve efficiency shall be considered.

- When demand for steam or hot water is high and exhaust heat can be utilized enough in the future, installing cogeneration facilities shall be considered.

(2) Items related to rational use of energy in factories

		5. Prevention of Energy Loss due to Radiation, Conduction, and Resistance, etc. (5-1) Prevention of Heat Loss due to Radiation and Conduction, etc.
Standards Components	Management	(1) Standards of thermal insulation A. The standards of heat-using facilities' heat insulation shall be compliant with provisions of JIS, etc. B. Heat insulation shall be performed for newly installed industrial furnaces based on the temperature of the external surface of the furnace wall specified in Table(5). [Standard] For existing furnaces, heat insulation shall be performed based on the temperature of the external surface of the furnace wall specified in Table(5), if possible. [Standard]
	Measurement & Recording	(2) Measurement and recording related to heat loss - Each facility's temperature of external surfaces of furnace wall, heated objects, waste gas, etc. shall be measured and recorded, and heat balance etc. shall be analyzed. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of heat-using facilities A. Heat-using facilities shall be inspected and maintained for heat loss prevention measures including thermal insulation work. [Management Manual] B. Facilities shall be inspected and maintained to maintain thermal insulation and to prevent leak of steam from steam trap. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new heat-using facilities A. When installing new heat-using facilities, thermal insulation shall be improved by using thicker heat insulation materials or materials with low heat conductivity, or doubly-layered thermal insulation, etc., and fire-retardant heat insulation materials shall have enough fire resistance. B. When installing new heat-using facilities, heat loss shall be prevented by reducing or sealing openings of heat-using facilities, installing double doors, or insulation using air flow, etc. C. When installing new heat-using facilities, radiation area shall be reduced by rationalization of pipe arrangement rout for heat media.
Target Components	Improvement of Existing Facilities	- Reduction of thermal capacity of carry-in wagons, etc. to industrial furnaces shall be considered. - Measures to improve thermal insulation properties of industrial furnaces to the "target value" in Table(5) shall be considered. - Improving thermal insulation of heat-using facilities shall be considered. - Prevention of heat loss from openings of heat-using facilities shall be considered. - Measures to prevent leakage of heat media shall be considered. - Reduction of radiation area pipes to transfer heat media shall be considered. - For open type facilities, etc. installing casing shall be considered.
	New Installation and Update of Facilities	

5. Prevention of Energy Loss due to Radiation, Conduction, and Resistance, etc.
(5-2) Prevention of Electricity Loss due to Resistance, etc.

(1) Management of power receiving and transforming facilities and power distribution facilities

A. Transformers and uninterruptible power systems shall be managed by adjusting the number of operating units and appropriate load dispatch so that the comprehensive efficiency is improved. [Management Manual]

B. Power receiving and transforming facilities shall be managed to have proper arrangement, to reduce the distribution lines and to have appropriate voltage. [Management Manual]

C. The power factor at the receiving end shall be set to 95% or higher based on the "standard" for Table(6), and this target shall be achieved by measures such as installing phase advance capacitors, etc.

D. Phase advance capacitors shall be managed to properly start/stop according to the facility to which they are installed. [Management Manual]

E. When a single-phase load is connected to a three-phase load, voltage imbalance shall be prevented and controlled. [Management Manual]

F. Electricity-using facilities shall be operated to reduce the maximum current by equalizing the power consumption. [Management Manual]

G. Electrical loss from power receiving and transforming facilities and power distribution facilities, etc. shall be reduced. [Management Manual]

(2) Measurement and recording related to power receiving and transforming facilities and power distribution facilities

- Power consumption, voltage and current, etc. of the power receiving and transforming facilities and power distribution facilities shall be measured and recorded. [Management Manual]

(3) Maintenance and inspection of power receiving and transforming facilities and power distribution facilities

- Power receiving and transforming facilities and power distribution facilities shall be inspected and maintained to keep in good condition. [Management Manual]

(4) Measures in installing new power receiving and transforming facilities and power distribution facilities

A. For power receiving and transforming facilities and power distribution facilities, the actual demand and future trends of electricity demand shall be considered to determine the arrangement, distribution voltage and capacity of facilities.

B. When introducing a new transformer, the transformer's energy efficiency shall comply with or higher than the levels stipulated in the standards for manufacturers' standards of judgment, etc. for transformers performance.

- Keeping the power factor at the receiving end 98% or higher shall be considered (refer to Table(6) for equipment to be applied).
- Appropriate measurement management by grasping electricity consumption situation and by using computers, etc. shall be considered.

- Adopting high efficiency transformers, preferably at the standard energy consumption efficiency level of better, shall be considered.

(2) Items related to rational use of energy in factories

		6. Rationalization of Conversion of Electricity to Motive Power, Heat, etc. (6-1) Motor Applied Facilities, Electric Heaters, etc.
Standards Components	Management	(1) Management of motor applied facilities and electric heaters, etc. A. Motor applied facilities shall be capable of stopping operation when unnecessary in order to prevent electrical loss due to motor's idle operation, taking into account of the relation with the power needed to start operation. [Management Manual] B. When using multiple electrical motors, the number of operating motors and the load distribution shall be appropriately adjusted so that the comprehensive efficiency of the entire electrical motors is high. [Management Manual] C. For fluid machines, pressure at the using end and delivery feed shall be investigated to manage the number of operating units and rotations, etc. [Management Manual] If variation of load change is constant, measures such as change of pipe work and ducts, and impeller cut, etc. shall be considered. D. For electrical heating facilities of induction furnaces, etc., thermal efficiency shall be improved by improving loading method of the heated object, reduction of electricity loss during unloaded operation, and insulation or waste heat recovery. [Management Manual] E. Efficiency of electrolytic facilities shall be improved by appropriately managing distance between electrodes, concentration of electrolytic solution, etc. [Management Manual] F. Electrical loss shall be lowered by managing the voltage and current, etc. of each energy-using facility. [Management Manual]
	Measurement & Recording	(2) Measurement and recording related to motor applied facilities and electrical heating facilities, etc. - For motor applied facilities, electrical heating facilities, etc., voltage and current, etc. shall be measured and recorded. [Management Manual]
	Maintenance & Inspection	(3) Maintenance and inspection of motor applied facilities and electrical heating facilities, etc. A. Motor applied facilities shall be inspected and maintained to reduce mechanical loss of the load machine, the power transmission section, and the motor. [Management Manual] B. Fluid machines shall be inspected and maintained to prevent the fluid leakage and to reduce the pipe resistance. [Management Manual] C. Electrical heating facilities, etc. shall be inspected and maintained to reduce the resistance loss of the wire connections and contact parts of switches, etc. [Management Manual]
	Necessary Measures when Installing New Facilities	(4) Measures in installing new motor applied facilities - For the motor applied facilities where frequent load change is expected, the facilities shall be configured to enable an operation easily adjustable based on the load fluctuations.
Target Components	Improvement of Existing Facilities	- Installing electric machineries whose capacities are suitable for the required output shall be considered. - For escalators, etc., efficient operation by motion sensors, etc. shall be considered. - For automatic vending machines, stopping operation during non-selling hours shall be considered.
	New Installation and Update of Facilities	- Introducing motors with higher efficiency than the "target value" in Table(7) shall be considered. - For motor facilities, installing equipment to control rotation shall be considered. - Electrical heating facilities shall be introduced after comparing heating methods other than electricity. Electrical heating facilities with appropriate heating method shall be introduced according to the temperature level. - Distributed arrangement of compact air compressors and blower fans for low pressure application shall be considered.

6. Rationalization of Conversion of Electricity to Motive Power, Heat, etc. (6-2) Lighting Systems, Elevators, Office Equipment, and Commercial Equipment	Factory Energy Management System
(1) Management of lighting systems, elevators, and office equipment A. Lighting systems shall be managed referring to the provisions specified in the JIS, etc. Dimming and turning-off using dimmer control shall be managed. [Management Manual] B. Elevators shall be managed for limitation of floors to stop and the number of operational units, etc. [Management Manual] C. Office equipment shall be turned off when unnecessary and low power mode shall be configured.	
(2) Measurement and recording related to lighting systems - For lighting systems, luminance of the workplace, etc. to be lighted shall be measured and recorded. [Management Manual]	
(3) Maintenance and inspection of lighting systems, elevators, and office equipment A. Lighting systems shall be inspected and maintained including cleaning and replacement, etc. [Management Manual] B. Elevators shall be inspected and maintained to reduce machine loss. [Management Manual] C. Office equipment shall be regularly inspected and maintained as required.	
(4) Measures in installing new lighting systems, elevators, office equipment, and commercial equipment A. When installing a new lighting system, the following measures shall be enforced referring to the items related to lighting system of the standards of judgment for buildings to improve the efficiency of energy use: (a) Energy conserving facilities such as fluorescent lighting using inverters, etc. shall be considered for the installation. (b) High efficiency lamps such as HID lamps, etc. shall be introduced. (c) Maintenance factors such as cleaning, etc. shall be considered for the installation. (d) Comprehensive energy efficiency factors including efficiency of lighting circuits or lighting fixtures, etc. shall be considered. (e) For places where natural lighting can be used, separate circuits shall be considered for the installation. (f) Installation of motion sensors, utilization of timers, and coordination with maintenance facilities shall be considered. B. For elevators, efficiency of energy use shall be improved referring to the items related to elevators of the standards of judgment for buildings. C. Machineries, office equipment, and commercial equipment relating to lighting systems that fall under specified equipment with energy consumption efficiency higher than standard shall be introduced.	
- For escalators, efficient operation by motion sensors, etc. shall be considered.	- Energy management shall be enforced as time-series, considering past results to grasp consumption trend. - Comprehensive energy conservation control including combustion facilities, heat-using facilities, waste heat recovery facilities, cogeneration facilities, electricity-using facilities, air-conditioning facilities, ventilation facilities, and hot water supply facilities, etc. shall be considered. - Grasping deterioration of equipment and facilities and timing of maintenance, etc. shall be considered.
- Selecting lighting systems with dimming capability or adopting automatic controlling system of lighting shall be considered. - Adopting LED (light-emitting diode) lighting systems shall be considered.	

Table : Standards and Target Values for Operating Equipment in Factories etc.

(1) Air ratios for boilers

Classification				Air ratio				
Item			Load factor (%)	Solid fuel		Liquid fuel	Gas fuel	Byproduced gas such as blast furnace gas
				Fixed bed	Fluidized bed			
Standard	For electric utility *		75–100	–	–	1.05–1.2	1.05–1.1	1.0
	General boilers (evaporation volume)	30t/h or more	50–100	1.3–1.45	1.2–1.45	1.1–1.25	1.1–1.2	1.2–1.3
		10 to less than 30t/h	50–100	1.3–1.45	1.2–1.45	1.15–1.3	1.15–1.3	–
		5 to less than 10/t	50–100	–	–	1.2–1.3	1.2–1.3	–
		Less than 5t/h	50–100	–	–	1.2–1.3	1.2–1.3	–
	Small once-through boilers		100	–	–	1.3–1.45	1.25–1.4	–
Target	For electric utility *		75–100	–	–	1.05–1.1	1.05–1.1	1.15–1.2
	General boilers (evaporation volume)	30t/h or more	50–100	1.2–1.3	1.2–1.25	1.05–1.15	1.05–1.15	1.2–1.3
		10 to less than 30t/h	50–100	1.2–1.3	1.2–1.25	1.15–1.25	1.15–1.25	–
		5 to less than 10/t	50–100	–	–	1.15–1.3	1.15–1.25	–
		Less than 5t/h	50–100	–	–	1.15–1.3	1.15–1.25	–
	Small once-through boilers		100	–	–	1.25–1.4	1.2–1.35	–

* The classification "for electric utility" above refers to boilers installed by electric power companies for power generation.

