Japan
Energy Conservation Handbook
2008

The Energy Conservation Center, Japan

CONTENTS

APPENDIX

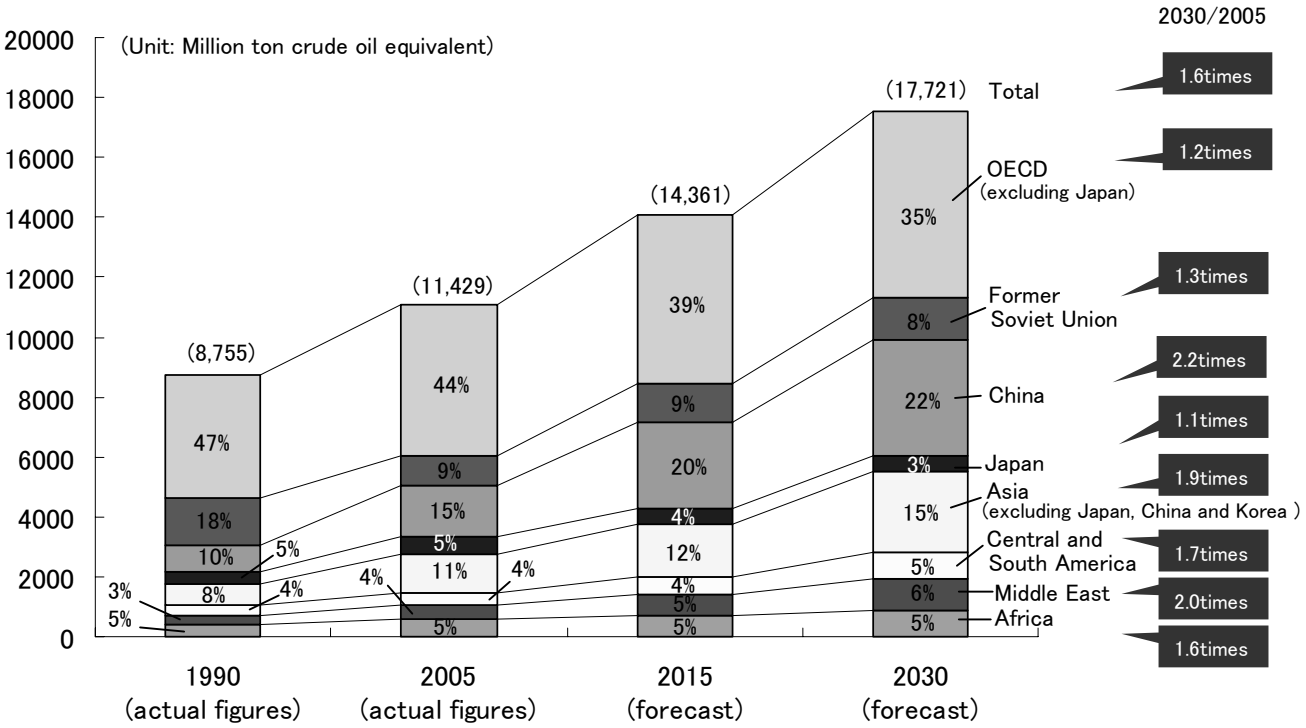
REFERENCE

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 and other Asian countries excluding China are expected to largely increase. For further world energy data, refer to the Appendix 1.1.

Increase of world energy demand centering on China and the rest of Asia

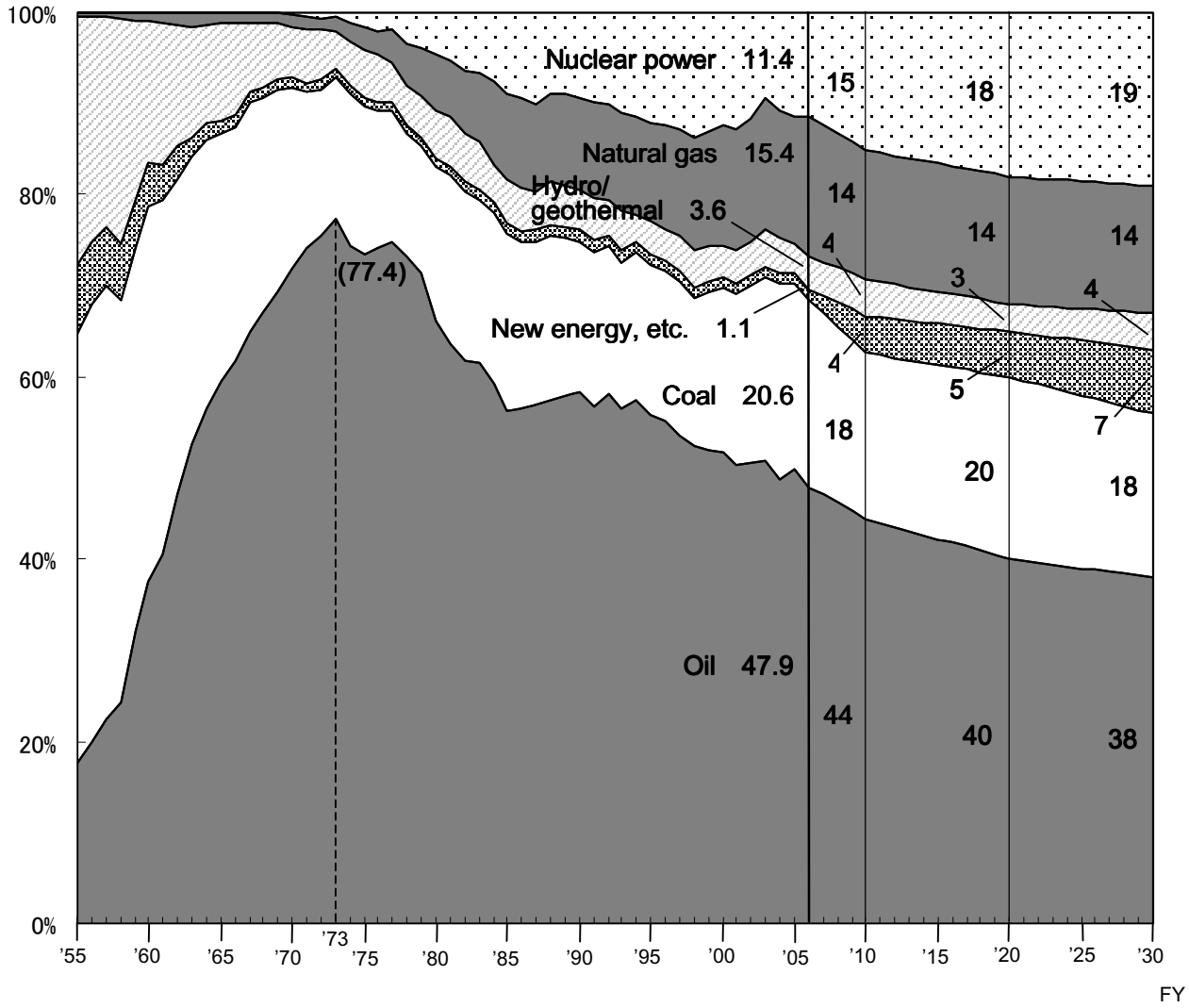


Source) Prepared from “World Energy Outlook 2007 (IEA)”

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 48 %). As shown in the next page, Japan’s energy consumption has been steadily expanded especially in commercial/residential and transportation sectors since the 1970’s oil crises period, largely due to convenience-thriving and energy-needing lifestyles. Refer to the Appendixes 1.2 and 1.3 for the Japan’s energy consumption trend.

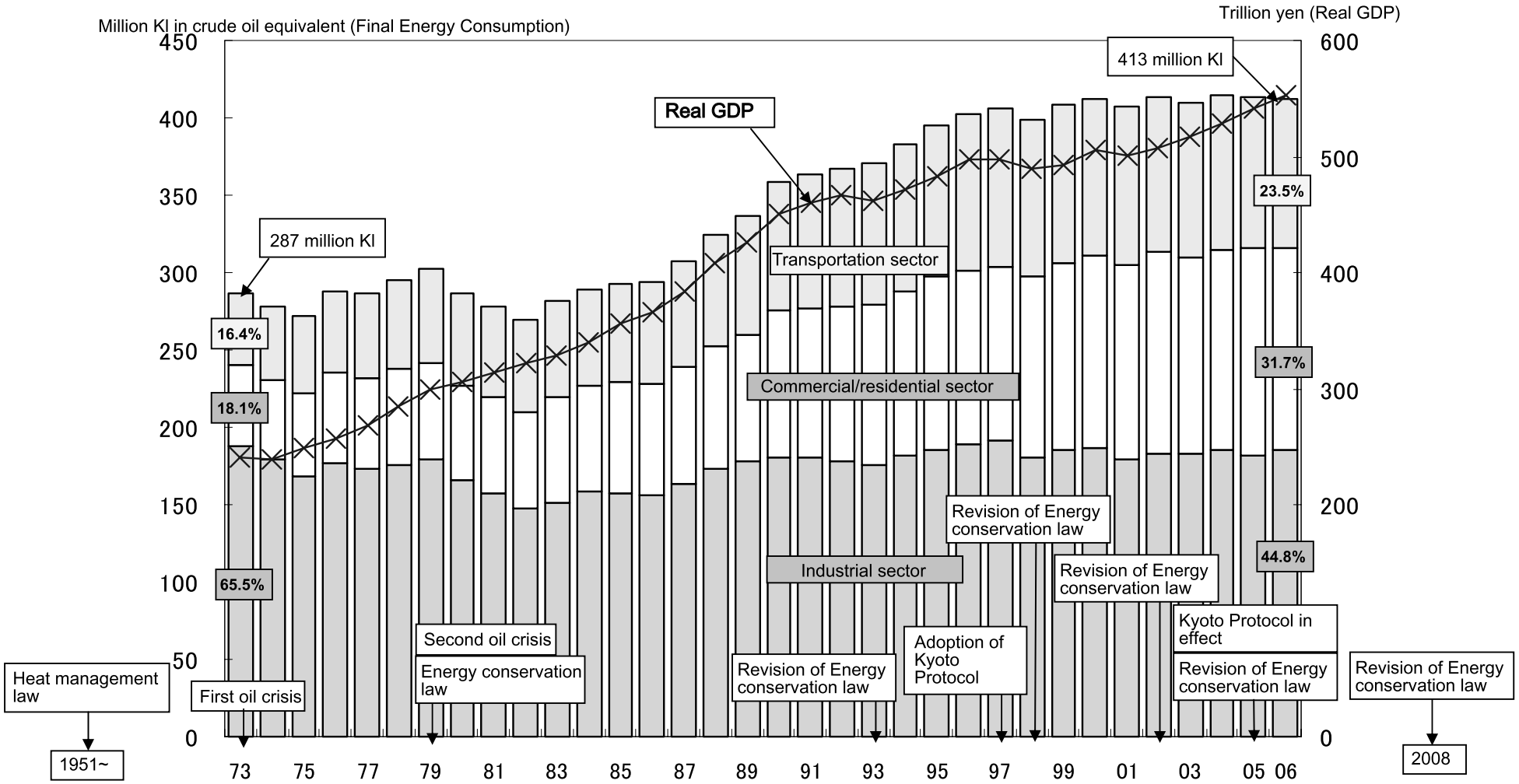
Transition of energy mix in Japan's primary energy supply (1955-2030)



Note) The estimated figures of FY 2010 are based on the long-term energy supply and demand outlook published by the Advisory Committee on Energy and Natural Resource in March 2005. Also the estimated figures of FY 2020 and 2030 are based on the above outlook published in March 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 (2008)"

Transition of Japan's Final Energy Consumption and Real GDP



Note) Note that, due to revision of the aggregation method in "Comprehensive Energy Statistics", 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 (2008)"

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 48%, 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 consists of 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 will urge the industrial, the commercial and residential and the transportation sectors to promote further energy conservation, even though considerable efforts have already been taken since the oil crisis. If these measures are put into place, an aggregate of 56 million kL energy is estimated to be saved in 2010, almost equivalent to the annual energy consumption in all households in Japan. This indicates the goal of the energy conservation measures presents itself highly ambitious one. However, based on 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 3.6 (3)).