< Standard >

Note 1 : The standard values of air ratio mentioned in the table above define those to be obtained in measurements at the boiler outlet when fired at a constant level of load after regular inspection and in a stable state.

Note 2 : Turbine load factor shall be used for boilers installed for power generation, and the load factor of the boiler itself for those installed for other purposes.

Note 3 : The air ratio value of each boiler should be calculated using the following expression. Round the result to one decimal place if the corresponding standard value as defined above is significant down to the first decimal, and to two decimal places if it is significant down to the second decimal.

Air ratio = 21/[21 - (Oxygen concentration in the exhaust emission in percentage)]

Note 4 : As to the pulverized coal fired boiler included in the fixed bed solid fuel types, standard air ratio values of 1.15-1.3 shall apply to electric utilities, and 1.2-1.3 to other applications (those having the quantity of evaporation of 30 t/h or more, and of 10 to less than 30 t/h only).

< Target >

Note 1 : The target values of air ratio mentioned in the table above define those to be obtained in measurements at the boiler outlet when fired at a constant level of load after regular inspection and in a stable state.

Note 2 : Refer to Notes 2 and 3 of the above **< Standard >** for calculation of load factor and air ratio.

Note 3 : As to the pulverized coal fired boiler included in the fixed bed solid fuel types, target air ratio values of 1.15-1.25 shall apply to electric utilities, and 1.2-1.25 to other applications (those having the quantity of evaporation of 30 t/h or more, and of 10 to less than 30 t/h only).

Note 4 : Target air ratio values shall be 1.2-1.3 for boilers firing black liquor at a load factor between 50 and 100%.

(2) Waste gas temperatures for boilers

Classification				Waste gas temperature				
Item			Load factor (%)	Solid fuel		Liquid fuel	Gas fuel	Byproduced gas such as blast furnace gas
				Fixed bed	Fluidized bed			
Standard	For electric utility *		75-100	-	-	145	110	200
	General boilers (evaporation volume)	30t/h or more	50-100	200	200	200	170	200
		10 to less than 30t/h	50-100	250	200	200	170	-
		5 to less than 10/t	50-100	-	-	220	200	-
		Less than 5t/h	50-100	-	-	250	220	-
	Small once-through boilers		100	-	-	250	220	-
Target	For electric utility *		75-100	-	-	135	110	190
	General boilers (evaporation volume)	30t/h or more	50-100	180	170	160	140	190
		10 to less than 30t/h	50-100	180	170	160	140	-
		5 to less than 10/t	50-100	-	300	180	160	-
		Less than 5t/h	50-100	-	320	200	180	-
	Small once-through boilers		100	-	-	200	180	-

* The classification "for electric utility" above refers to boilers installed by electric power companies for power generation.

< Standard >

* The classification "for electric utility" above refers to boilers installed by electric power companies for power generation.

Note 1 : The standard values of waste gas temperature mentioned in the table above define those to be obtained in measurements at the boiler outlet when fired at 100% of load factor (turbine load factor shall be used for boilers installed for power generation, and the load factor of the boiler itself for those installed for other applications) after regular inspection, with its inlet air temperature set at 20ºC. The boiler outlet may be the outlet of a waste heat recovery plant or a flue gas treatment system for environmental protection if such equipment is in use.

Note 2 : As to the pulverized coal fired boiler included in the fixed bed solid fuel types, standard waste gas temperature values of 150ºC shall apply to electric utilities, and 200ºC to other applications (those having the quantity of evaporation of 30 t/h or more, and of 10 to less than 30 t/h only).

< Target >

Note 1 : The target values of waste gas temperature mentioned in the table above define those to be obtained in measurements at the boiler outlet when fired at 100% of load factor (turbine load factor shall be used for boilers installed for power generation, and the load factor of the boiler itself for those installed for other applications) after regular inspection, with its inlet air temperature set at 20ºC. The boiler outlet may be the outlet of a waste heat recovery plant or a flue gas treatment system for environmental protection if such equipment is in use.

Note 2 : As to the pulverized coal fired boiler included in the fixed bed solid fuel types, target waste gas temperature values of 140ºC shall apply to electric utilities, and 160ºC to other applications (those having the quantity of evaporation of 30 t/h or more, and of 10 to less than 30 t/h only).

Note 3 : Target waste gas temperature values shall be 180ºC for boilers firing black liquor.

(3) Air ratios for industrial furnaces

Item		Gas fuel		Liquid fuel		
		Continuous type	Intermittent type	Continuous type	Intermittent type	
Standard	Melting furnace for metal forging	1.25	1.35	1.3	1.4	
	Continuous reheating furnace (billet, bloom, slab)	1.20	-	1.25	-	
	Metal heating furnace other the above	1.25	1.35	1.25	1.35	
	Metal heat treatment furnace	1.20	1.25	1.25	1.3	
	Oil heating furnace	1.20	-	1.25	-	
	Thermal decomposition furnace and reforming furnace	1.20	-	1.25	-	
	Cement kiln	1.30	-	1.3	-	∗1
	Coal kiln	1.30	1.35	1.3	1.35	∗1
	Drying furnace	1.25	1.45	1.3	1.5	∗2
Target	Melting furnace for metal forging	1.05-1.20	1.05-1.25	1.05-1.25	1.05-1.30	
	Continuous reheating furnace (billet, bloom, slab)	1.05-1.15	-	1.05-1.20	-	
	Metal heating furnace other than the above	1.05-1.20	1.05-1.30	1.05-1.20	1.05-1.30	
	Metal heat treatment furnace	1.05-1.15	1.05-1.25	1.05-1.20	1.05-1.30	
	Oil heating furnace	1.05-1.20	-	1.05-1.25	-	
	Thermal decomposition furnace and reforming furnace	1.05-1.20	-	1.05-1.25	-	
	Cement kiln	1.05-1.25	-	1.05-1.25	-	∗1
	Coal kiln	1.05-1.25	1.05-1.35	1.05-1.25	1.05-1.35	∗1
	Drying furnace	1.05-1.25	1.05-1.45	1.05-1.30	1.05-1.50	∗2

*1 Value of liquid fuel in case pulverized coal firing
*2 Burner portion only

< Standard >

Note 1 : The standard values of air ratio mentioned in the table above define those to be obtained in measurements at the exhaust port of kiln or furnace when fired at a level of load around the rated after inspection and repair.

Note 2 : Standard values for liquid fuel types shall apply to industrial furnaces that use by-product gases such as blast furnace gas as fuel.

< Target >

Note 1 : The target values of air ratio mentioned in the table above define those to be obtained in measurements at the exhaust port of kiln or furnace when fired at a level of load around the rated after inspection and repair.

Note 2 : Target values for liquid fuel types shall apply to industrial furnaces that use by-product gases such as blast furnace gas as fuel.

(4) Standard and target rates of waste heat recovery for industrial furnaces (including waste gas temperatures for reference)

Exhaust gas temperature(℃)	Capacity category	Standard waste heat recovery rate %	Target waste heat recovery rate (%)	Reference	
				Waste gas temperature (℃)	Preheated air (℃)
Less than 500	A ・B	25	35	275	190
500 - 600	A ・B	25	35	335	230
600 - 700	A	35	40	365	305
	B	30	35	400	270
	C	25	30	435	230
700 - 800	A	35	40	420	350
	B	30	35	460	310
	C	25	30	505	265
800 - 900	A	40	45	435	440
	B	30	40	480	395
	C	25	35	525	345
900-1,000	A	45	55	385	595
	B	35	45	485	490
	C	30	40	535	440
1,000 or more	A	45	55	-	-
	B	35	45	-	-
	C	30	40	-	-

* In the above table, A refers to the furnaces with the rated capacity of 84,000 MJ per hour or more. And B includes the furnaces with the rated capacity from 21,000MJ per hour or more to less than 84,000MJ. Finally, C refers to the furnaces that have the hourly rated capacity from 840MJ or more to less than 21,000MJ.

< Standard >

Note 1 : The standard waste heat recovery rates mentioned in the table above define the percentage of recovered heat in relation to sensible heat of the exhaust gas emitted from the furnace chamber when fired at a level of load around the rated.

< Target >

Note 1 : The target waste heat recovery rates mentioned in the table above define the percentage of recovered heat in relation to sensible heat of the exhaust gas emitted from the furnace chamber when fired at a level of load around the rated.

Note 2 : The waste gas and preheated air temperature values indicated above as reference are those resulting from calculations of waste gas temperatures during waste heat recovery at the corresponding target rates and air temperatures during preheating using such recovered heat. The values have been calculated based on the following conditions:

(i) Temperature drop due to heat radiation-diffusion loss between furnace outlet and heat exchanger: 60ºC

(ii) Heat radiation-diffusion rate from heat exchanger: 5%

(iii) Use of liquid fuel (equivalent to heavy oil)

(iv) Outside air temperature: 20ºC

(v) Air ratio: 1.2

(5) Standard values and target values of furnace wall outer surface temperatures (for industrial furnaces with furnace temperatures of 500℃ and higher)

Item	Furnace temperature (℃)	Furnace wall outer surface temperature (℃)		
		Ceiling	Side wall	Bottom in contact with open air
Standard	1,300 or more	140	120	180
	1,100-1,300	125	110	145
	900-1,100	110	95	120
	Less than 900	90	80	100
Target	1,300 or more	120	110	160
	1,100-1,300	110	100	135
	900-1,100	100	90	110
	Less than 900	80	70	90

< Standard >

Note 1 : The standard values of furnace wall outer surface temperature mentioned in the table above define the average temperature of furnace wall outer surface (except specific parts) during its normal, steady operation at an outside air temperature of 20ºC.

< Target >

Note 1 : The target values of furnace wall outer surface temperature mentioned in the table above define the average temperature of furnace wall outer surface (except specific parts) during its normal, steady operation at an outside air temperature of 20ºC.

(6) Standard value and target value of power factor

< Standard >

The standard value of power factor at the power receiving end is 95% or more.

< Target >

The target value of power factor at the power receiving end is 98% or more and it is applied to the equipment listed below and electric power substation facilities.