(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 and tax reduction measures have been established (low interest loans by the Japan Development Bank and Smaller Business Finance Corporation and a tax system for promoting investment to reform energy supply and demand structure) by the Energy Conservation Assistance Law.

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 such as evaluation criteria, operation standards, etc.

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

(c) Commercial and residential sector: Guidelines 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.

(3) Promotion of international energy conservation measures

Under the government policy and support, ECCJ conducts various training programs targeting developing countries mainly in Asia to promote energy efficiency and conservation as well as to enhance Japan’s stable energy supply. Programs include lectures; practical trainings at trial plants; factory tours, etc., aiming at transferring Japan’s experiences and information including energy conservation policies, energy management activities and status, technologies regarded highly efficient, etc.), which could serve as useful reference for their planning/implementation/diffusion of energy efficiency and conservation.

1) For bilateral cooperation
- Dispatch of experts
- Acceptance of trainees

2) For multilateral cooperation
- Exchange information and opinions through international organizations, such as IEA and APEC
- Establishment of international cooperation through Asia Energy Efficiency and Conservation Collaboration Center

2.2 The Basic Energy Plan

The Agency for Natural Resources and Energy (ANRE) submitted the Basic Energy Plan to the Diet in October, 2003. This plan defines the next 10-year direction of measures on the demand and supply based on the three principles set in the Fundamental Law on Energy Policy Measures. The three principles are as follows:

(1) Energy security

To deal with the future growth of energy demand in the Asian region and Japan's high oil dependency on the Middle East countries, the following measures should be promoted: (i) Energy conservation, (ii) Diversifying imported energy resources and strengthening the relationship with major oil exporting nations, (iii) Diversifying energy resources, such as developing domestically produced fuels, (iv) Securing the oil and LP gas reserves.

The supply-demand problem of electricity in the Kanto area should be considered, and reliability and stability of domestic supply should be secured. Securing energy is a prerequisite for the stable energy supply. The government and business owners should make full efforts to secure the stable supply.

(2) Adaptability to the environment

In addition to reducing the emissions of NO_x and SO_x, the following measures will be promoted to combat global warming: (i) Energy conservation, (ii) Use of non-fossil energy and switch to gas energy and (iii) Development and introduction of clean fossil fuel systems and energy efficiency technology.

(3) Utilization of market mechanism

Promote the institutional reforms and design plans to utilize market principles in the framework that meets Japan's real situations, considering "Securing the stable supply of energy" and "Environmental sustainability"

Source) Energy White Paper 2004 issued by Ministry of Economy, Trade and Industry

2.3 Japan's Recent National Strategies and Activities

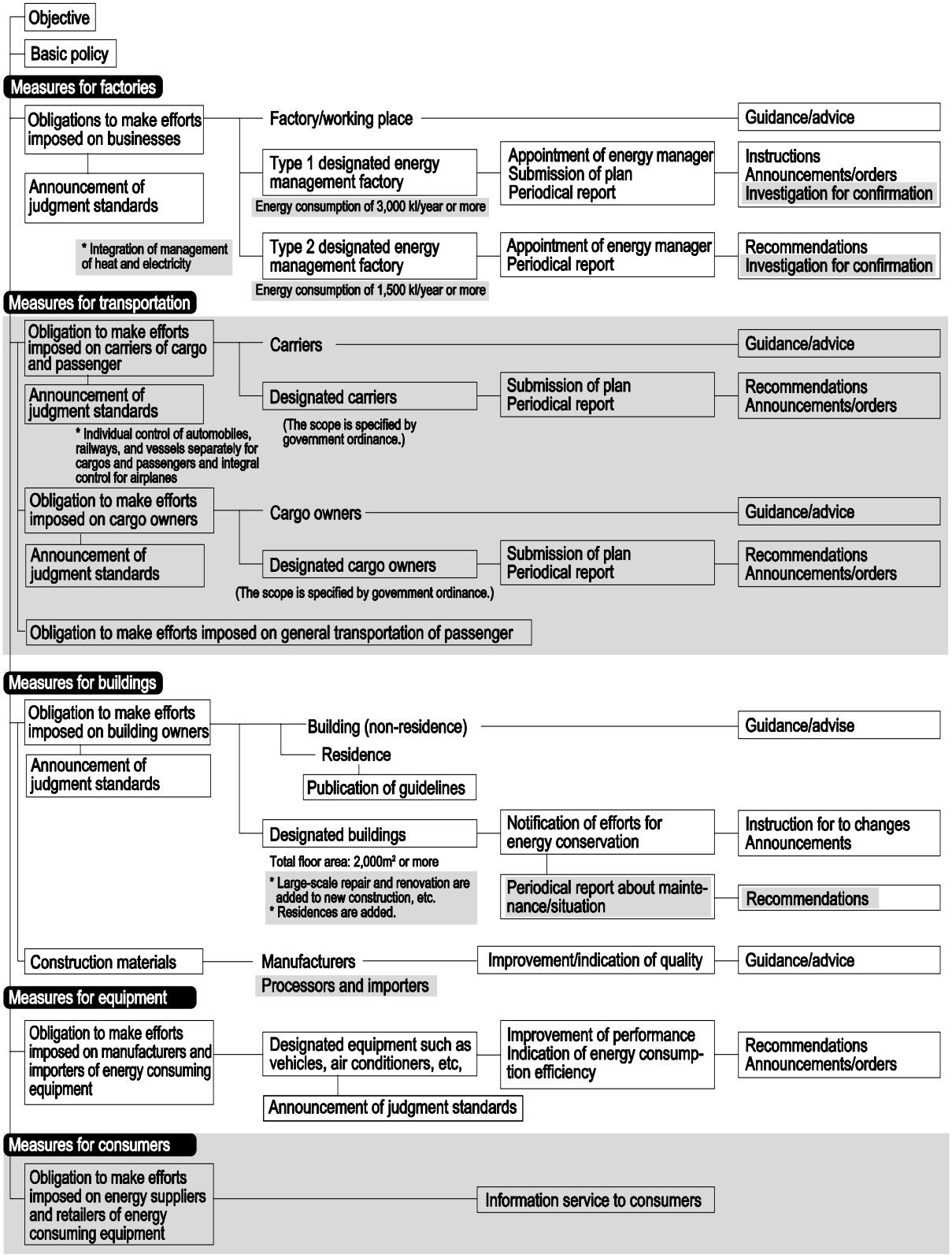
Responding to the stringent global energy situation such as an oil price rise, the "new national energy strategy" was studied in consideration with energy security and officially announced on May 31, 2006. The "energy conservation technology strategy" was established and declared in the "energy conservation frontrunner plan" under the "new national energy strategy" in order to improve the energy consumption by at least 30% by the year 2030. This improvement will be achieved by establishing a virtuous circle of technological innovation and reform of the social system. For the details, refer to the Appendixes 2.1 and 2.2.

In order to cope with a weakening of the energy supply-demand structure caused by a sharp increase in energy demand in Asian countries, the "Asia energy conservation promotion program" was presented as an effort of international cooperation to voluntarily promote energy conservation in Asian countries. Refer to the Appendix 2.3 for further detail of Japan's international cooperation.

2.4 Law concerning the Rational Use of Energy

Structure of the law

Enforced on 1st Oct. 1979, revised on 10th August 2005 (is the revised part)



*The contents of the revised version which will be enforced in April 2009 are not included.

Refer to page 17 for the outline of this revised version.

(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) shall establish and announce fundamental policies aiming at comprehensive promotion of the rational energy utilization in respective fields. The main energy users in each field shall 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

Japan's final energy consumption in the industrial and civil business sectors accounts for as much as 60% of the total energy consumption. More proactive actions to promote the rational energy utilization in factories and business premises are important. To implement the law effectively, the following provisions were established:

1) Evaluation criteria for business operators

METI shall establish and announce the subject of evaluation criteria 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 evaluation criteria are targeted to those who conduct business activities and utilize energy in their factories / business premises (hereafter referred to as factories) and are purposed that the rational utilization of energy in factories would be implemented appropriately and effectively. (Refer to the 2.5 "Evaluation Criteria" and the 2.6 "Standards and Target Values".)

These evaluation criteria 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.

2) Guidance and advice

The competent minister (METI and other minister(s) responsible for the programs of the relevant factories) may provide business operators with guidance and advice about the rational energy use

with the consideration of the things concerning the evaluation criteria when judged necessary by the minister.

3) Type 1 designated energy management factories

Factories 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 belong to the five manufacturing industries 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” shall appoint an energy manager to monitor the work related to the rational energy utilization, prepare and submit a mid-to-long term plan, and report annually the status of their energy utilization to the competent minister.

The buildings in the category of “Type 1 Designated Energy Management Factories” may appoint an energy management officer, instead of an energy manager, who has completed a designated training course that were conventionally conducted in the past. In those buildings, an energy management officer is conducting a day-to-day energy management, but they shall have a participation of an energy manager, only when preparing a mid-to-long term plan.

<Instructions, announcement and order to make rationalization plans>

If “Type 1 Designated Energy Management Factories” are judged to be in egregious breach of the evaluation criteria for energy rationalization, the competent minister may instruct the designated factories to prepare a rationalization plan. If the operator does not adhere to the instructions, the ministers are authorized to announce to that effect or give an order for taking any action to respond to the instructions based on the opinion collected at the council concerned.

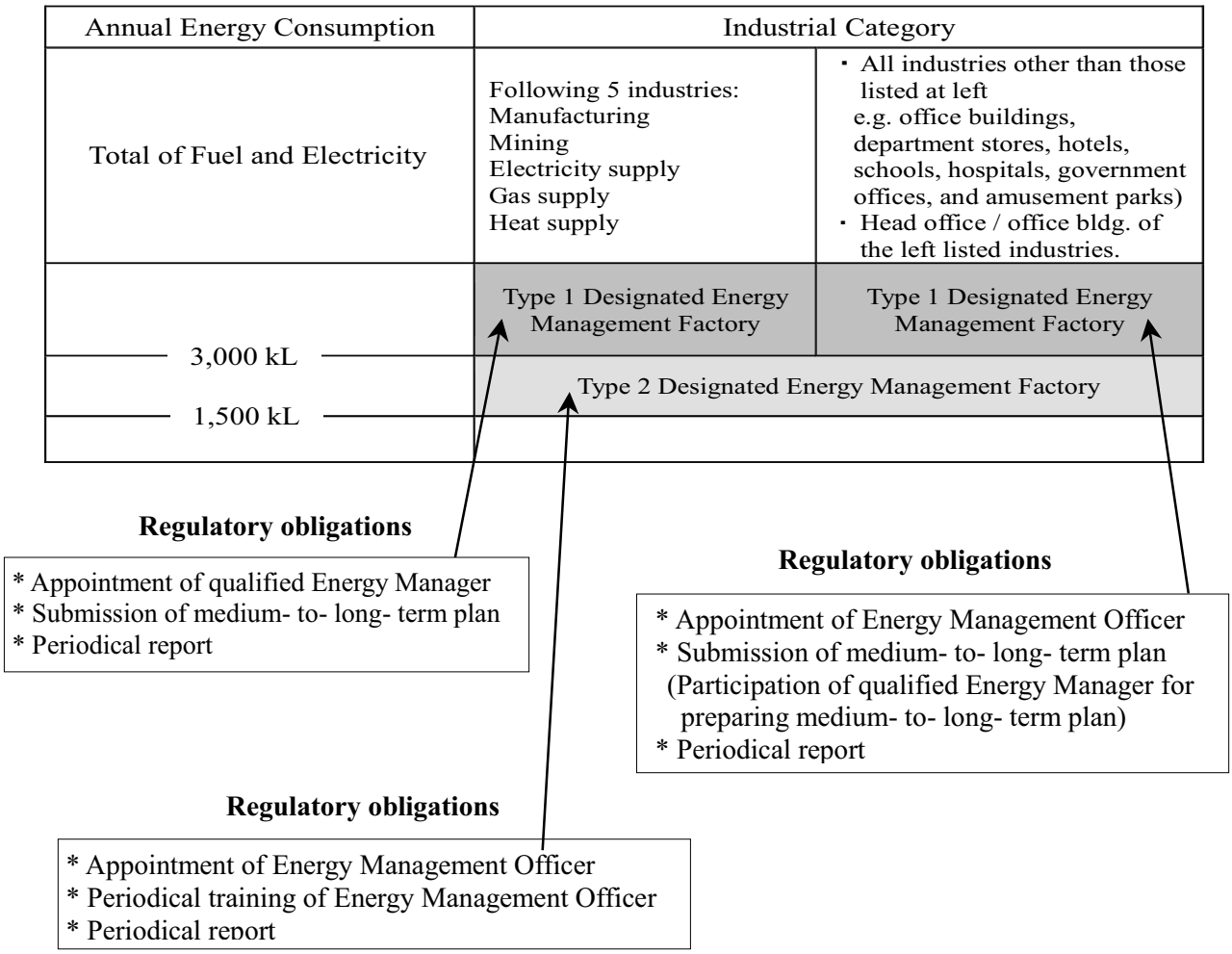
4) Type 2 designated energy management factories

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) shall promote the rational use of energy in the same way as “Type 1 Designated Energy Management Factories”. Those factories shall be designated as “Type 2 Designated Energy Management Factories”. The law prescribes that “Type 2 Designated Energy Management Factories” shall appoint an energy management officer, who takes a training session of energy conservation, and keep the record of the conditions of energy use, etc. However, the amended law in June 2002 imposed an obligation to report on energy use to the competent minister on an annual basis instead of the obligation of recording the energy use situations stipulated by the former version of the law.

<Recommendation>

If “Type 2 Designated Energy Management Factories” are judged not to comply with the evaluation criteria for energy rationalization, the competent minister may submit a recommendation to the operators and request them to take necessary steps for the rational use of energy.

5) Category of designated energy management factory



6) Number of energy managers required by the law

Type 1 Designated Energy Management Factories producing Coke and supplying Electricity, Gas and Heat

Annual Fuel Consumption	Number Required
3,000 or less than 100,000 kl-oe	1
100,000 kl-oe or more	2

Type 1 Designated Energy management Factories other than above

Annual Fuel 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

7) Certified energy manager system

Factories belonging to any of the five designated industries with a total of fuel and electricity consumption of at least 3,000 kL of crude equivalent are designated as "Type 1 Designated Energy Management Factories" under the Law concerning Rational Use of Energy, subject to the obligation to appoint one or more energy managers according to the level of the energy consumption. Such energy managers must be selected from nationally qualified license holders for energy management.

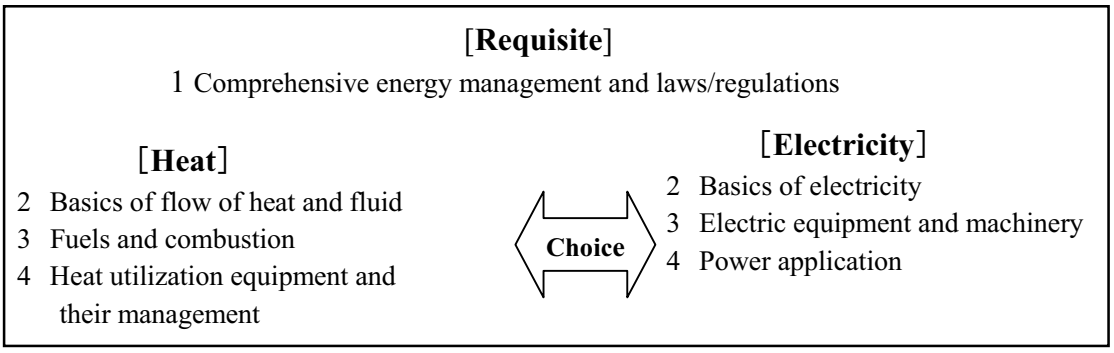
A license is awarded to a person who has passed the examination for qualified person for energy management or who has been authorized by the Minister for Economy, Trade and Industry upon completing a qualification course of qualified person for energy management. This certification process works as follows:

(a) Examination of qualified person for energy management

a) Prerequisites : None

b) Examination subjects

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



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 shall 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 March, 2006. (Refer to the item 2.7 Evaluation Criteria for Buildings.) The new standard for houses was announced on 27 March, 2006.

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 evaluation criteria which the building owners should refer to in making decisions and for private dwellings shall 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. 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.

3) Instructions for specified buildings

Construction Clients and Owners (Specified Construction Clients, etc.) who intend to construct or extensively modify the buildings (including residences) having a total floor area of 2,000m^2 or

larger (Specified Buildings) shall 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 shall submit periodical reports on maintenance of buildings with respect to energy-saving measures.

When the competent authority finds energy-saving measures to be significantly insufficient in consideration of the criteria, the authority shall advise them for improvement. When the Specified Construction Clients, etc. do not follow the authority's advice and instruction for improvement on the measures described in the notification, the authority shall announce to the public the name of the owner in question.

(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 shall, 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. 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) shall establish and announce standards for energy efficiency improvement which manufacturers should 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 should 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, television sets, copying machines, computers, magnetic disk drives, gasoline-fueled and diesel powered trucks and VTRs
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

2) Labeling

Equipment described above shall 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) shall 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 shall 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

It is obliged that transportation companies both in cargo and passenger as well as cargo owners which are over a given level of business scale shall be responsible to draw up energy conservation plans and report the amount of energy consumption, etc. every year.

(8) Activities of the New Energy and Industrial Technology Development Organization

In addition to its current activities, the New Energy and Industrial Technology Development Organization (NEDO) has also begun (a) to develop energy use rationalization technologies, (b) to provide support for introducing energy use rationalization technologies, etc.

(9) Supporting measures and penalties

The law also provides other requirements for the government to make efforts concerning financial aid and tax incentive measures to promote rational energy use, measures to promote science and technology, and measures to deepen the awareness of consumers. The law also specifies provisions concerning the submission of reports, on the spot-inspections, and penalties.

(10) 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 March 2008, energy conservation measures were strengthened in both the commercial sector including offices, convenience stores, etc. and household sector. This amended version will be enforced in April 2009.

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

Chronicles of Legislation and Major Revisions of Energy Conservation Law

	Promulgation Date	Effective Date	Summary of Legislation and Major 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 Major 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 Major Revisions	Note
Revision (6)	May 2008	April 2009	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. (Through 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 Evaluation Criteria for Factories on Rational Use of Energy

(Note) The following table is based on "Judgment standards for business owners on the rational use of energy at factories" revised in April 2006.

Category	Managem ent	Measurement & Recording	Maintenance & Inspection	Necessary Measures when Installing New Facilities and Equipment
Rationalization of Fuel Combustion	(1) Management manuals shall be made including the following management factors for fuel combustion: 1)The air ratio shall be controlled based on the type of fuel combustion facility and the fuel type. **Management Manual** 2)The air ratio of the facility shall be reduced to the level of the air ratio standards specified in the attachment table 1 (A). **Standards** 3)Multiple facilities shall control the total thermal efficiency by adjusting the loads. **Management Manual** 4)Fuel quality shall be properly controlled to improve the combustion efficiency.	(2) Management manuals shall be made including the following measurement & recording items for fuel combustion: - fuel supply amount - exhaust gas temperatures - residual oxygen present in exhaust emissions, etc.	(3) Management manuals shall be made including the following maintenance & inspection factors: The combustion facilities shall be regularly maintained and inspected to secure the optimum condition. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new combustion facilities: 1)The combustion facilities and equipment shall be able to adjust the fuel amount and the air ratio according to the load change. 2)The ventilation system shall be able to adjust the airflow rate and combustion chamber pressure.
2. Rationalization of Heating, Cooling, and Heat Transfer 2-1 Heating Equipment, etc.	(1) Management manuals shall be made including the following management factors for heating, cooling, and heat transfer: 1) The facilities using thermal medium shall control the temperature of the medium, the pressure, and the amount. **Management Manual** 2)Industrial furnaces shall improvement the thermal efficiency to improve the heat patterns. **Management Manual** 3) Status of overloads and underloads shall be prevented by controlling the amount of the heated or cooled objects and the positioning inside the furnace. **Management Manual** 4) The facilities using multiple facilities and equipment shall adjust the loads to maximize the total facilities efficiency. **Management Manual** 5) The waiting time occurred between the repetitive process shall be reduced. **Management Manual** 6) Intermittent operations shall streamline the	(2) Management manuals shall be made including the following measurement & recording items for heating: The temperature of the heating medium, the pressure, and the feed rate of such as the steam shall be measured and recorded. **Management Manual**	(3) Management manuals shall be made including the following maintenance & inspection factors: To prevent the deterioration of the heat transfer, heat-transferring parts of boilers and heat exchangers, soot, dust, and scale shall be regularly inspected and maintained. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new heating facilities: 1) Heat exchanging parts shall use high thermal conductivity materials. 2) Heat exchangers shall use streamlined arrangement to improve the facilities' overall thermal efficiency.

	operational patterns. 7) Boiler water' water quality shall be quality-controlled. 8) Steaming facilities shall shut off the steam feed valves when not in use. 9) Heating facilities shall keep the steam dryness at an appropriate level. 10) Related factors of heating, including heated and cooled objects, heat media, etc. shall be included in the management manuals. **Management Manual**			
2. Rationalization of Heating, Cooling, and Heat Transfer 2-2 Air-conditioning equipment and hot water supply	(1) Management manuals shall be made including the following management factors for air-conditioning equipment and hot water supply: 1) Air-conditioners shall reduce the loads by controlling and limiting the air-conditioning target zones, utilizing blinds, etc., adjusting the room temperature, the frequency of the ventilation, humidity values, and equipment and facilities' operational time according to the operational status. **Management Manual** The temperature of air-conditioning levels shall be referred to the government's recommended levels. **Management Manual** 2) The heat source facilities and equipment shall be managed in a way that the facilities and equipment efficiency will be comprehensively improved based on seasonal weather changes. **Management Manual** 3) The heat source facilities and equipment composed of multiple same types of facilities or composed of multiple different types of facilities shall be managed in a way that the total facilities and equipment efficiency will be improved collectively based on seasonal weather changes. 4) Multiple air-conditioning equipment or facilities using the same or different type of facilities shall be managed in a way that the total facilities and the equipment efficiency will be collectively improved	(2) Management manuals shall be made including the following measurement & recording items for air-conditioning equipment and hot water supply: 1) The temperature and humidity levels, etc. shall be regularly measured and recorded for each of the operational zone. **Management Manual** 2) All factors that contribute to the facilities' collective efficiency and each unit's efficiency shall be regularly measured and recorded. **Management Manual** 3) The hot water supply systems shall be regularly measured and recorded in the amount, the	(3) Management manuals shall be made including the following maintenance & inspection factors: 1) Air-conditioners shall be regularly inspected and maintained to improve the each air-conditioner's efficiency and the facilities' total efficiency improvement. **Management Manual** 2) Hot water supply facilities shall be regularly inspected and maintained to improve the efficiency. **Management Manual** 3) The automatic devices that are installed in the air-conditioning systems shall be regularly inspected and maintained. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new air-conditioning and hot water supply equipment and facilities: 1) The energy conservation law's building evaluation criteria shall be referred to when installing the new equipment and facilities and following points shall be implemented to improve the efficiency: i) Each air-conditioner shall be independently controlled by the each operational area adjustable to the heat demand change. ii) High efficient heat source such as heat pump, etc. shall be introduced. iii) High efficient operation shall be introduced such as by controlling the number of the operational units. iv) Systems that enable the wind change and current rotation shall be introduced. v) Air-conditioning shall be controlled such as by installing