Equipment name	Capacity (kW)
Cage-type induction motor	more than 75
Coil-type induction motor	more than 100
Induction furnace	more than 50
Vacuum melting furnace	more than 50
Induction heater	more than 50
Arc furnace	-
Flash butt welder (excluding portable type)	more than 10
Arc welder (excluding portable type)	more than 10
Rectifier	more than 10,000

(7) Target efficiencies of high efficiency motors

① Totally enclosed types (0.2 – 160 kW)

Output (kW)	Efficiency Values (%)					
	2-poles		4-poles		6-poles	
	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
	200V or 400V	220V or 440V	200V or 400V	220V or 440V	200V or 400V	220V or 440V
0.2	70.0	71.0	72.0	74.0	–	–
0.4	76.0	77.0	76.0	78.0	73.0	76.0
0.8	77.5	78.5	80.5	82.5	78.5	80.0
1.5	83.0	84.0	82.5	84.0	83.0	84.5
2.2	84.5	85.5	85.5	87.0	84.5	86.0
3.7	87.0	87.5	86.0	87.5	86.0	87.0
5.5	88.0	88.5	88.5	89.5	88.0	89.0
7.5	88.5	89.0	88.5	89.5	88.5	89.5
11.0	90.0	90.2	90.2	91.0	89.5	90.2
15.0	90.0	90.2	90.6	91.0	89.5	90.2
18.5	90.6	91.0	91.7	92.4	91.0	91.7
22.0	91.0	91.0	91.7	92.4	91.0	91.7
30.0	91.4	91.7	92.4	93.0	91.7	92.4
37.0	92.1	92.4	92.4	93.0	91.7	92.4
45.0	92.4	92.7	92.7	93.0	92.4	93.0
55.0	92.7	93.0	93.3	93.6	93.3	93.6
75.0	93.6	93.6	94.1	94.5	93.6	94.1
90.0	94.3	94.5	94.1	94.5	93.9	94.1
110.0	94.3	94.5	94.1	94.5	94.5	95.0
132.0	94.8	95.0	94.5	95.0	94.5	95.0
160.0	94.8	95.0	94.8	95.0	94.5	95.0

② Protected type (0.75 – 160 kW)

Output (kW)	Efficiency Values (%)					
	2-poles		4-poles		6-poles	
	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
	200V or 400V	220V or 440V	200V or 400V	220V or 440V	200V or 400V	220V or 440V
0.75	77.5	78.5	80.0	82.0	78.0	80.0
1.5	83.0	84.0	82.0	84.0	82.0	84.0
2.2	83.0	84.0	85.0	86.5	84.0	85.5
3.7	85.0	85.5	86.0	87.5	85.5	87.0
5.5	87.0	87.5	87.5	88.5	87.0	88.5
7.5	88.0	88.5	88.5	89.5	88.0	89.0
11.0	89.0	89.5	90.0	90.6	89.0	90.0
15.0	89.5	90.2	90.2	91.0	89.5	90.6
18.5	90.6	91.0	90.6	91.4	90.6	91.4
22.0	90.6	91.0	91.4	92.1	91.0	91.7
30.0	91.0	91.4	91.7	92.1	91.4	92.1
37.0	91.4	91.7	92.1	92.4	91.7	92.4
45.0	91.7	92.1	92.1	92.7	92.1	92.7
55.0	92.1	92.4	92.4	93.0	92.4	93.0
75.0	92.4	92.7	92.7	93.3	92.4	93.0
90.0	92.7	93.0	93.0	93.6	92.7	93.3
110.0	93.0	93.3	93.3	93.6	93.0	93.6
132.0	93.3	93.6	93.3	93.9	93.3	93.9
160.0	93.9	94.1	93.6	94.5	93.6	94.1

Note : Efficiency values shall be measured according to the procedures set forth in Section 7.3 - “Efficiency Test” of JIS C 4212 titled “High-efficiency, Low Voltage Three-phase Squirrel Cage Induction Motors,” by applying the tolerance values provided in its Section 4.2 - “Applicable Tolerances.”

(8) Benchmark index and medium- and long-term target level

Classification	Business Field	Benchmark Index	Level to Target
1A	**Iron manufacturing using blast furnaces** (business to manufacture pig iron using blast furnaces to manufacture products)	The value obtained by A/B A : Energy consumption in the blast furnaces for steel business B : Amount of raw steel	0.531 kL/t or less
1B	**Common steel manufacturing using electrical furnaces** (business to manufacture pig iron using electrical furnaces to manufacture rolled steel products, excluding iron manufacturing using blast furnaces)	Sum of (1) and (2) (1) The value obtained by A/B A : Energy consumption in the process to manufacture raw steel using electrical furnaces B : Amount of raw steel (2) The value obtained by A/B A : Energy consumption in the process to manufacture rolled common steel products from billet B : Amount of rolled steel	0.143 kL/t or less
1C	**Special steel manufacturing using electrical furnaces** (business to manufacture pig iron using electrical furnaces to manufacture special steel products (rolled special steel products, hot special steel pipes, cold-drawn special steel pipes, cold-finished special steel products, forged special steel products, casted special steel products), excluding iron manufacturing using blast furnaces)	Sum of (1) and (2) (1) The value obtained by A/B A : Energy consumption in the process to manufacture raw steel using electrical furnaces B : Amount of raw steel (2) The value obtained by A/B A : Energy consumption in the process to manufacture special steel products (rolled special steel products, hot special steel pipes, cold-drawn special steel pipes, cold-finished special steel products, forged special steel products, casted special steel products) from billet B : Amount of shipped (sold) steel	0.36 kL/t or less
2	**Electrical supplier** (industry that supplies electricity determined by 2.1 of Act on the Rational Use of Energy among general electricity industry determined by 2.1.1 of Electricity Utilities Industry Law or wholesale electricity industry determined by 2.1.3 of Electricity Utilities Industry Law)	The value obtained by A/B (thermal efficiency standardized index) A : Thermal efficiency obtained by a performance test of rated output at thermal electric power generation facilities of factories that run this business (excluding low power facilities) B : Designed efficiency of the rated output In the case of plural facilities in the factory, the value is determined by a weigted average method based on the rated output. The value obtained by A/B (thermal electric power generation efficiency) A : Total electrical energy generated by thermal electric power generation facilities of factories that run this business B : Higher calorific value of the fuel that was required to generate the total energy	100.3% or more of thermal efficiency standardized index
3	**Cement manufacturing** (business to manufacture portland cement (JIS R 5210), blast furnace cement (JIS R 5211), silica cement (JIS R 5212), fly-ash cement (JIS R 5213))	Total of (1) to (4) (1) The value obtained by A/B A : Energy consumption in the raw material process B : Production volume in the raw material part (2) The value obtained by A/B A : Energy consumption in the pyroprocess B : Production volume in the pyroprocess part (3) The value obtained by A/B A : Energy consumption in the finishing process B : Production volume in the finishing part (4) The value obtained by A/B A : Energy consumption in the shipping process, etc. B : Shipping volume	3,891 MJ/t or less

Classification	Business Field	Benchmark Index	Level to Target
4A	**Paper manufacturing** (mainly, business to manufacture paper (printing paper (including coated printing paper, lightweight coated printing paper and excluding tissue paper), communication paper, packing paper and newsprint paper) from wood pulp, used paper and other fibers, excluding business to manufacture special paper such as hybrid paper etc. and sanitary paper)	The value obtained by A/B A : Energy consumption in the process to manufacture paper B : Production volume	8,532 MJ/t or less
4B	**Paperboard manufactuirng** (mainly, business to manufacture board paper (linerboard for corrugated board (liner and corrugating medium) and board paper for paper ware (including white paperboard, strawboard, colorboard and chipball) from wood pulp, used paper and other fibers, excluding business to manufacture base paper for building material, insulating paper, base paper for food and other special paper)	The value obtained by A/B A : Energy consumption in the process to manufacture paper board B : Production volume	4,944 MJ/t or less
5	**Oil refining industry** (industry determined by 2.5 of Petroleum Stockpiling Act)	The value obtained by A/B A : Energy consumption in the petroleum refining process B : Total of multiplying (1) by (2) (1) Coefficient recognized as appropriate based on the world average etc. of each plant in the petroleum refining process (2) Oil throughput of each plant in the petroleum refining process	0.876 or less
6A	**Basic petrochemicals manufacturing** (including derivatives produced from an integrated process)	The value obtained by A/B A : Energy consumption in the process to manufacture ethylene B : Production volume of ethylene etc. (Products : ethylene, propylene, butadiene, benzene, etc)	11.9 GJ/t or less
6B	**Soda chemical industry**	Total of (1) and (2) (1) The value obtained by A/B A : Energy consumption in the electrolytic process B : Weight of sodium hydroxide from electrolytic cell (2) The value obtained by A/B A : Heat quantity of steam usage in the concentration process B : Weight of liquid sodium hydroxide	3.45 GJ/t or less

2.2 Standards of Judgment for Buildings on Rational Use of Energy

(Announcement No.3 of Ministry of Economy, Trade and Industry/Ministry of Land, Infrastructure and Transport on 30 January 2009)

This is the outline of the "Standards of Judgment for Construction Clients and Owners of Specified Buildings on the Rational Use of Energy for Buildings". For full-text and details of the scores, please refer to the website by ECCJ. (http://www.asiaeec-col.eccj.or.jp/law/ken1_e.html)

(1) Prevention of heat loss through external walls, windows, etc. of the buildings

(a) Construction clients shall take proper measures to prevent heat loss through the external walls, windows, etc. of buildings, with due consideration given to the following particulars.

i) They shall make the site and floor plans for buildings with due consideration given to the orientation of the external walls, layouts of rooms, and other matters.

ii) They shall use thermal insulating materials for external walls, roofs, floors, windows, and openings.

iii) They shall reduce the solar radiation load by adopting a system capable of properly controlling solar radiation through windows, planting trees, or taking other measures.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph (1)-(a) related to the external walls, windows, etc. of buildings (except for those of the building type described in Column (8) of Table 1 and common in Paragraphs from (1)-(b) to (1)-(e) below) shall be made based on Paragraph (1)-(c). Note that for external walls, windows, etc. of buildings having a total floor area of 5,000 square meters or less, the judgment may be made based on Paragraphs (1)-(c) and (1)-(d). For external walls, windows, etc. of buildings having a total floor area of less than 2,000 square meters, the judgment may be made based on Paragraph (1)-(c) and (1)-(d), and Paragraph (1)-(e).

(c) The value calculated by dividing the annual thermal load of the indoor perimeter zones of a building by the total of the floor areas (unit: m^2) of the indoor perimeter zones shall be equal to or smaller than the value calculated by multiplying the value specified for each cell in Row (a) of Table 1 by the scale correction coefficient. Indoor perimeter zone means an indoor zone of 5 m or less in horizontal distance from the center line of the external wall of each floor excluding the basement, the indoor floor of the top story just beneath the roof, and the indoor floor just above the floors exposed to the outside air.

(d) For external walls, windows, etc. of buildings having a total floor area of 5,000 square meters or less that are important from the viewpoint of energy use, the score, which is calculated by adding the score selected according to the building type and regional classification to the total of the evaluation scores shown in i) to iv) below, shall be 100 or more.

i) "The evaluation score of the site and floor plans of buildings"

The score shall be the total of the scores selected based on the implemented measures for each item.

ii) “The evaluation score of the thermal insulation performance of the external walls and roofs”

The score in a warm or cold district shall be the total of the scores selected based on the implemented measures for each item in the district. The scores in a tropical district shall be 0. When 2 or more measures are taken for one item, the judgment shall be made based on an area-weighted average of the thicknesses of the thermal insulators.

iii) “The evaluation score of the thermal insulation performance of windows”

The score in a warm or cold district shall be selected based on the implemented measures in the district of the building. The score in a tropical district shall be 0.

iv) “The evaluation score of the solar heat shading performance of windows”

The score shall be selected based on the implemented measures in the district of the building.

(e) For external walls, windows, etc. of buildings having a total floor area of less than 2,000 square meters that are important from the viewpoint of energy use, the score, which is calculated by adding the score selected according to the building type and regional classification to the total of the evaluation scores shown in i) and ii) below, shall be 100 or more.

i) “The evaluation score of the thermal insulation performance of the external walls”

The score in a warm or cold district shall be the score selected based on the implemented measures in the district. The evaluation score in a tropical district shall be 0.

ii) “The evaluation scores of both the thermal insulation performance and solar heat shading performance of windows”

The score shall be the total scores selected based on the implemented measures for each item in the district..