	based on the load conditions. **Management Manual** 5) The temperature and the pressure, etc. of hot water supply facilities and the equipment shall be controlled and the water supply area shall be limited according to the seasonal and the facilities' working conditions. **Management Manual** 6) The heating source facilities of the hot water supply system shall be controlled in such a way that the auxiliary equipment such as heat source equipment and pumps, etc. shall be taken into account to improve the facilities' overall efficiency. **Management Manual** 7) The hot water supply systems composed of multiple heating source facilities and equipment shall improve the facilities' overall efficiency achieved by adjusting the number of units operating based on the load conditions. **Management Manual**	temperature, and other factors that contribute to the facilities' efficiency. **Management Manual**		a measuring device in each target room, etc. and the BEMS. 2) New hot water supply equipment and facilities shall be adjustable to the water supply load change. The systems used in small amount for limited parts shall be adjustable to convert to the system capable of targeting the specified area. 3) When procuring equipment, the energy conservation law's designated equipment shall be selected that is compliant with the standard of the law. i) Air-conditioners ii) Stoves iii) Gas water heaters iv) Oil water heaters v) Gas cookers
3. Recovery and utilization of waste heat	(1) Management manuals shall be made including the following management factors for recovery and utilization of waste heat: 1) The waste heat recovery rate and exhaust gas temperature shall be controlled according to the facility. **Management Manual** 2) The waste heat recovery rate and exhaust gas temperature shall be referred to the standard of the appendix table 3 (A). **Standards** 3) Steam drains shall be controlled in the temperature, the quantity, and the permissible properties 4) Recovery capacity shall be controlled for the recovery utilization of the latent heat, the pressure and the combustible components of the heated solid or fluid, etc. 5) Utilization of waste heat shall be controlled and	(2) Management manuals shall be made including the following measurement & recording items for waste heat: The temperature, the heat quantity, the elements, etc., shall be regularly recorded and measured to check the status of waste heat of the appropriate use. **Management Manual**	(3) Management manuals shall be made including the following maintenance & inspection factors: The waste heat recovery facilities shall be regularly maintained and inspected and the prevention measures such as the cleaning of the heat transfer surface for prevention of heat medium leakage shall be regularly implemented. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new waste heat recovery and utilization facilities and equipment: 1) The flues and piping, etc. of the waste heat recovery and utilization facilities shall be controlled and maintained in the temperature of the waste heat. 2) The surface, the shape, and the area size of the heat transfer shall be improved to maximize the waste-heat recovery rate.

	elaborated according to the temperature and the facilities' operating conditions.			
4. Rationalization in the conversion of heat power, etc. 4-1 Dedicated power generation facilities and equipment	(1) Management manuals shall be made including the following management factors for dedicated power generation facilities and equipment: 1)Proper operational management shall be achieved for the high efficiency of the facilities. **Management Manual** Comprehensive management shall be implemented for facilities that are in parallel operation by appropriately dividing the load according to the load's increase or decrease. **Management Manual** 2)When the lowering pressure operation is possible for the partial load put on the steam turbines, the thermal electricity plants shall be properly optimized. **Management Manual**	(2) Management manuals shall be made including the following measurement & recording items for dedicated power generation facilities and equipment: The thermal efficiency related factors shall be regularly recorded and measured for dedicated power generation facilities and equipment. **Management Manual**	(3) Management manuals shall be made including the following maintenance & inspection factors for dedicated power generation facilities and equipment: The facilities shall be regularly inspected and maintained to the effect that the thermal efficiency is maintained high. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new facilities and equipment: 1) The electricity demand and projected trends shall be considered and referred to as to determine the size of the facilities. 2) The generation efficiency of new dedicated power generation facilities shall not be lower than the level of the generation efficiency of the domestic annual average of the power reception and generation facilities.
4. Rationalization in the conversion of heat power, etc. 4-2 Cogeneration facilities and equipment	(1) Management manuals shall be made including the following management factors for cogeneration facilities and equipment: 1) Facility operation shall be controlled to the effect that the overall efficiency of the cogeneration facilities is improved according to the load increases and decreases. **Management Manual** 2) Allowable minimum levels of the bleed-gas or back-pressure turbines shall be controlled when the cogeneration facilities are using bleed-gas or back-pressure turbines. **Management Manual**	(2) Management manuals shall be made including the following measurement & recording items for cogeneration facilities and equipment: 1) The thermal efficiency shall be regularly recorded and measured. **Management Manual** 2) Cogeneration facilities and equipment that use turbines in a minimum pressure shall be regularly record and measured	(3) Management manuals shall be made including the following maintenance & inspection factors: The cogeneration facilities and equipment shall be regularly inspected and maintained to maximize the facilities' thermal efficiency.	(4) Management manuals shall be made including following measures directed at installing new cogeneration facilities and equipment: The electricity and heat demand and the projected trends shall be considered and referred to when determining the appropriate size of the facilities.

		in the pressure of the entrance and the exit, the extraction pressure, and the back pressure of the turbines. **Management Manual**		
5. Prevention of energy loss due to radiation, conduction, resistance, etc. 5-1 Prevention of heat loss due to radiation, conduction, etc.	(1) Thermal insulation standards shall include the consideration of the following insulation standard factors: 1) The standards of heat-using facilities' heat insulation shall be based on JIS. 2) The heat insulation shall be performed for new industrial furnaces based on the temperatures of the furnace wall surface specified in the appendix. **Standards** For current and already-installed industrial furnaces, the heat insulation shall be also performed based on the temperatures of the furnace wall surface specified in the appendix.	(2) Management manuals shall be made including the following measurement & recording items for prevention of heat loss: Each facility's temperature of furnace wall surfaces, heated objects, waste gas, etc. shall be regularly recorded and measured and analysis of heat balance shall be carried out based on the obtained records. **Management Manual**	(3) Management manuals shall be made including the following maintenance & inspection factors for heat-using facilities: 1) The heat loss prevention measures such as installing heat insulation shall be regularly inspected and maintained for heat-using facilities. **Management Manual** 2) The heat-using facilities shall be regularly inspected and maintained to prevent the steam leakage from steam traps. **Management Manual**	(4) Management manuals shall be made including following measures directed at installing new heat-using facilities: 1) New heat-using facilities shall be improved of the insulation by measures such as increasing the thickness of the insulation, adopting the insulation materials with low levels of heat transfer, performing the double insulation. New heat-using facilities shall install the fire-resistant insulation that has enough fire-resistance performing levels. 2) New heat-using facilities shall prevent the heat loss by introducing measures such as minimizing or air-tightening the opening section of the facility, utilizing the air flow, and installing double-doors, etc. 3) New heat-using facilities shall be capable to reduce the radiating area by measures such as rationalizing the transport piping routes for heating mediums.
5. Prevention of energy loss due to radiation, conduction,	(1) Management manuals shall be made including the following management factors for reception and transformer facilities:	(2) Management manuals shall be made including the following measurement &	(3) Management manuals shall be made including the following maintenance &	(4) Management manuals shall be made including following measures directed at installing new reception and transformer facilities:

resistance, etc. 5-2 Prevention of electrical loss due to resistance, etc.	1) Transformers and uninterruptible power supply shall be maintained by measures such as adjusting the number in operation and the appropriate load distribution. **Management Manual** 2) Reception and transformer facilities shall improve the arrangement of facilities, reduce the distribution lines, and improve the distribution voltage. **Management Manual** 3) The power factor at the reception end shall be set over 90% based on the standard for attachment table 4 **Standards** and this target shall be achieved by measures such as installing equipment such as capacitors. 4) The power capacitor shall be properly managed to be enable of a proper operation and termination according to the facility operational setting. **Management Manual** 5) Voltage imbalance shall be prevented and controlled for settings where a single-phase load is connected to a three-phase load. **Management Manual** 6) Electricity using facilities shall be capable to reduce the maximum current by equalizing the power. **Management Manual** 7) Electrical loss from reception, transformer, and distribution facilities shall be reduced and minimized. **Management Manual**	recording items for reception and transformer facilities: The electricity used, the voltage, and the electricity of transformers and distribution facilities, etc. shall be regularly recorded and measured. **Management Manual** The facilities shall be regularly recorded and measured based on the records.	inspection factors: Maintenance and inspection of power reception, transformer, and distribution facilities shall be carried out to maintain a good condition. **Management Manual**	1) The electricity demand and projected trends shall be considered and referred to as to determine the location, the distribution voltage, and the size of the new reception, transformer, and distribution facilities. 2) When introducing a new transformer, the transformer's energy efficiency shall comply with or higher than the levels stipulated in the standards for manufacturers' evaluation criteria for transformers performance.
6. Rationalization of conversion from electricity to mechanical power, heat, etc. 6-1 Motor applied equipment and electric heaters	(1) Management manuals shall be made including the following management factors for motor applied equipment and electric heaters, etc.: 1) Motor applied equipment and facilities shall be capable of terminating the operation when unnecessary to prevent the electrical loss occurred from motor's idle operation, taking into account of the relation with the power needed for the operational start. **Management Manual** 2) Multiple electrical motors shall be properly	(2) Management manuals shall be made including the following measurement & recording items for motor applied equipment and electric heaters, etc.: The voltage and electricity of motor	(3) Management manuals shall be made including the following maintenance & inspection factors: 1) Motor applied equipment and electric heaters, etc. shall be maintained and inspected to reduce the	(4) Management manuals shall be made including following measures directed at installing new motor applied equipment and facilities: For the motor applied equipment and facilities where a frequent load change is foreseeable, the facilities shall be configured to enable an operation easily adjustable based on the load fluctuations.

etc.	controlled by maintaining the appropriate demand rate, the number of motors operating, and the load distribution. **Management Manual** 3) Fluid machines shall be capable of adjusting to reduce the load of the motors by adjusting the delivery feed and the pressure by measures such as controlling the number of units based on the review of the use of pressure and discharge. **Management Manual** 4) Heating facilities of induction furnaces, etc. shall be improved in its loading method of the heated objects, shall be reduced in the electricity loss occurred by the unloaded operation, and shall be improved in the thermal efficiency by insulation or recovering heat loss. **Management Manual** 5) The efficiency of electrolytic facilities shall be improved by appropriately managing electrode distance and electrolytic solutions, etc. **Management Manual** 6) Electrical loss shall be lowered and prevented by managing the voltage and current for the each energy-using facility. **Management Manual**	applied equipment and electric heaters, etc. shall regularly be recorded and measured. **Management Manual**	mechanical loss of the load machine, the power transmission section, and the motor. **Management Manual** 2) Fluid machines shall be maintained and inspected to prevent the fluid leakage and to reduce the pipe resistance. **Management Manual** 3) Electric heating facilities, etc. shall be maintained and inspected to reduce the resistance loss of the wire connections and the contact parts for the opening and the closing, etc. **Management Manual**	
6. Rationalization of conversion of electricity into power, heat, etc. 6-2Lighting systems, elevators, and office equipment	(1) Management manuals shall be made including the following management factors for lighting systems, elevators, and office equipment: 1) Lighting facilities shall be managed and referred to the provisions specified in the JIS. **Management Manual** 2) Elevators shall be managed and adjusted in the operational numbers according to the operational status. 3) Office equipment shall be switched off when unnecessary and shall be capable of introducing the low-power mode.	(2) Management manuals shall be made including the following measurement & recording items for lighting systems: The luminance of the lighting systems installed in the working places, etc. shall be recorded and measured **Management Manual** and based on the results regularly be recorded and measured.	(3) Management manuals shall be made including the following maintenance & inspection factors: 1) The lighting facilities shall be regularly maintained and inspected by measures such as cleaning or replacement. **Management Manual** 2) The mechanical loss of elevators shall be regularly maintained and inspected.	(4) Management manuals shall be made including following measures directed at installing new lighting systems, elevators, and office equipment: 1) The lighting facilities shall be referred to the energy conservation law's lighting provision of the building evaluation criteria to improve the energy efficiency. i) Energy efficient fluorescent lighting using inverters, etc. shall be considered for the installation. ii) Energy efficient HID lamps, etc. shall be considered for the

			Management Manual 3) The office equipment shall be regularly maintained and inspected.	installation. iii) Maintenance factors such as cleaning shall be considered for the installation. iv) Comprehensive energy efficiency factors including: lighting circuit or lighting efficiency shall be considered. v) Separate circuit for places that can use natural lighting shall be considered for the installation. 2) Procurement of the following equipment shall be based on the energy conservation law-designated performance levels or higher: i) Fluorescent lights ii) Copiers iii) Computers iv) Magnetic disc units v) TV sets vi) Video-cassette recorders vii) Electric refrigerators viii) Electric freezers ix) Electric toilet seats x) Vending machines

2.6 Standards and Target Values for Operating Equipment in Factories

(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			1.05-1.20	1.05-1.10	1.2
	Others (evaporation volume)	30t/h or more	50-100	1.3-1.45	1.2-1.45	1.10-1.25	1.10-1.20	1.20-1.30
		10 to less than 30t/h	50-100	1.3-1.45	1.2-1.45	1.15-1.30	1.15-1.30	-
		5 to less than 10t/h	50-100	-	-	1.20-1.30	1.20-1.30	-
		Less than 5t/h	50-100	-	-	1.20-1.30	1.20-1.30	-
Target	For electric utility		75-100	-	-	1.05-1.10	1.05-1.10	1.15-1.20
	Others (evaporation volume)	30t/n or more	50-100	1.2-1.3	1.2-1.25	1.10-1.15	1.10-1.15	1.20-1.30
		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 10t/n	50-100	-	-	1.15-1.30	1.15-1.25	-
		Less than 5t/h	50-100	-	-	1.15-1.30	1.15-1.25	-

< Standards >

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).

< Targets >

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 Appendix I-(A)-(1) 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	Fludized bed			
Standard	For electric utility		75-100	-	-	145	110	200
	Others (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 10t/h	50-100	-	-	220	200	-
		Less than 5t/h	50-100	-	-	250	220	-
Target	For electric utility		75-100	-	-	135	110	190
	Others (evaporation volume)	30t/n 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 10t/n	50-100	-	300	180	160	-
		Less than 5t/h	50-100	-	320	200	180	-

< Standards >

* 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).

< Targets >

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

< Standards >

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.

< Targets >

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.

< Standards >

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.

< Targets >

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

< Standards >

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.

< Targets >

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

< Standards >

The standard value of power factor at the power receiving end is 90% or more.

< Targets >

The target value of power factor at the power receiving end is 95% 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.”

2.7 Evaluation Criteria for Building on Rational Use of Energy

(Ministry of Economy, Trade and Industry/Ministry of Land, Infrastructure and Transport, Notice No. 1, partially revised on March 30, 2006)

This is the outline of the "Evaluation Criteria for Building on Rational Use of Energy". For full-text and details of the scores, please refer to the website by ECCJ. (http://www.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 (1)-(a) related to the external walls, windows, etc. of buildings (except for "Factories and others" in Table 1) shall be based on (1)-(c). Note that for external walls, windows, etc. of buildings having a total floor area of 5,000 square meters or less (excluding those in tropical regions), the judgment may be based on(1)-(d) as well as (1)-(c).

(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) With regard to external walls, windows, etc. of buildings listed in the note in (1)-(b), for the external walls, windows, etc. which are important from the viewpoint of energy use, the value calculated by adding the value determined according to the building type and regional classification to the total of the evaluation scores 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 selected based on the measures taken regarding main orientation, shape, core layout and average floor height of a building.

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

The score in an ordinary or cold district shall be the total of the scores selected based

on the measures taken 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 an ordinary or cold district shall be selected based on the measures taken 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 measures taken in the district of the building.

(e) 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 (2)-(a) related to air conditioning equipment installed in buildings (except for “Factories and others” in Table 1) shall be based on (2)-(c). Note that the judgment for air conditioning equipment (which is limited to package air conditioners (limited to the air-cooling type) defined in Japanese Industrial Standards B 8616-1999 (package air conditioners) and gas heat pump air conditioners defined in Japanese Industrial Standards B 8627-2000 (gas engine-driven heat pump air conditioners)) installed in buildings having a total floor area of 5,000 square meters or less may be based on (2)-(d) as well as (2)-(c).

(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) With regard to the air conditioning equipment listed in the note in (2)-(b), for the equipment which is important from the viewpoint of energy use, the value calculated by adding the value determined 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 measures taken.

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 measures taken.

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

(e) 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 (3)-(a) related to mechanical ventilation equipment (except for air conditioning equipment) installed in a building (except for "Factories and others" in Table 1) shall be based on (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 based on (3)-(d) as well as (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) With regard to the mechanical ventilation equipment shown in the note in (3)-(b), for the equipment which is installed in non-air conditioned rooms and which is important from the viewpoint of energy use, the value calculated by adding 80 to the total scores selected based on the measures taken 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 (4)-(a) related to lighting fixtures installed in a building shall be based on (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 based on (4)-(d) as well as (4)-(c).

(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) With regard to lighting fixtures shown in the note in (4)-(b), for each lighting section which is important from the viewpoint of energy use, the value calculated by adding 80 to the total score of the scores listed in i) to iii) below shall be 100 or more. If there are two or more lighting sections, the value 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 measures taken for each item.

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

The score shall be selected based on the measures taken.

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 scores selected based on the measures taken for each item.

(e) 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 (5)-(a) related to hot water supply equipment installed in a building shall be based on (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 based on (5)-(d) as well as (5)-(c).

(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) With regard to hot water supply equipment shown in the note in (5)-(b), for the equipment which is important from the viewpoint of energy use, the value 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 measures taken 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 measures taken 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 measures taken. (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) Obligations of owners of specified building regarding the maintenance related to hot water supply equipment.

(6) Efficient use of energy by lifting equipment

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

i) They shall adopt a proper control system for lifting equipment.

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 (6)-(a) related to elevators among lifting equipment installed in a building (only for "Hotels and others" and "Offices and others" in Table 1) shall be based on (6)-(c). Note that the judgment for elevators among lifting equipment installed in a building having a total floor area of 5,000 square meters or less may be based on (6)-(d) as well as (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) With regard to the elevators shown in the note in (6)-(b), for the elevators which are important from the viewpoint of energy use, the value calculated by adding 80 to the total scores specified in i) and ii) below shall be 100 or more.

i) The evaluation score for the control system of elevators

The score shall be selected based on the measures taken.

ii) The evaluation score for the number of elevators installed

The score shall be 10 when less than three elevators are installed, and 0 when three or more elevators are installed.

(e) Obligations of owners of specified building regarding the maintenance related to lifting equipment.

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	340	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	–	–	–	–

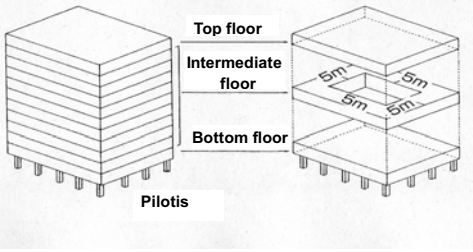
Note)

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:

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



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):

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

2.8 Law for Energy Conservation and Recycling Support

The law is designed to support business operators voluntarily implementing projects to promote the rationalization of the use of energy and natural resources.

(1) Guidelines for efforts

The competent minister shall establish guidelines for business operators and building owners voluntarily implementing projects to promote the rationalization of the use of energy and natural resources.

(2) The definition of specified projects

Three categories of projects are defined as "specified". Business operators etc. who takes on the projects must draw up and submit project plans to the competent minister in order to receive his/her approval. The three categories are the projects that:

a. Install or improve the equipment that can contribute to the rational use of energy in factories or other business sites[1].

b. Use any building materials or install or improve any equipment that can contribute to the rational use of energy at the time of building construction.

c. Conduct R&D on the manufacturing technology of industrial products that can contribute to the rational use of energy.

(3) Approval of projects

The competent minister shall approve the projects if he/she recognizes that they meet the requirements of the guidelines stated in (1).

(4) Assistance measures

The specified business projects that are conducted in conformity with the approved plan get support with the following assistance measures:

a. Interest rate subsidy[2],

b. Bond issued by NEDO

(5) Specified facilities

Heat supply facilities that are necessary to establish the effective energy utilization system will be designated as “specified facilities. The effective energy utilization system includes “the large-scale cogeneration regional heat supply system” or “the cascade heat utilization-type industrial complex”. And the funds borrowed to install or improve those facilities will be covered by the bonds by the NEDO.

(6) Enforcement of the law

The law was enforced on 25 June, 1993 and had a ten-year life span. However, it was partially revised in 1 October, 2003 and determined to be extended until 31 March, 2013.

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[1] The same business categories as covered by the designated energy management factory scheme (Section 1, Article 6, Energy Conservation Law).

[2] Financial institutions (Development Bank of Japan, etc.) who lend the necessary funds have the interests partially covered by Oil Special Account (currently Energy Special Account) (budgetary action without any legal provision). The interest is far lower than the lowest interest for the fiscal investments and loans (a. 1.8% for the specific activities of factories, etc, b. 1.85% for those of buildings, as of March 14, 2000).

2.9 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) Official financial assistance programs (2007)

1) For large-sized enterprises

financing percentage

Target Projects	Agency	Interest Rate	%
Overall Energy-saving Promotion Projects 1. General Energy Conservation Projects The following are considered as general energy conservation projects: (1) Projects for installation or improvement of approved equipment by the enterprises approved according to Energy Conservation Assistant Law, which is included in their proposed building construction plans, including extensions and reconstruction work, and which is specified by such enterprises as contributing to the improved use of energy in their energy conservation projects submitted to and approved by Authority. (2) Projects for constructions required for achievement of medium- or long-term energy conservation plans designed by investors/owners of office buildings, department stores, hotels or other similar facilities according to the Energy Conservation Law. (3) Projects for installation or improvement of such manufacturing machinery and equipment that meet the specific requirements for energy performance standard provided in the Energy Conservation Act (hereinafter called "Top Runner Equipment"). (4) Non-industrial projects that can improve energy use efficiency by 10% or more. (5) Cogeneration system improvement projects rendering 60% or higher primary energy use efficiency (cogeneration systems should have output power of at least 50 kW)	DBJ ODFC	Preferential rate I *1	50% 40%
2. Energy-saving Promotion Projects for the Industrial Sector The following projects that will make it possible to reduce energy consumption by 100 kL or more per year in terms of crude oil: (a) Effective energy use Projects for installation of additional equipment to recover unused energy such as waste heat or equipment to raise energy use efficiency by 10% or more, including ESCO/ESP projects. (b) Promotion of introduction of the approved equipment for effective energy use type for industries Projects for installation or improvement of approved equipment by the enterprises approved according to Energy Conservation Assistant Law, which is required at their factory or work places and which is specified by such enterprises as contributing to the improved use of energy in their energy conservation projects submitted to and approved by Authority.	DBJ ODFC	Preferential rate I *2	50%

3. Energy-saving Promotion Projects for Buildings Repair projects contributing to improvement in energy-saving performance (ESCO/ESP projects only) 4. Projects for acquisition of machinery and equipment that meet the specific requirements for energy performance standard provided in the Energy Conservation Act ("Top Runner Equipment").	DBJ ODFC	Preferential rate I *3	
5. Electric Power Load Leveling Projects Projects for selection and installation of such equipment that contributes most to leveling power load from among regenerative air-conditioners/hot-water supply systems, regenerative heaters and city gas air coolers.	DBJ ODFC	Preferential rate I *4	50%
Projects for improvement of wind power generation plants (Output of 1200 kW or higher)	DBJ	Preferential rate I	40%
Projects for improvement of solar power generation plants (Output of 150 kW or higher) *5			
Fuel cell introduction projects (Output of 100 kW or higher, use of waste heat, and 65% or higher primary energy use efficiency are required.)			
Biomass energy plant introduction projects			

*1 : Projects described in (1), (2) and (3) are provided with interest subsidies from the Energy Special Account. The preferential rate II is applied to the ESCO or ESP projects of those fallen under the projects (1) and (2) that are subsidized by the Energy Special Account if the benefit of interest subsidy is selected.

*2 : The preferential rate II is applied to the projects that are provided with interest subsidies from the Energy Special Account, the ESCO or ESP projects, and the projects of which energy use efficiency are considered to be improve more than 20% if the benefit of interest subsidy is selected.

*3 : Interest subsidies are available by the Energy Special Account (The preferential rate II is applied to those provided with this subsidy if the benefit of interest subsidy is selected).