(f) Obligations of owners of specified building regarding the maintenance related to prevention of heat loss through external walls, windows, etc. of the buildings

(2) Efficient use of energy by air conditioning equipment

(a) Construction clients shall take proper measures to achieve efficient use of energy by air conditioning equipment, with due consideration given to the following practices.

i) They shall take into consideration the air conditioning load characteristics of rooms and other factors in designing air conditioning systems.

ii) They shall make heat retention plans to minimize energy loss in air ducts, piping, and others.

iii) They shall adopt a proper control system for air conditioning equipment.

iv) They shall adopt a heat source system with high energy efficiency.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph 2-1 related to air conditioning equipment installed in buildings (except for those of the building type described in Column (8) of Table 1 and common in Sections from (2)-(b) to (2)-(e)

shall be made based on Paragraph (2)-(c). Note that the judgment for air conditioning equipment (which is limited to both package air conditioners (limited to the air-cooling type) defined in JIS B8616 (package air conditioners) and gas engine-driven heat pump air conditioners defined in JIS B8627 (gas engine-driven heat pump air conditioners) and common in Paragraphs (2)-(b), (2)-(d) and (2)-(e) installed in buildings having a total floor area of 5,000 square meters or less may be made based on Paragraph (2)-(d), as well as Paragraph (2)-(c). The judgment for air conditioning equipment installed in buildings having a total floor area of less than 2,000 square meters may be made based on Paragraphs (2)-(c), (2)-(d) and (2)-(e).

(c) The value calculated by dividing the annual primary energy consumption by the air conditioning equipment to be installed in buildings to treat the air conditioning load in terms of heat quantity (Joule) by the assumed air conditioning load of the building in the same period shall be equal to or smaller than the value specified in each cell of Row (b) of Table 1.

(d) For the air conditioning equipment installed in buildings having a total floor area of 5,000 square meters or less that is important from the viewpoint of energy use, the score, which is calculated by adding the score according to the building type and regional classification to the total of the evaluation scores in i) to iii) below, shall be 100 or more.

i) "The evaluation score for the reduction in outside air load"
The score shall be the total of the scores selected based on the implemented measures for each item.

ii) "The evaluation score for the installation location of an outdoor unit and the length of the pipe from the outdoor unit to the indoor unit"
The score shall be selected based on the implemented measures.

iii) "The evaluation score for the efficiency of heat source equipment"
The score shall be selected based on the implemented measures.

(e) For the air conditioning equipment installed in buildings having a total floor area of less than 2,000 square meters that is important from the viewpoint of energy use, the score, which is calculated by adding the score selected according to the building type and regional classification to the total of the evaluation scores shown in i) and ii) below, shall be 100 or more.

i) "The evaluation score for the reduction in outside air load"
The score shall be the total of scores selected based on the implemented measures.

ii) "The evaluation scores for the efficiency of heat source equipment"
The score shall be selected based on the implemented measures.

(f) Obligations of owners of specified building regarding the maintenance related to air conditioning equipment.

(3) Efficient use of energy by mechanical ventilation equipment other than air conditioning equipment

(a) Construction clients shall take proper measures to achieve efficient use of energy by mechanical ventilation equipment other than air conditioning equipment, with due consideration given to the following practices.

i) They shall make a plan to minimize energy loss in air ducts and others.

ii) They shall adopt a proper control system for mechanical ventilation equipment other than air conditioning equipment.

ii) They shall introduce mechanical ventilation equipment with high energy efficiency and a proper capacity for the required ventilation volume.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph (3)-(a) related to mechanical ventilation equipment (except for air conditioning equipment and mechanical ventilation equipment with the rated output of 0.2kW or less, and limited to mechanical ventilation equipment of which total rated output is 5.5kW or more. The same applies to Paragraphs from (3)-(b) to (3)-(d)) installed in a building (except for that of the building type described in Column (8) of Table 1 and common in Paragraphs from (3)-(b) to (3)-(d)) shall be made based on Paragraph (3)-(c). Note that the judgment for mechanical ventilation equipment installed in a building having a total floor area of 5,000 square meters or less may be made based on Paragraph (3)-(d), as well as Paragraph (3)-(c).

(c) The value calculated by dividing the annual primary energy consumption for mechanical ventilation equipment installed in a building in terms of heat quantity (Joule) by the annual assumed primary energy consumption for ventilation of the building in the same period in terms of heat quantity shall be equal to or smaller than the value specified in each cell of Raw (c) of Table 1.

(d) For the mechanical ventilation equipment installed in buildings having a total floor area of 5,000 square meters or less that is important from the viewpoint of energy use and installed in non-air conditioned rooms, the score, which is calculated by adding 80 to the total scores selected based on the implemented measures for each item, shall be 100 or more.

(e) Obligations of owners of specified building regarding the maintenance related to mechanical ventilation equipment other than air conditioning equipment

(4) Efficient use of energy by lighting fixtures

(a) Construction clients shall take proper measures to achieve efficient use of energy by lighting fixtures, with due consideration given to the following practices.

i) They shall introduce lighting fixtures with high lighting efficiency.

ii) They shall adopt a proper control system for lighting fixtures.

iii) They shall install lighting fixtures in a manner that facilitates easy maintenance and management.

iv) They shall properly lay out lighting fixtures, set illuminance, and select room shape and interior finishes.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph (4)-(a) related to lighting fixtures (limited to lighting fixtures which are installed indoors mainly for the purpose of providing lighting necessary for work environment, excluding those installed for special purposes, such as evacuation and lifesaving purposes. The same applies from Paragraphs (4)-(b) to (4)-(e) installed in a building shall be made based on Paragraph (4)-(c). Note that the judgment for lighting fixtures installed in a building having a total floor area of 5,000 square meters or less may be made based on Paragraph (4)-(d), as well as Paragraph (4)-(c). The judgment for lighting fixtures installed in buildings having a total floor area of less than 2,000 square meters may be made based on Paragraph (4)-(e), as well as Paragraphs (4)-(c) and (4)-(d).

(c) The value calculated by dividing the annual primary energy consumption for lighting fixtures installed in a building in terms of heat quantity (Joule) by the annual assumed primary energy consumption for lighting of the building in the same period in terms of heat quantity shall be equal to or smaller than the value specified in each cell of Row (d) of Table 1.

(d) For lighting fixtures installed in buildings having a total floor area of 5,000 square meters or less, for each lighting section that is important from the viewpoint of energy use, the score, which is calculated by adding 80 to the total of the evaluation scores listed in i) to iii) below, shall be 100 or more. If there are two or more lighting sections, the score, which is calculated by adding 80 to an area-weighted average of the scores in all the lighting sections, shall be 100 or more.

i) "The evaluation score for the lighting efficiency of lighting fixtures"
The score shall be the total of the scores selected based on the implemented measures for each item.

ii) "The evaluation score for the control method of lighting fixtures"
The score shall be selected based on the implemented measures.

iii) "The evaluation score for the layouts of lighting fixtures, setting of illuminance, and selection of room shape and interior finishes"
The score shall be the total of the scores selected based on the implemented measures for each item.

(e) For lighting fixtures installed in buildings having a total floor area of less than 2,000 square meters, for each lighting section that is important from the viewpoint of energy use, the score, which is calculated by adding 80 to the total of the evaluation scores listed in i) to iii) below, shall be 100 or more. If there are two or more lighting sections, the score, which is calculated by adding 80 to an area-weighted average of the scores of all the lighting sections, shall be 100 or more.

i) "The evaluation score for the lighting efficiency of lighting fixtures"
The score shall be the total of the scores selected based on the implemented measures.

ii) "The evaluation score for the control method of lighting fixtures"

The score shall be selected based on the implemented measures.

iii) "The evaluation score for the layouts of lighting fixtures and setting of illuminance,"

The score shall be selected based on the implemented measures.

(f) Obligations of owners of specified building regarding the maintenance related to lighting fixtures.

(5) Efficient use of energy by hot water supply equipment

(a) Construction clients shall take proper measures to achieve efficient use of energy by hot water supply equipment, with due consideration given to the following practices.

i) They shall consider shorter piping, thermal insulation of piping, etc. in planning proper piping.

ii) They shall adopt a proper control system for hot water supply equipment.

iii) They shall adopt an energy-efficient heat source system.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph (5)-(a) related to hot water supply equipment (limited to the central heat source system having a hot water return pipe. The same applies to Paragraphs from (5)-(b) to (5)-(e) installed in a building shall be made based on Paragraph (5)-(c). Note that the judgment for hot water supply equipment installed in a building having a total floor area of 5,000 square meters or less may be made based on Paragraph (5)-(d), as well as Paragraph (5)-(c). The judgment for hot water supply equipment installed in buildings having a total floor area of less than 2,000 square meters may be made based on Paragraph (5)-(e) as well as Paragraphs (5)-(c) and (5)-(d).

(c) The value calculated by dividing the annual primary energy consumption for hot water supply equipment installed in a building in terms of heat quantity (Joule) by the annual assumed hot water supply load of the building in the same period in terms of heat quantity shall be equal to or smaller than the value specified in Row (e) of Table 1.

(d) For hot water supply equipment installed in buildings having a total floor area of 5,000 square meters or less that is important from the viewpoint of energy use, the score, which is calculated by adding 70 to the total scores of the scores specified in i) to v) below, shall be 100 or more.

i) "The evaluation score for the piping plan"

The score shall be the total of the scores selected based on the implemented measures for each item. (When there are two or more measures taken for one item, the highest score among the corresponding scores shall be used.)

ii) "The evaluation score for the control system of hot water supply equipment"

The score shall be the total of the scores selected based on the implemented measures for each item (When there are two or more measures taken for one item, the highest score among the corresponding scores shall be used.)

iii) "The evaluation score for the efficiency of heat source equipment"

The score shall be selected based on the implemented measures. (When there are two or more measures taken are applicable, the highest score among the corresponding scores

shall be used.)

iv) When solar heat is used as a heat source, the evaluation score to be added shall be obtained by multiplying by 100 the value calculated by dividing the quantity of solar heating (unit: kilojoules/year) by the hot water supply load (unit: kilojoules/year).

v) When supplied water is preheated, the evaluation score to be added shall be obtained by multiplying by 100 the value calculated by dividing the annual average of water temperature raise by preheating (unit: ºC) by a temperature difference between the temperature of hot water used (unit: ºC) and the annual average of supplied water temperature by region (unit: ºC).

(e) For hot water supply equipment installed in a building having a total floor area of less than 2,000 square meters that is important from the viewpoint of energy use, the score, which is calculated by adding 80 to the total of the scores specified in i) to v) below, shall be 100 or more.

i) "The evaluation score for the piping plan"

The score shall be the total of the scores selected based on the implemented measures. (When there are two or more measures for one item, the highest score among the corresponding scores shall be used.)

ii) "The evaluation score for the control system of hot water supply equipment"

The score shall be selected based on the implemented measures.

iii) The evaluation scores shall be 10 when either latent heat recovery water heaters or heat pump water heaters are used.

iv) The evaluation scores shall be 10 when solar heat is used.

v) The evaluation scores shall be 5 when supply water is preheated.

(f) Obligations of owners of specified building regarding the maintenance related to hot water supply equipment.

(6) Efficient use of energy by vertical transportation

(a) Construction clients shall take proper measures to achieve efficient use of energy by vertical transportation, with due consideration given to the following practices.

i) They shall adopt a proper control system for vertical transportation.

ii) They shall adopt a drive system with high energy efficiency.

iii) They shall adopt a proper installation plan for the required transport capacity.

(b) The judgment whether construction clients have taken proper measures for the matters listed in Paragraph (6)-(a) related to elevators (limited to the cases where three or more elevators are installed. The same applies to Paragraphs from (6)-(b) to (6)-(d) among vertical transportation installed in a building (only for that of the building type described in Column (1) and Column (4) of Attached Table 1 and common in Paragraphs from (6)-(b) to (6)-(d) shall be made based on Paragraph (6)-(c). Note that the judgment for elevators among vertical transportation installed in a

building having a total floor area of 5,000 square meters or less may be made based on Paragraph (6)-d), as well as Paragraph (6)-(c).

(c) The value calculated by dividing the annual primary energy consumption for elevators installed in a building in terms of heat quantity (Joule) by the annual assumed primary energy consumption for elevators of the building in the same period in terms of heat quantity shall be equal to or smaller than the value specified in each cell of Row (f) of Table 1.

(d) For the elevators installed in buildings having a total floor area of 5,000 square meters or less that are important from the viewpoint of energy use, the score, which is calculated by adding 80 to the total of evaluation scores for the elevator control, shall be 100 or more.

(e) Obligations of owners of specified building regarding the maintenance related to vertical transportation.

Table 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hotels and others	Hospitals and others	Shops selling goods and others	Offices and others	Schools and others	Restau-rants, and others	Halls and others	Factories and others
(a)	420 470 (in the cold district)	340 370 (in the cold district)	380	300	320	550	550	–
(b)	2.5	2.5	1.7	1.5	1.5	2.2	2.2	–
(c)	1.0	1.0	0.9	1.0	0.8	1.5	1.0	–
(d)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(e)	In the case of $0 < l_x \leq 7$ 1.5 In the case of $7 < l_x \leq 12$ 1.6 In the case of $12 < l_x \leq 17$ 1.7 In the case of $17 < l_x \leq 22$ 1.8 In the case of $22 < l_x$ 1.9							
(f)	1.0	–	–	1.0	–	–	–	–

Note)

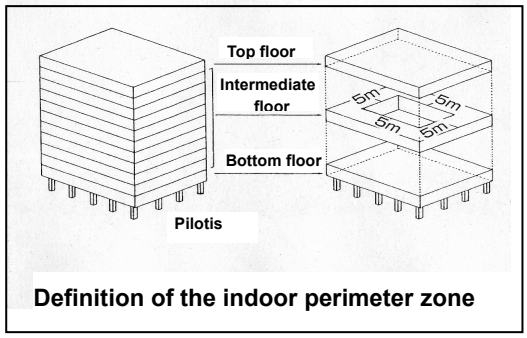
1. "Hotels and others" mean hotels, Japanese-style hotels, and other facilities which are similar from the viewpoint of energy use.
2. "Hospitals and others" mean hospitals, nursing homes, institutions for those with physical disabilities, and other facilities which are similar from the viewpoint of energy use.
3. "Shops selling goods and others" mean department stores, markets, and other facilities which are similar from the viewpoint of energy use.
4. "Offices and others" mean offices, government and other public offices, libraries, museums, and other facilities which are similar from the viewpoint of energy use.
5. "Schools and others" mean elementary, junior high, and senior high schools, universities, technical colleges, advanced vocational schools, professional schools, and other facilities which are similar from the viewpoint of energy use.

6. “Restaurants and others” mean restaurants, buffets, coffee houses, cabarets, and other facilities which are similar from the viewpoint of energy use.
7. “Halls and others” mean auditoriums, halls, bowling alleys, gymnasiums, theaters, cinemas, pachinko parlors, other facilities which are similar from the viewpoint of energy use.
8. “Factories and others” mean factories, livestock barns, garages, bicycle-parking areas, warehouses, pavilions, wholesale markets, crematories, and other facilities which are similar from the viewpoint of energy use.
9. In this table, I_x shall be the value calculated by dividing the sum of the length of the circulation piping for supplying hot water and that of the primary piping (unit: m) by the daily mean of the total amount of hot water consumed (unit: m^3).

【About indicator (a) ~ (f) in Table 1】

・Indicator (a) is called “PAL”.
PAL stands for “Perimeter Annual Load” and is defined as follows:

$$\text{PAL} = \frac{\text{Annual thermal load of the indoor perimeter zones (MJ/year)}}{\text{Floor area of the indoor perimeter zones } (\text{m}^2)}$$



Definition of the indoor perimeter zone

・Indicator (b) ~ (f) is called “CEC/AC”, “CEC/V”, “CEC/L”, “CEC/HW” and “CEC/EV”, respectively.
CEC stands for “Coefficient of Energy Consumption”.

CEC definition for air-conditioning (indicator (b) : CEC/AC) and hot water supply (indicator (e) : CEC/HW):

$$\text{CEC} = \frac{\text{Annual primary energy consumption of the target equipment (MJ/year)}}{\text{Annual assumed load of the relevant use (MJ/year)}}$$

CEC definition for ventilation (indicator (c) : CEC/V), lighting (indicator (d) : CEC/L) and elevator (indicator (f) : CEC/EV):

$$\text{CEC} = \frac{\text{Annual primary energy consumption of the target equipment (MJ/year)}}{\text{Annual assumed primary energy consumption of the target equipment (MJ/year)}}$$

3. INTERNATIONAL COOPERATION

3.1 Outline of Asia Energy Conservation Program

(1) Significance of energy conservation cooperation

Energy conservation cooperation is needed from the point of view of enhancing energy supply-demand structure, solving global environmental problems, promoting international contribution, reducing destabilizing factors in the Asian countries, deepening the business exchange between Japan and Asian countries and so on.

1) Improving energy supply-demand structure

Energy demand has been sharply increasing in Asian countries primarily in China and India due to rapid economic growth, and it causes globally tight market conditions on energy demand and supply and historical high price of crude oil. Accordingly it is an urgent need to deter a sharp increase of demand in Asian countries by promoting energy conservation cooperation with those countries to improve their energy efficiency.

2) Solving global environmental problems

The promotion of energy conservation cooperation will contribute to solving global environmental problems in Asian countries.

3) International contribution

Since most of Asian countries are heavily dependent on imported oil and have a fragile energy supply-demand structure, there is an increasing need for them to promote the energy conservation. So Japan's active commitment to respond to their expectations on energy conservation cooperation is of great significance for improving energy security in Asia.

4) Reduction of destabilizing factors in the Asian economy

Japan has been sustaining profound economic relationships of interdependence with Asian countries. It is important for Japan's economy to prevent destabilization of the whole economy in Asia due to fluctuations in energy price.

5) Deepening the business exchange between Japan and Asian countries

Promoting energy conservation in Asian countries will contribute to business exchange between Japan and Asian countries through future expansion of the demand for energy-efficient appliances and facilities.

(2) Future direction of energy conservation cooperation

In order to promote energy conservation in Asian countries on their own initiative, international cooperation in the energy conservation field will be implemented based on the following ideas:

1) Support for establishing the institutional system in Asian countries

・Implementing the establishment of the institutional system concerning energy conservation

through the strengthening of support for the development of human resources including dispatch of long term experts to Asian countries and reception of trainees in the training course in Japan, etc.

・Supporting for operation and management of energy conservation centers in various countries and regions as well as for appropriate operation of the institutional system concerning energy conservation in Asian countries .

2) Cooperation in the residential/commercial, transportation, and electric power sectors

・In addition to the existing cooperation in the industrial sector, extending the cooperation in the residential/commercial, transportation and power sectors that includes the support for formulating the energy-efficiency standards/labeling system, developing the ESCO system.

3) Support for the business-based diffusion of Japanese-made energy-efficient appliances and facilities into Asian countries

・Supporting the business-based diffusion of energy-efficient appliances and facilities through the Japanese companies' business activities by promoting dialog among industries and business meeting and utilizing policy-based finance and the CDM scheme etc.

4) Collaboration with international organizations, the government and agencies concerned

・Collaborating with international organizations including the IEA and APEC and supporting international NPOs which formulate energy efficiency standards and labeling etc.

・Strengthening coordination between the government and agencies concerned in order to implement effective cooperation.

5) Active utilization of the international framework

・Contributing actively to the operation of the international framework including the sectoral benchmark approach.

(3) Cooperation to individual country in energy conservation field

It is necessary to consider comprehensively the following factors of each country to develop cooperation in energy conservation field strategically:

a) Size for energy demand

b) Importance of a country in the energy policy of Japan

c) Economic relation with Japan

d) Commitment and attitude to the promotion of energy conservation

Bilateral policy dialogs will be held with the Asian countries for cooperation. An action plan will be formulated to promote continued energy conservation cooperation.

Source) Prepared from "Material at the 9th Energy Efficiency and Conservation Subcommittee of the Advisory Committee on Energy and Natural Resources (May 2006)"
http://www.meti.go.jp/committee/materials/downloadfiles/g60607h11j.pdf

<Outline of the Effort for Energy Conservation of Prioritized Countries for Cooperation>

a) China: The most prioritized country for cooperation in energy conservation field

・China is the world's second largest energy consumer with large potential of energy conservation. The share of the industrial and residential/commercial sectors in the consumption is large, but the growth of the consumption is expected in the transportation sector along with the rapid spread of motorization.

・20% reduction of energy intensity was set as the improvement target in the 11th Five-Year Plan. The Energy Conservation Law went into effect in '98 and was revised in '08. Now it is expected that more effective measures will be implemented.

b) India: Strengthening of cooperation in energy conservation field

・India is the world's fourth largest energy consumer with large potential of energy conservation. The share of the industrial sector in the consumption is large, but the growth of the consumption is expected in the transportation sector along with the rapid spread of motorization.

・Since the establishment of the Energy Conservation Law in '01, energy conservation measures have been actively promoted such as the development of related legislations and the strengthening of implementation systems etc.

c) Thailand: Support of the programs for supplementing the operation of the policies and legal system concerning energy conservation in the industrial, and residential/ commercial.

・The energy consumption of Thailand is approximately 20% of that of Japan.

・Thailand has the Energy Conservation Law similar to Japan's one. It is an advanced country in energy conservation in ASEAN including the effective implementation of energy manager system. Also, measures are implemented in residential/commercial sector such as labeling system for residential/commercial equipment, dissemination program of energy-efficient equipment by an Electricity Generating Authority of Thailand, etc.

d) Indonesia: Support for the launch of the legal system concerning energy conservation including support for the structure improvement for promoting energy conservation in the industrial sector

・Indonesia's energy consumption is approximately 30% of that of Japan. It has already become a net-importer of oil with the growth in energy consumption.

・ Awareness on energy conservation has increased in response to the high price of crude oil and the reduction of subsidy for energy price, and Government Regulation on Energy Conservation was established in December 2009.

e) Vietnam: Support for formulation and enforcement of the energy conservation law

・Vietnam's energy consumption is approximately 10% of that of Japan.

・The Energy Conservation Law similar to Japan's one is scheduled to go into effect in January 2011. However, the development of related legislations and implementation

systems to implement the law is still needed. Also, the fact that low price of energy does not provide an incentive for energy conservation is an issue.

Source) Survey by the Energy Conservation Center, Japan

3.2 East Asia Summit (EAS)

(1) Overview

While discussion on the future establishment of an East Asian community (EAc) was emerged, the report of the East Asia Vision Group (EAVG) was submitted to the 2001 ASEAN + 3 Summit Meeting by a group of experts in the private sector. The report referred to the evolution of the ASEAN + 3 Summit Meeting into an EAS as a means of realizing the EAc.
At the ASEAN + 3 Summit Meeting held in November 2004, it was officially decided that a first EAS would be held in December 2005 in Kuala Lumpur.