*4 : City gas air cooler projects are provided with interest subsidies from the Energy Special Account (The preferential rate II is applied if the benefit of interest subsidy is selected).

*5 : Includes non facility capital (projects that support capital and fund-raising, etc.)

Note) DBJ : Development Bank of Japan
ODFC : The Okinawa Development Finance Corporation

2) For small and medium-sized enterprises

Period of Lending: 15 years

Target Projects	Agency	Interest rate
(Promoting the efficient use of energy) (1) Projects for acquisition of energy conservation facilities, including acquisition by ESCOs for lease or rental. (2) Projects for acquisition of mechanical self-running equipment for works by lease or rental companies.	JASME NFLC ODFC	Special interest rate 1.
(Promoting the introduction of specific high energy performance equipment) (1) Projects for installation of specified industrial high-performance furnaces, high-performance boilers and others. (2) Projects for installation of specified additional equipment which yields performance comparable to industrial high-performance furnaces or high-performance boilers to current furnaces or boilers.	JASME NFLC ODFC	Special energy conservation interest rate *
(Promoting the use of alternative energy sources) Projects for introduction of the equipment that uses alternative energy sources instead of oil, including remodeling and updating of those existing.	JASME	One of three types of interest rate will be applied depending on the equipment.

* Interests are subsidized from the Energy Special Account.

Note) JASME: Japan Finance Corporation for Small and Medium Enterprise
NFLC : National Life Finance Corporation

Source) Prepared from "the Financial Supporting Measures on Financial and Taxation for Introducing Energy Efficiency and New Energy Facilities (2007) by Ministry of Economy, Trade and Industry"

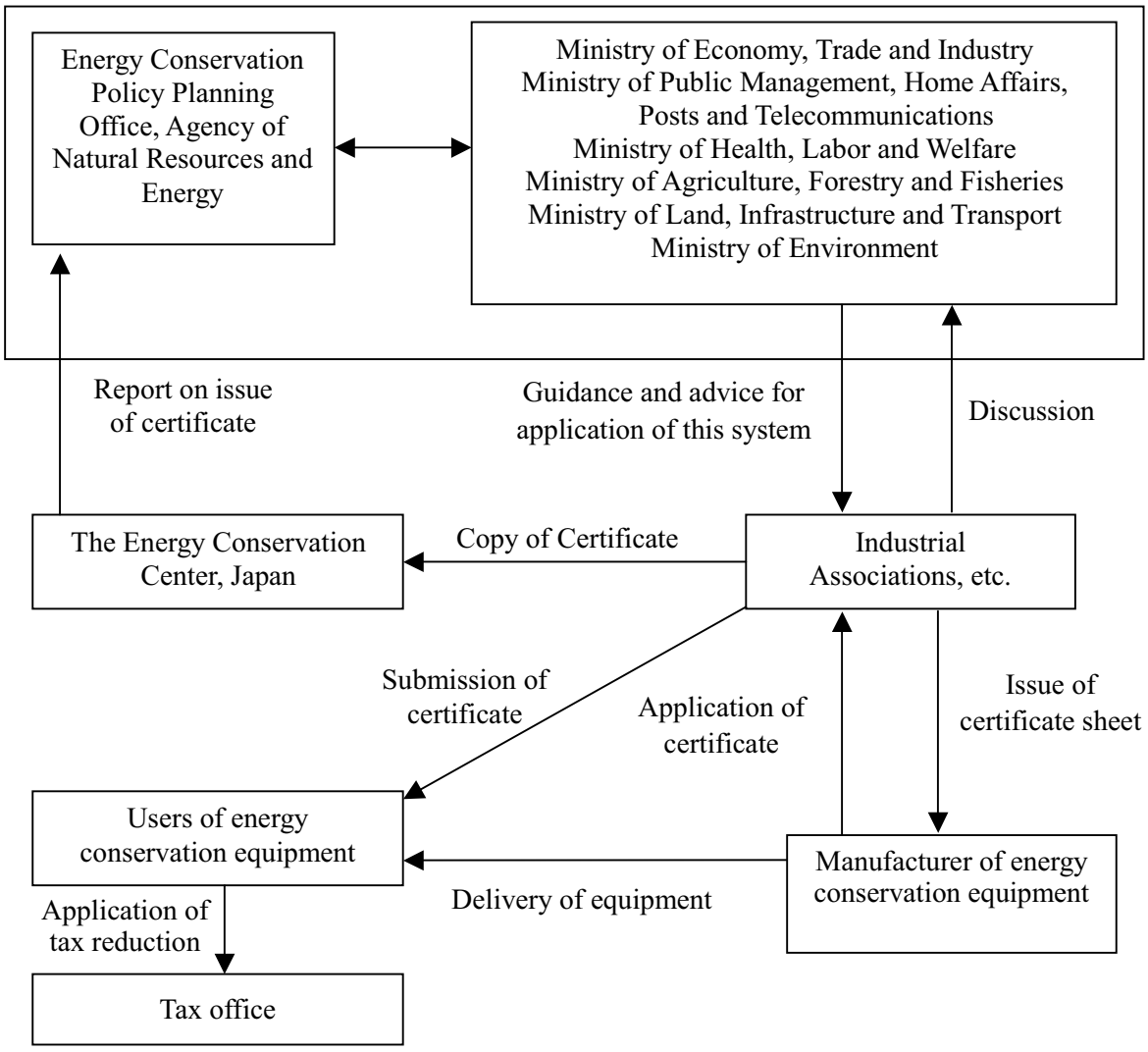
(2) Tax incentives to promote investment in the energy supply and demand structure reform (2007)

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 equivalent to 7% of the equipment acquisition cost (which should not be more than 20% of the income tax or corporate tax payable.) and that applies only to small and medium sized companies.
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 69 units

(3) Certification process for the equipment which promotes reform of energy supply and demand structure



2.10 Commendation Programs toward Energy Conservation Efforts

The Energy Conservation Center, Japan conducts various commendation and awareness raising programs on the rational use of energy as follows:

1) "Commendation Program to Excellent Energy Managers":
   A commendation certificate is given to individuals who have long been pursuing energy management and contributed to efficient energy management. (Sponsored by METI)
2) "Commendation Program to Excellent Energy Management Factories":
   A commendation 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) "The National Contest of Energy Conservation Successful Cases":
   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) "Commendation Program to Meritorious Energy Management Performers":
   A commendation certificate is given to individuals who have long played a central role and contributed to promoting the efficient energy managements. (Sponsored by ECCJ)
5) "Commendation Program to Excellent Energy Management Engineers":
   A commendation 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) Energy Conservation Poster Contest and Essay Contest for elementary and junior high school students. (Sponsored by METI)
7) Commendation Program to Excellent Energy Conservation Equipment[1]:
   A commendation 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) The Energy Conservation Grand Prize
   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) The commendation program for "Top Energy Efficient Product Retailing Promotion Store". (Sponsored by METI)
10) The commendation program for "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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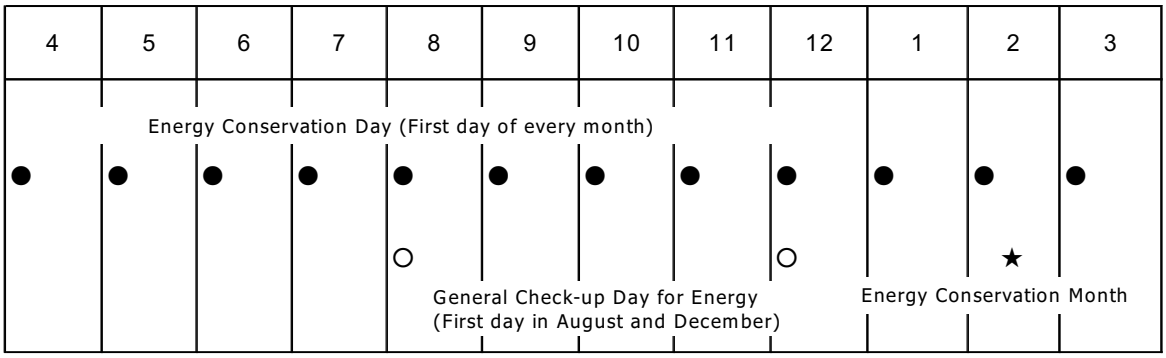
1 "Energy Conservation Equipment" represents, i) devices, facilities and systems in addition to "equipment" in general sense, ii) measuring instruments remarkably contributing to energy conservation, iii) equipment that exploits unutilized resources such as wastes.

2 JFM = The Japan Machinery Federation

2.11 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.



2.12 Energy Audit Program

A few audit experts will 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 will make an on-site survey how the facilities in the factory or building are operated. After the survey, they will 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 received the energy audit service is 2,513 in the decade from FY1998 to 2007.

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

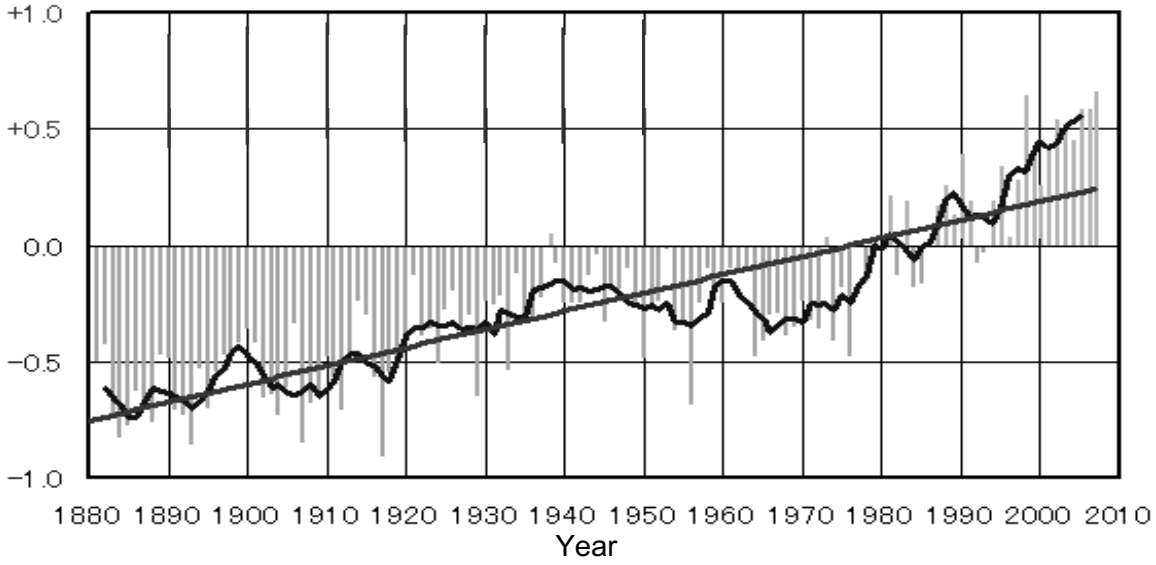
The total number of buildings received the energy audit service is 2,306 in the decade from FY1998 to 2007. During this period, the target buildings were ones in the category of “Type 1 Designated Energy Management Factories”.