The ASEAN side decided on three conditions for participation in the first EAS as follows: The country should (1) be a Treaty of Amity and Cooperation in Southeast Asia (TAC) member or have the will to become a member, (2) be a complete ASEAN Dialogue Partner, and (3) have substantive relations with ASEAN.

At the ASEAN + 3 Ministerial Meeting held in Laos at the end of July 2005 , it was formally decided that Australia, India and New Zealand, which do not belong to ASEAN + 3, would take part in the EAS.
Then the participant countries are now 16 as follows:
ASEAN 10 countries, Japan, China, South Korea, Australia, New Zealand, India

(2) Past achievement (energy, environment etc. related issues only)

1) First EAS (Kuala Lumpur (Malaysia), 14 Dec. 2005)

- The leaders of the participating countries discussed the future directions of East Asia and, in that context, how the region should further develop regional cooperation in East Asia, from both broad and strategic perspectives.
- Release of the Kuala Lumpur Declaration (the major points as follows):

a. The EAS could play a "significant role" in community building in this region;
b. The EAS will be an open, inclusive, and transparent forum;
c. The participating countries of the EAS will strive to strengthen global norms and universally recognized values;
d. The EAS will focus on a wide range of areas, notably, political, security, economic, social and cultural issues;
e. The EAS will be convened annually (this point is provided in the EAS Chairman's Statement). The EAS will be hosted and chaired by an ASEAN member country and held back-to-back with the annual ASEAN Summit.

2) Second EAS (Cebu (Malaysia), 14 Dec. 2005)

・Session on Energy

As a priority area for the second East Asia Summit, a special session on energy was convened to achieve shared goal of ensuring affordable energy sources for development in the region. The leaders of the participating countries agreed that discussions should take into consideration : energy security, renewable and alternative energy sources, energy efficiency and conservation, climate change.

Then the participating countries adopted "Cebu Declaration on East Asian Energy Security", which aims to establish goals and action plans on energy efficiency and conservation, to promote the use of biofuels, etc.

In the session, Prime Minister Shinzo Abe announced the four-pillar initiative entitled "Fueling Asia - Japan's Cooperation Initiative for Clean Energy and Sustainable Growth." consisting of the followings:

a. Promotion of energy efficiency and conservation (receive 1,000 trainees and dispatch 500 experts in 5 years, establish "Asia Energy Efficiency and Conservation Collaboration Center" etc.)

b. Promotion of biomass energy (receive 500 trainees in 5 years etc.)

c. Clean use of coal (establish "Coal Liquefaction Assistance Center" etc.)"

d. Eradication of energy poverty (provide energy-related ODA of approximately USD 2.0 billion over the next 3 years)",

and the leaders of the participating countries welcomed the initiative.

3) Third EAS (Singapore, 21 Nov. 2007)

・Session on Energy, Environment, Climate Change and Sustainable Development

Prime Minister Takeo Fukuda gave a clear message that global environmental issues must be addressed urgently, especially on climate change issues, a practical framework after 2013 joined by all major countries should be established for COP 13 held in Bali in December. He announced that Japan could be in a leadership position to address environmental issues by taking advantage of experience of overcoming pollution and possession of leading-edge technology in the environmental energy field. Based on this point, he said that Japan would like to strive for the realization of a sustainable society in East Asia with the other participating countries and announced Japan's environmental cooperation initiative: "Building a low carbon and sound material-cycle society", "Conservation of rich and diverse nature", and "Developing an intellectual infrastructure for environmental conservation towards the future".

4) Fourth EAS (Cha-am Hua Hin (Thailand), 25 Oct. 2009)

・Environment, Climate Change

The leaders of the participant countries expressed their commitment to continue to contribute actively in bringing about a successful outcome of the Copenhagen Conference (COP15) and shared the view that it is important to work closely to ensure that such outcome should incorporate long-term cooperative actions to address climate change in accordance with the principles and provisions of the UNFCCC and the Bali Action Plan, taking into account the principles of "Common but Differentiated Responsibilities and Respective Capabilities", and

the specific national circumstances of the participating countries.

Source) http://www.mofa.go.jp/region/asia-paci/eas/index.html
http://www.mofa.go.jp/mofaj/area/eas/index.html

3.3 International Partnership for Energy Efficiency Cooperation (IPEEC)

(1) Purpose and overview

IPEEC (International Partnership for Energy Efficiency Cooperation), which aims for promoting voluntary efforts of participating countries to improve energy conservation such as sharing advanced practices and exchanging information related to energy conservation measures and technologies, was officially launched at the G8 energy ministers' meeting held in Rome in May 2009 since major economies (China, Korea, Brazil and Mexico) signed its organization requirement as well as G8 countries. Also, India and EU officially signed to join at the first executive meeting held in September 2009 and the second executive meeting held in January 2010, respectively.

(2) Activities

The following activities are expected to be undertaken:

- Development of energy efficiency indicators, collection of best practice and enhance data collection.
- Exchange information on sectoral and cross-sectoral approach to improve energy conservation
- Development of public-private partnerships in the major energy consumption sector
- Joint research and development of major energy-saving technology
- Promoting the diffusion of energy saving products and services
- Efforts to be determined by individual participating countries

This partnership is intended to provide a forum for discussion and information sharing. This declaration is not an international treaty and without restriction by law.

In addition to the Japan-led ”Energy Management Action Network (EMAK) (refer to (3) below)”, there are key projects such as “Sustainable Building Network : SBN, led by Germany”, “Worldwide Energy Efficiency Action through Capacity Building and Training : WEACT, led by Italy”, “Assessment of Energy Efficiency Finance Mechanisms, led by India”, “Improving Policies through Energy Efficiency Indicators, led by France”, and “Super-efficient Equipment and Appliance Deployment, led by USA”.

(3) Energy Management Action Network (EMAK)

Energy Management Action Network (EMAK) is a Japan-led project which Japan proposed as one of the tasks under IPEEC in order to promote cooperation on energy conservation. The task of EMAK is to create a robust forum to promote energy management practices in industry by utilizing a network of different actors. EMAK interconnects policy makers and industry practitioners in charge of energy management, who are the two different major actors. Networking these key actors

serves as a platform which enables them to share the best practices on policy frameworks, human resource development, as well as the state-of-art energy management systems and practices including energy management system.

The first workshop was held in Paris in January 2010. The purposes of this workshop were to share energy management practices and to discuss the design of effective and useful concept of EMAK. Then in the second workshop held in Washington, D.C. in May 2010, the presentations provided insights into the energy management institutions and regulatory systems of various countries, and provided a learning experience for all participants. Also, the sessions included one focused solely on how the introduction of ISO50001 can facilitate energy management in a company and support the achievement of the goal of EMAK.

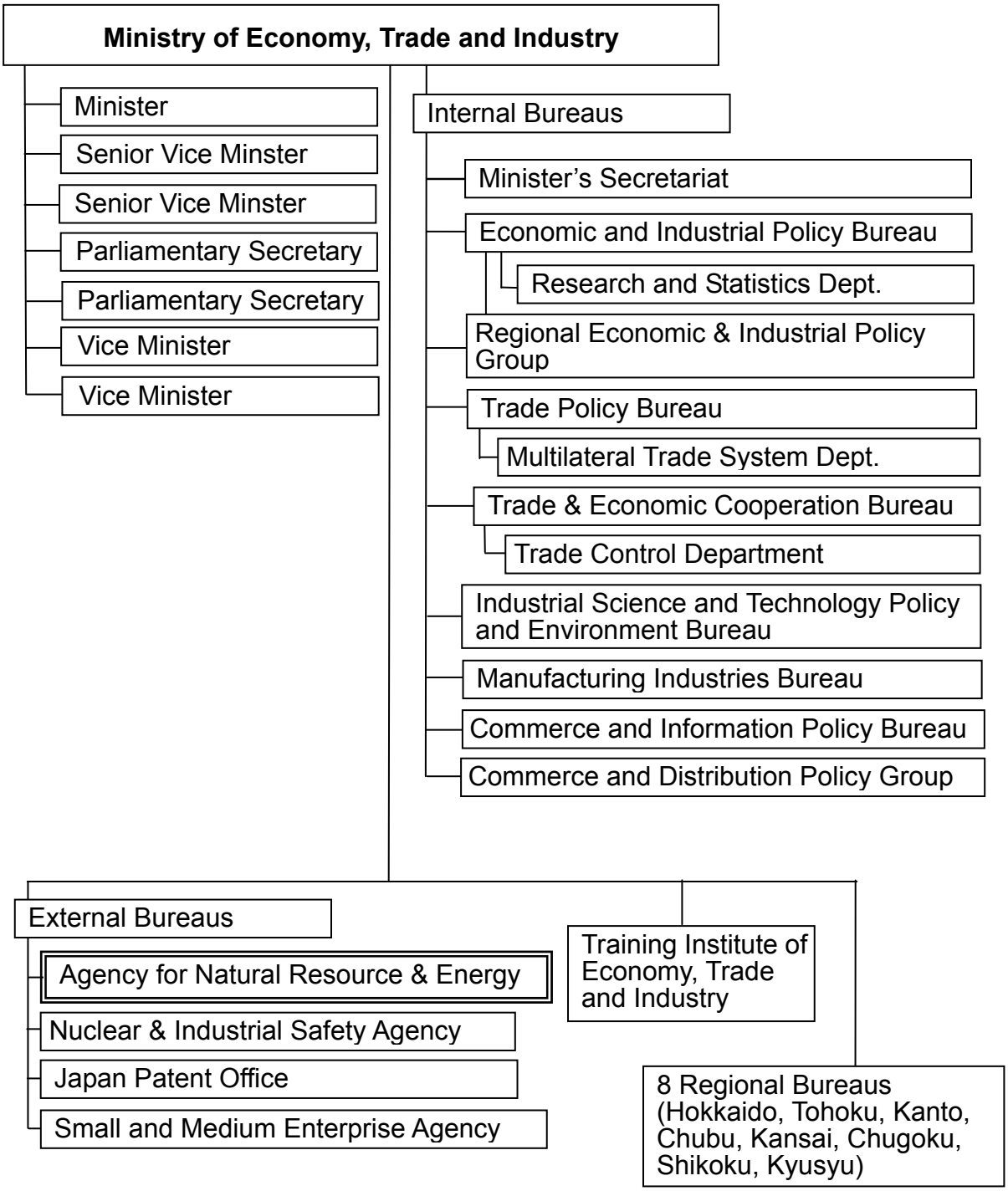
Source) http://www.enecho.meti.go.jp/topics/090529.htm
http://ipeecshare.org/
http://www.nedo.go.jp/kankobutsu/report/1064/1064-4.pdf
http://sites.google.com/site/emakbiz/

REFERENCE

1. RELATED ORGANIZATIONS

1.1 Ministry of Economy, Trade and Industry (METI)

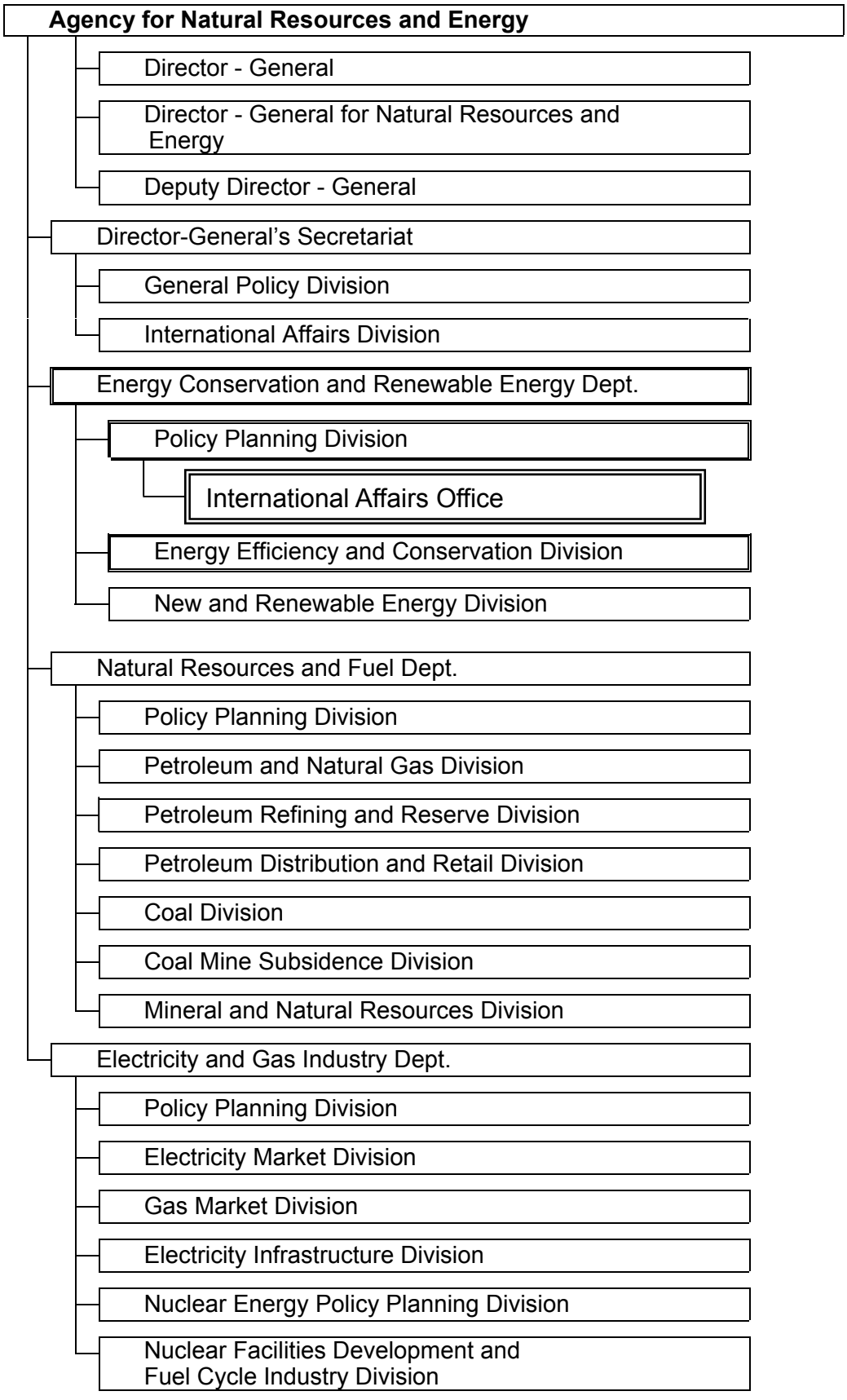
(1) Organization of METI (as of September 1, 2009)



METI Website : http://www.meti.go.jp/english/index.html

(2) Organization of Agency for Natural Resources and Energy (ANRE)

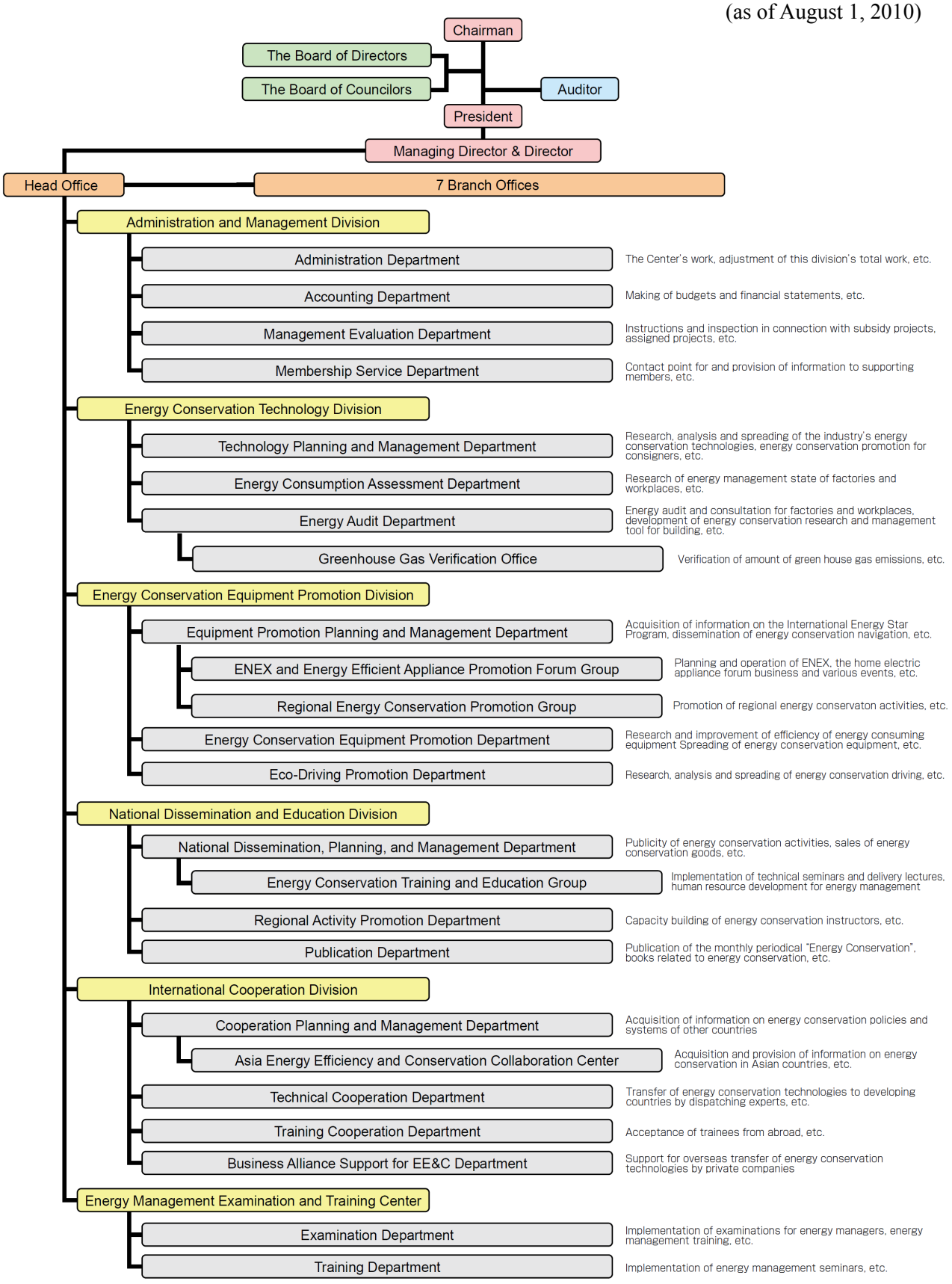
(as of September 1, 2009)



ANRE Website : http://www.enecho.meti.go.jp/english/index.htm

1.2 The Energy Conservation Center, Japan (ECCJ)

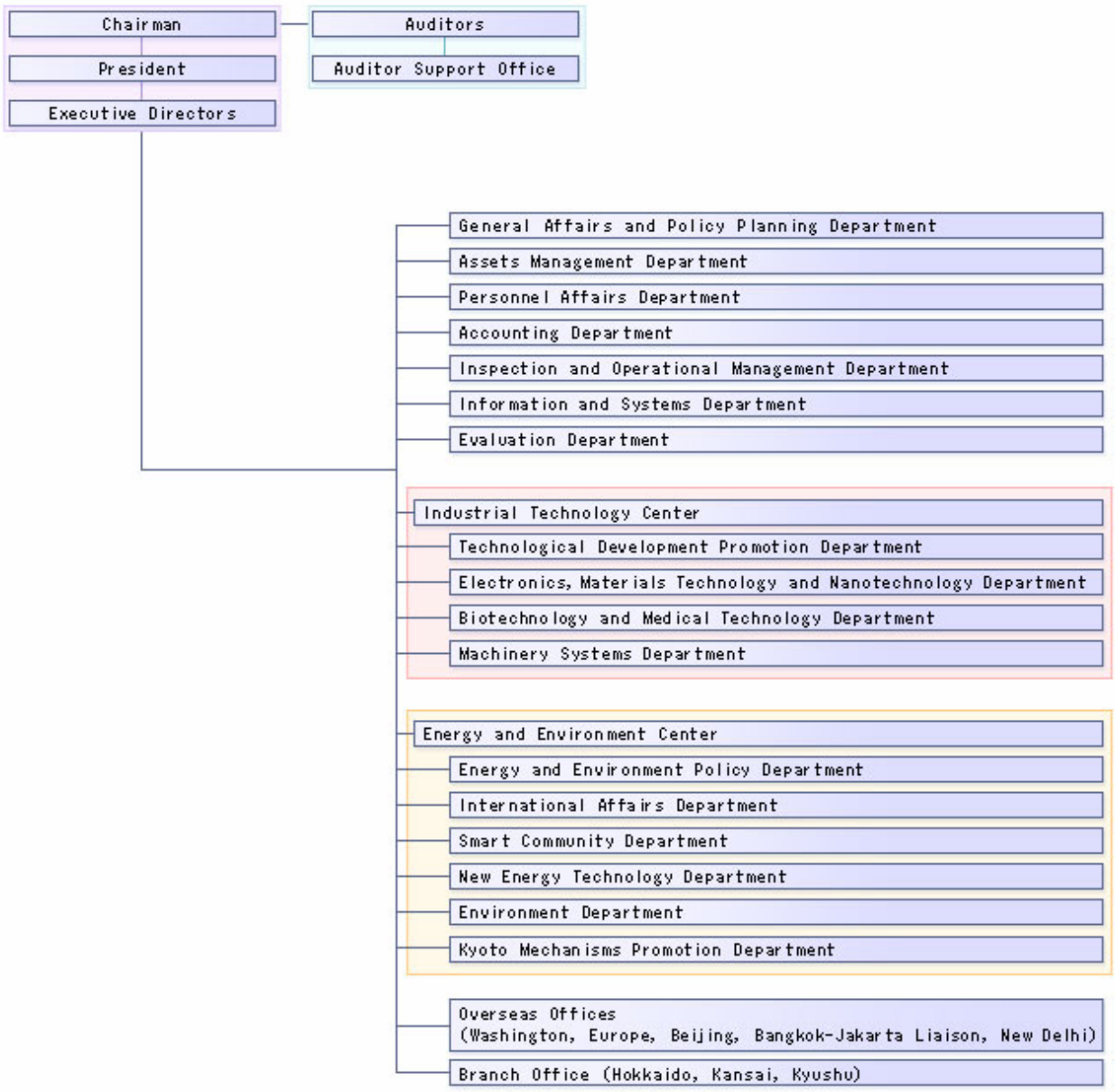
(as of August 1, 2010)