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

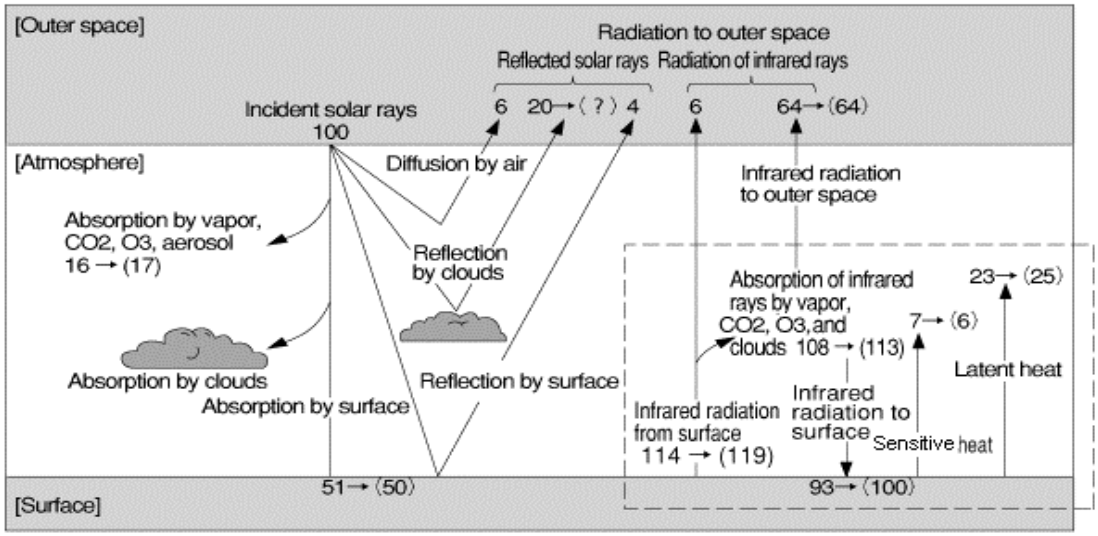
(1) Transition of deviation from normal surface temperature (only at the ground level)



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 form "Website of Japan Meteorological Agency"

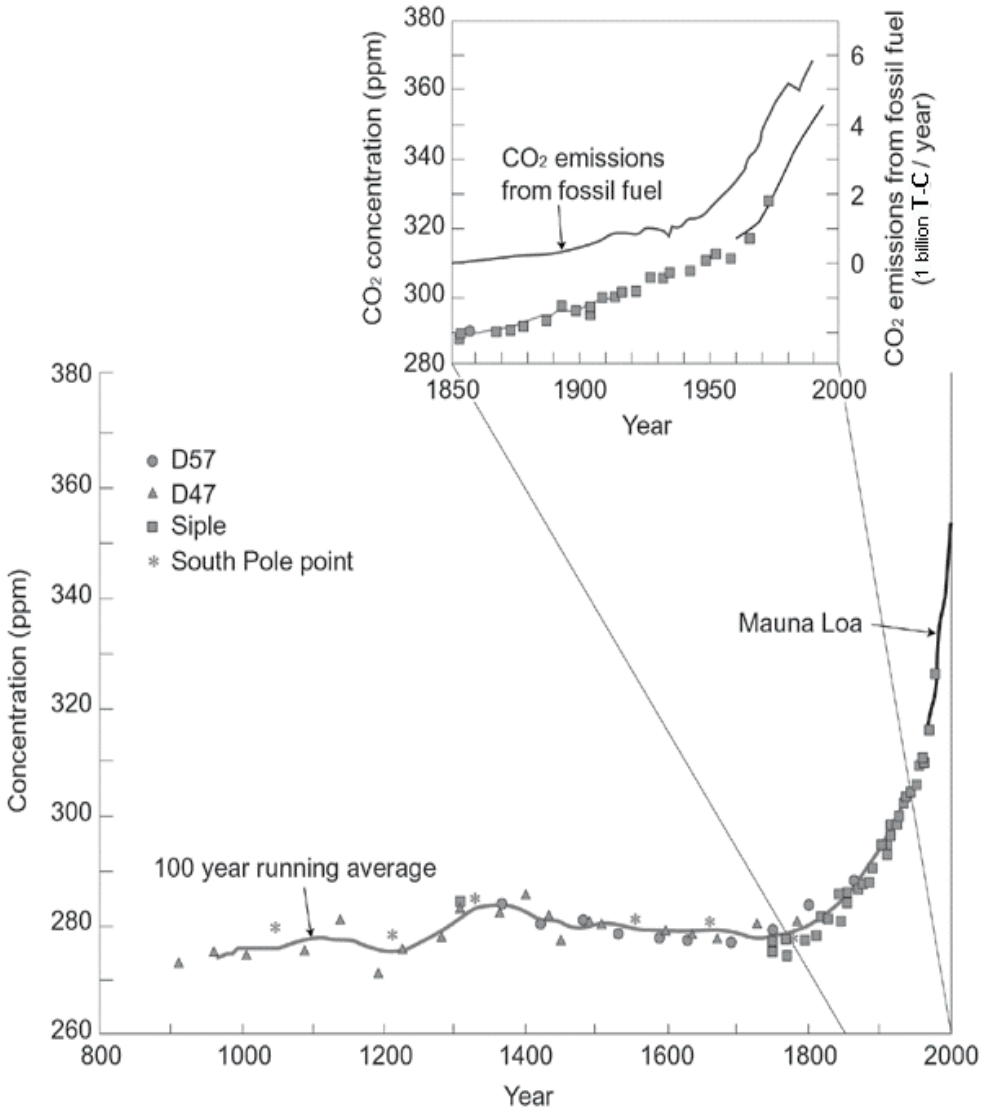
(2) Global energy balance (Index incident solar rays = 100)



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)

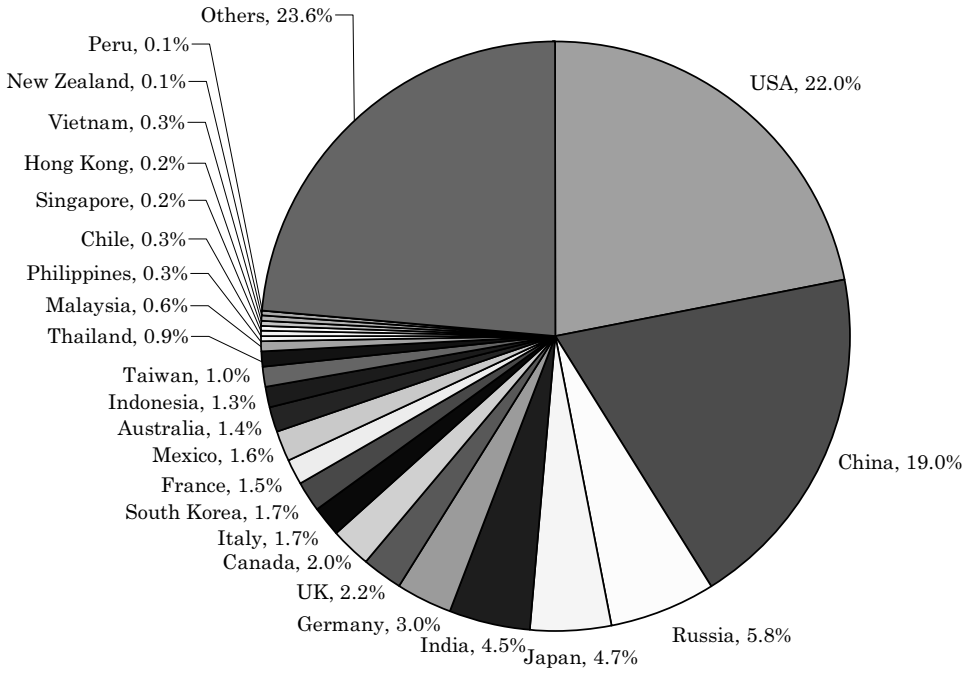
(3) Increase of the carbon dioxide level and changes in fossil energy consumption



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).

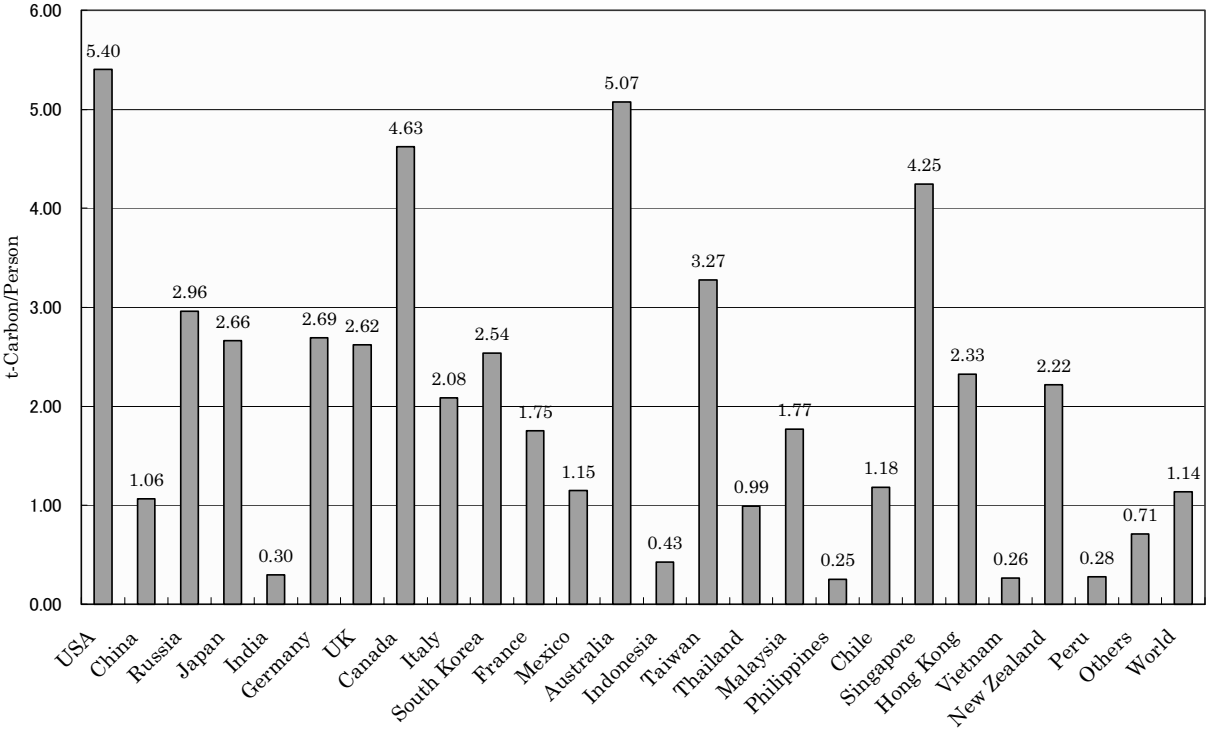
Source) IPCC (1995), translated by the Meteorological Agency. (IPCC: Intergovernmental Panel on Climate Change) “White Paper on the Environment 2000” (Ministry of Environment)

(4) CO2 emissions by country (2005)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

(5) Per-capita CO_2 emissions (2005)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

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)

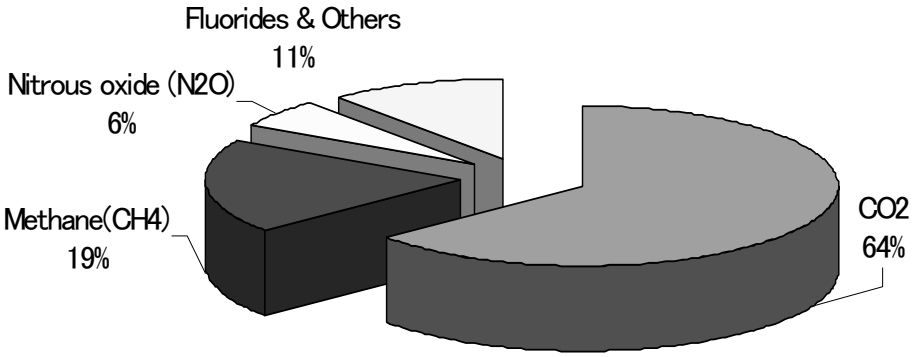
- 18-38 cm rise is estimated in the society where the environment and economic activities are projected to be globally balanced.
- 26-59 cm rise is estimated in the society where the high economic growth is achieved by recognizing fossil fuel as the important source of energy.