ECCJ/AEEC Website : http://www.asiaeec-col.eccj.or.jp/index.html

1.3 The New Energy and Industrial Technology Development Organization (NEDO)

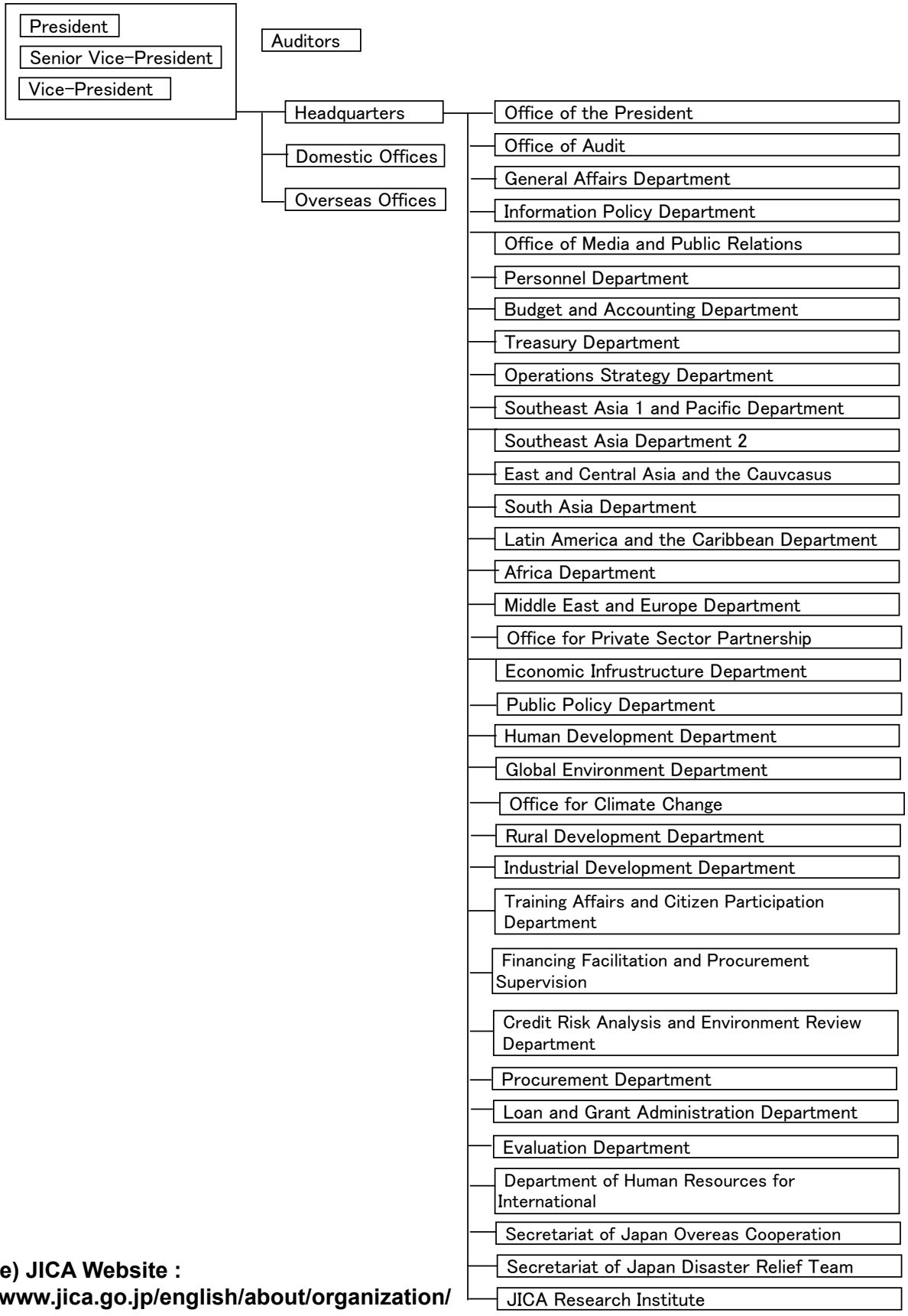
(as of July 1, 2010)



Source) NEDO Website :
http://www.nedo.go.jp/english/introducing/organization.html

1.4 Japan International Cooperation Agency (JICA)

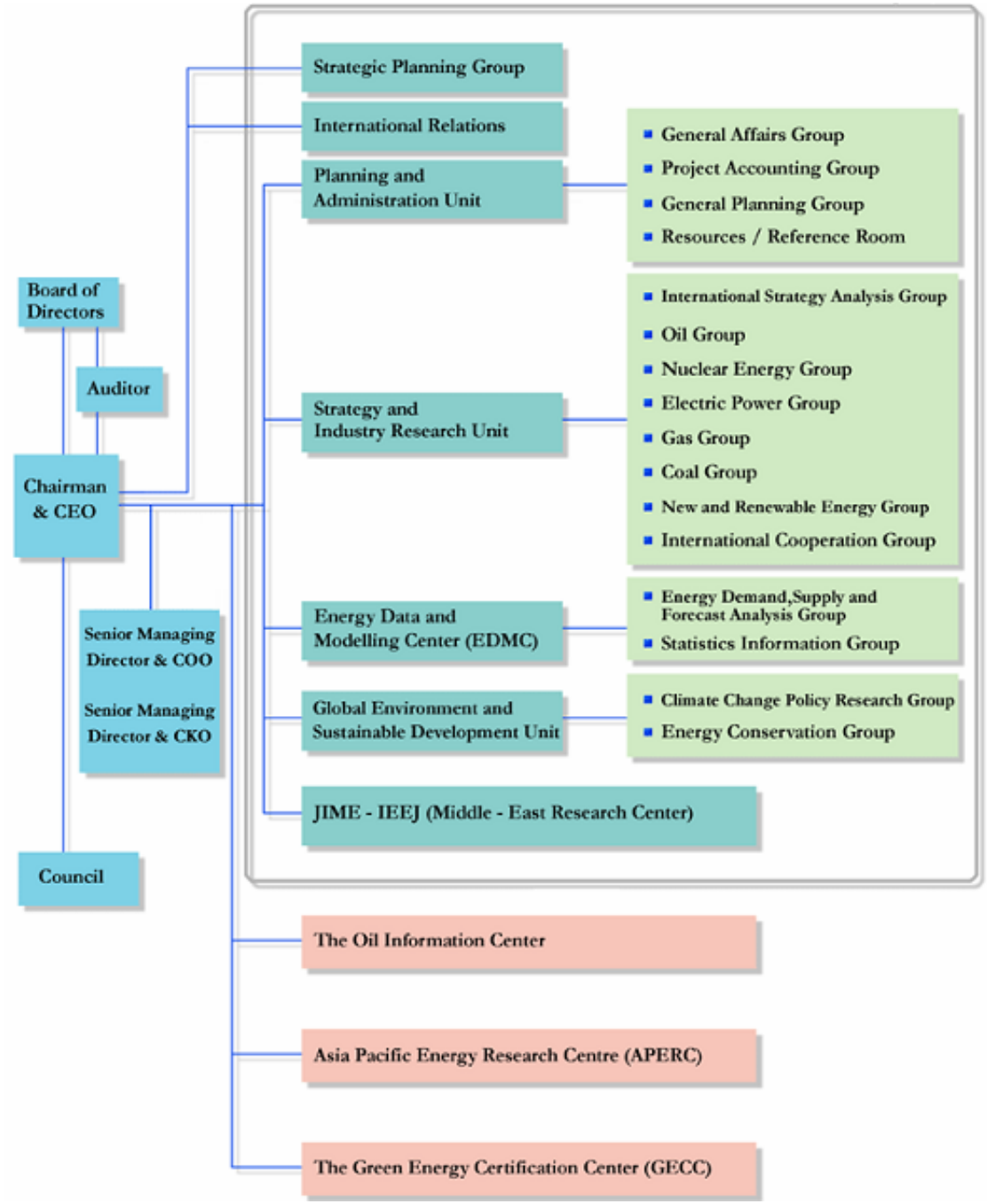
(as of October 1, 2009)



Source) JICA Website :
http://www.jica.go.jp/english/about/organization/

1.5 The Institute of Energy Economics, Japan (IEEJ)

(as of April 1, 2010)



Source) IEEJ Website :
http://eneken.ieej.or.jp/en/about/organization.html

2. ENERGY CALORIES (JAPAN)

Energy	Unit	Average Calorie (kcal)		Energy	Unit	Average Calorie (kcal)	
<Coal>				Kerosene	L	1953-99	8,900
Coking Coal (Domestic)	kg	1953-55	7,400			2000-	8,767
		1956-60	7,500	Gas Oil	L	1953-99	9,200
		1961-65	7,600			2000-04	9,126
		1966-	7,700			2005-	9,006
Coking Coal (Import)	kg	1953-99	7,600	Fuel Oil A	L	1953-99	9,300
		2000-04	6,904			2000-	9,341
		2005-	6,928	Fuel Oil B	L	1953-99	9,600
Steam Coal (Domestic)	kg	1953-65	5,900			2000-	9,651
		1966-70	5,800	Fuel Oil C	L	1953-99	9,800
		1971-80	5,600			2000-04	9,962
		1981-99	5,800			2005-	10,009
		2000-	5,375	Lubricants	L	1953-99	9,600
Steam Coal (Import)	kg	1953-99	6,200			2000-	9,603
		2000-04	6,354	Other Petroleum	kg	1953-99	10,100
		2005-	6,139			2000-04	10,105
Hard Coal (Domestic)	kg	1953-65	5,700			2005-	9,771
		1966-70	5,600	Refinery Gas	m^3	1953-99	9,400
		1971-75	6,100			2000-	10,726
		1976-	4,300	Petroleum Coke	kg	1953-99	8,500
Hard Coal (Import)	kg	1953-99	6,500			2000-04	8,504
		2000-04	6,498			2005-	7,143
		2005-	6,426	LPG	kg	1953-99	12,000
Brown Coal	kg	1953-99	4,100			2000-04	11,992
		2000-	4,109			2005-	12,136
Coke	kg	1953-99	7,200	Natural Gas	m^3	1953-99	9,800
		2000-04	7,191	Natural Gas (Domestic)	m^3	2000-04	9,771
		2005-	7,023			2005-	10,392
Coke Oven Gas	m^3	1953-99	4,800	LNG	kg	1953-99	13,000
		2000-	5,041	Natural Gas (Import)	kg	2000-04	13,019
Blast Furnace Gas	m^3	1953-99	800			2005-	13,043
		2000-	815	Coal Field Gas	m^3		8,600
Converter Gas	m^3	1953-99	2,000	Town Gas	m^3	1953-99	10,000
		2000-	2,009			2000-04	9,818
Patent Fuel	kg	1953-99	5,700			2005-	10,702
		2000-	5,709	Electricity	kWh	( ) is thermal efficiency	
<Oil>				(20.7%)		1953	4,150
Crude Oil	L	1953-55	9,300	(22.2%)		1954	3,850
		1956-60	9,350	(24.0%)		1955	3,600
		1961-70	9,400	(25.8%)		1956	3,350
		1971-80	9,300	(26.8%)		1957	3,200
		1981-99	9,250	(28.6%)		1958	3,000
		2000-	9,126	(31.1%)		1959	2,750
NGL	L	1953-99	8,100	(31.9%)		1960	2,700
		2000-	8,433	(32.7%)		1961	2,650
Gasoline	L	1953-99	8,400	(33.9%)		1962	2,550
		2000-	8,266	(36.0%)		1963	2,400
Naphtha	L	1953-99	8,000	(36.5%)		1964	2,350
		2000-04	8,146	(36.9%)		1965	2,350
		2005-	8,027	(37.4%)		1966-70	2,300
Jet Fuel	L	1953-99	8,700	(38.1%)		1971-99	2,250
		2000-	8,767	(39.98%)		2000-04	2,150
				(40.88%)		2005-	2,105

Source) Prepared from “EDMC Handbook of Energy and Economic Statistics in JAPAN (2010)”