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 was held in Montreal, Canada on Nov.28-Dec.9, 2005
The COP 12 & COP/MOP 2 was held in Nairobi, Kenya on Nov.6 -17, 2006

(6) Outline and achievements of COP 13 & COP/MOP 3

The COP 13 & COP/MOP 3 was held in Bali, Indonesia on Dec.3 -15, 2007
The reached agreements on the framework after 2013 are following:

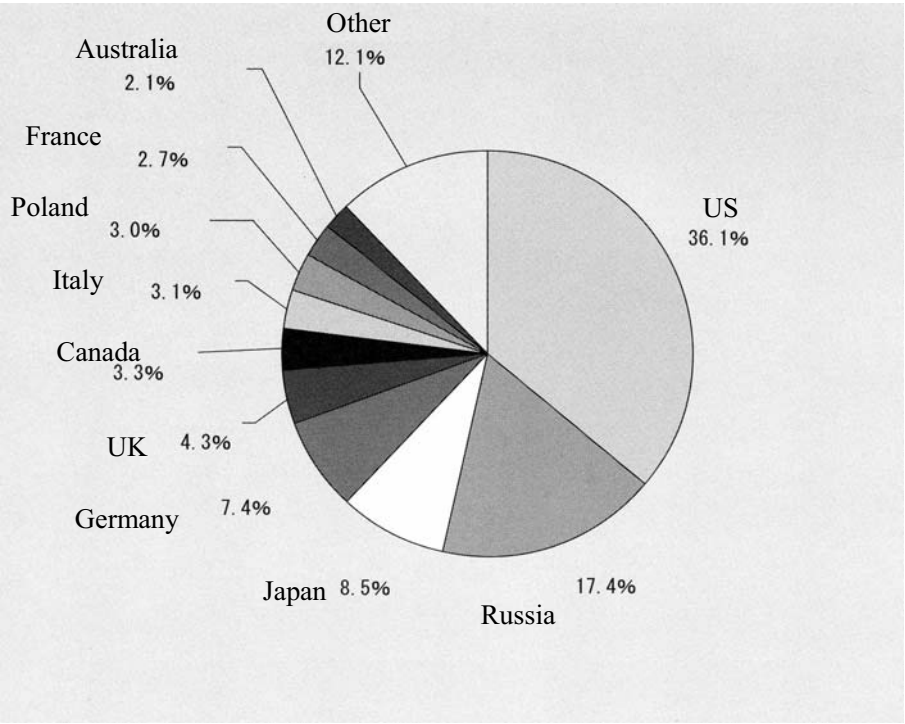
1. Ad Hoc Working Group (AWG) under the Framework Convention (New AWG (Bali Roadmap))
   Under the framework convention, new AWG will be launched to address the framework etc. after 2013 and it will complete its work in 2009.
2. AWG 4 on Further Commitments for Developed Countries (Annex I parties)
   The future action plan of the AWG was agreed and a conclusion will be drawn from the results of the works in 2009
3. Review of the Kyoto Protocol under Article 9 (Article 9 review)
   Items to be addressed in the second review of the protocol scheduled to take place in the next year were subjects of the discussion, however, a decision was made without defining the target items.

The COP 14 COP/MOP 4 will be held in Poland in December 2008.

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 eac 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

3.5 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 (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	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)	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		National Framework for Energy Efficiency NFEE 2004
				National Greenhouse Strategy2002
Financial support system concerning energy conservation	Subsidy 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 bio-energy incentive based on the federal tax	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 Industry, Tourism, and Resources-ITR
	Ministry of Land, Infrastructure and Transport	Department of Transport-DOT	Transport Canada	Department of Transport and Regional Services-DOTARS
			Environment Canada	Department of Climate Change
	Ministry of the Environment	Environmental Protection Agency-EPA		
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		
	Institute for Global Environmental Strategies (IGES)			
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	Energy Policy Act of 2005 based measures for industry, transportation, public, and commercial/residential sectors: MEPS target equipment expansion continued promotion of Energy Star program, 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 white paper 2004 for industry, transportation, public, and commercial/residential sectors: expansion of target equipment of MEPS standard, various voluntary agreements and programs, utilization of partnership schemes
	Efficiency improvement of nuclear power generation	Efficiency improvement of nuclear power generation	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%	－21%	0%	－12.5%
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	Renewable Obligation Order 2005, Energy Act 2004, 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 Programme 2007/ Energy Efficiency Action Plan 2007/ National Climate Change Programme 2005	Energy White Paper 2003 (Livre blanc sur les energies 2003)	Energy White Paper 2003 (Our Energy Future-Creating a Low Carbon Economy 2003)
	EU Energy Conservation Plan, SAVE Program, etc. (Intelligent Energy Europe 2003-2006)		Energy Efficiency Action Plan 2007	
	Implementation of energy conservation program based on the EU Parliament/Board decision (No.1230/2003/EC)			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	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 Trade and Industry-DTI
		Federal Ministry of Transport, Building, and Housing-BMVBW	Ministry for the Environment	Department for Transport-DfT
				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

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).

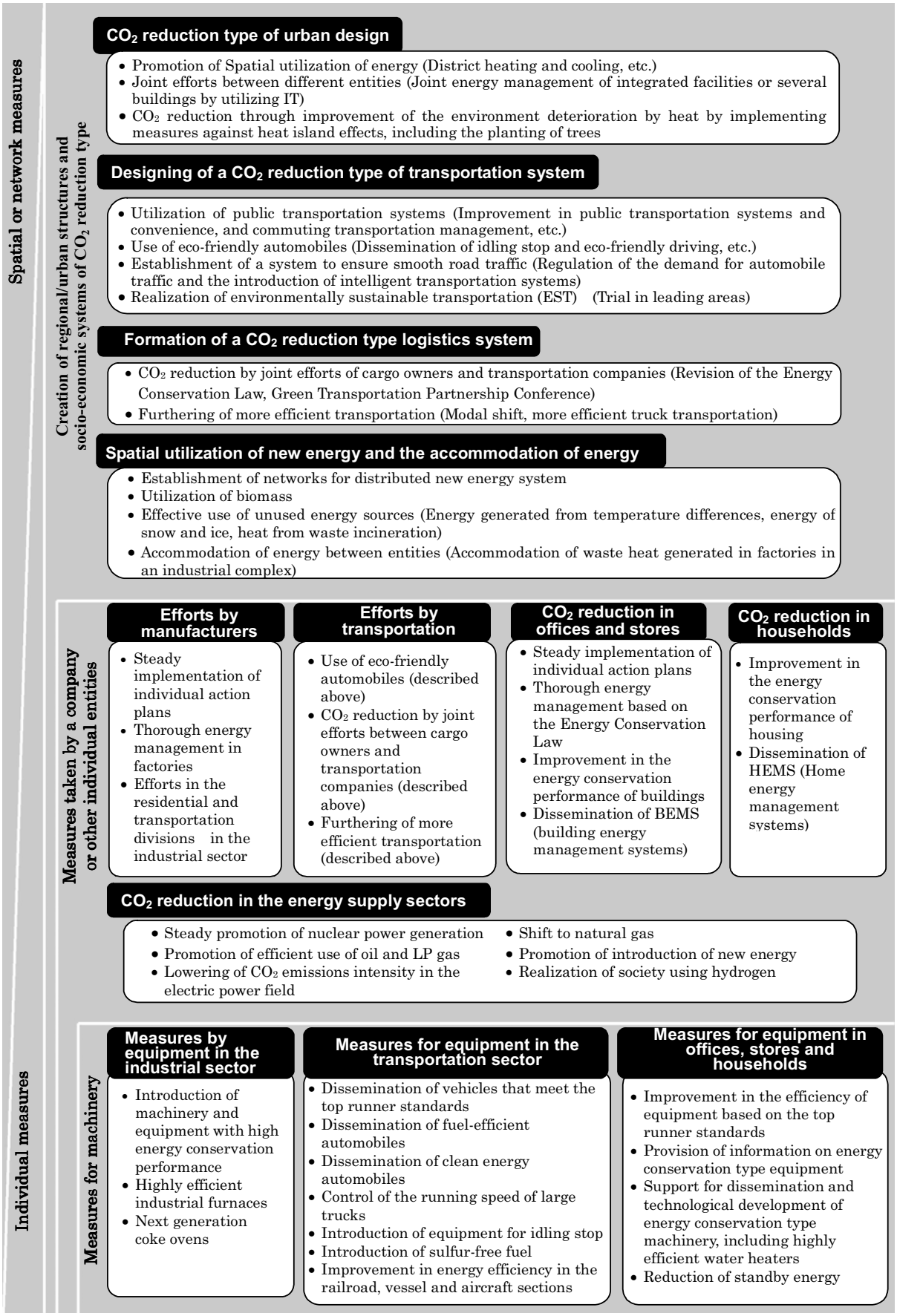
(2) Kyoto protocol target achievement plan

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.	4,980	5,030
	Promotion of introduction of fuel cell		20	2,200
	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, residential and commercial, and transportation, but the FY 2004 data marked the ratio of 2:1:1, 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 factories

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.

Moreover, in unison with the revision of the Energy Conservation Law, new criteria 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. In addition, there are financial incentives such as low interest loan programs to boost investment in developing energy efficient products and technologies under the law concerning energy conservation and recycling assistance and tax breaks under the tax measures to promote the investment in restructuring the country's energy supply-demand.

2) Relevant legislation

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

a) Enactment of a basic policy concerning the rational use of energy (Cabinet decision announced by the Ministry of International Trade and Industry (MITI) on 15 July 1993)

b) Guidelines for the rational energy utilization in factories (MITI announcement No. 39 dated on 25 Jan 1999).

c) Guide for making a medium-long term plan of those who establishes factories for undertakings of manufacturers among the Type 1 Specified Business Operator' (Announcement No.1, Ministry of Finance, Ministry of Health and Welfare, Ministry of Agriculture, Forestry, and Fisheries, MITI, and Ministry of Transportation dated on 25 February 1999).

d) Guide for making a medium-long term plan of those who establishes factories for undertakings of mine industry, electric supply industry, gas supply industry, and heat supply industry among the Type 1 Specified Business Operator' (MITI Announcement No. 108 dated on 25 February 1999).

ii) Supporting measures

a) Support based on the Energy Conservation and Recycling Support Law

b) Low-interest financing by the Development Bank of Japan, etc.

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

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

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

iii) Commendation, dissemination and publicity activities

a) Commendation toward excellent energy control-designated factories

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

iv) Technology development

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

b) 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 (2008)
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 and confidence-building 2. Further improvement of efficiency in thermal power generation and discussion on the management and control of thermal power source 3. Diffusion and expansion of renewable energy 4. Research and development of technology contributing to energy conservation, CO_2 recovery and storage technology.
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. ・As an additional measure, use a million tons of plastic waste in blast furnaces, etc. on the assumption of the establishment of appropriate collection systems and others. *Take an average of five years from FY2008 to FY2012 to achieve the above target.	1. Recovery of waste energy (increase of recovery of by-product gas, steam, CDQ steam etc.) 2. Efficiency improvement of facilities (new installation and remodeling of in-house power generators, installation of regenerative burners, introduction of high efficiency oxygen compressor) 3. Reduction of process, making the process continuous (introduction of direct rolling etc.) 4. Improvement of operation (power saving, compressed air saving, steam saving, fuel saving activities, reduction of ratio of reducing agent) 5. Investment on energy conservation such as efficiency improvement at the renewal of facilities
Japan Chemical Industry Association (JCIA)	・Aim to reduce energy intensity to 90% of the FY1990 level by FY2010. ・Develop the chemical industry's own technologies such as catalytic technology, biotechnology and process technology in harmony with the environment. ・Contribute to CO_2 emission reduction measures in developing countries as well as transferring energy conservation technology and environmental protection technology which have been developed in the chemical industry.	1. Efficiency improvement of facilities and equipment (installation of high efficiency facilities, replacement of equipment and materials etc.) 2. Rationalization of process (process rationalization, process conversion etc.) 3. Recovery of waste energy (recovery of waste heat and cool energy, turning waste fluid/ waste oil/waste gas into fuel etc.) 4. Improvement of operation methods (condition change of pressure, temperature, flow etc.) 5. Fuel switch and others (fuel switch, product modification etc.)
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 (among refining facilities etc.) 3. Additional construction of recovering facilities of waste heat and waste energy (waste heat boiler, recovery equipment of furnace exhaust gas heat, etc.) 4. Efficiency improvement by appropriate maintenance of facilities 5. Adoption of efficient equipment and catalyst 6. Participation in "Industrial Complex Renaissance" (sharing of heat energy among neighboring factories in industrial complex)

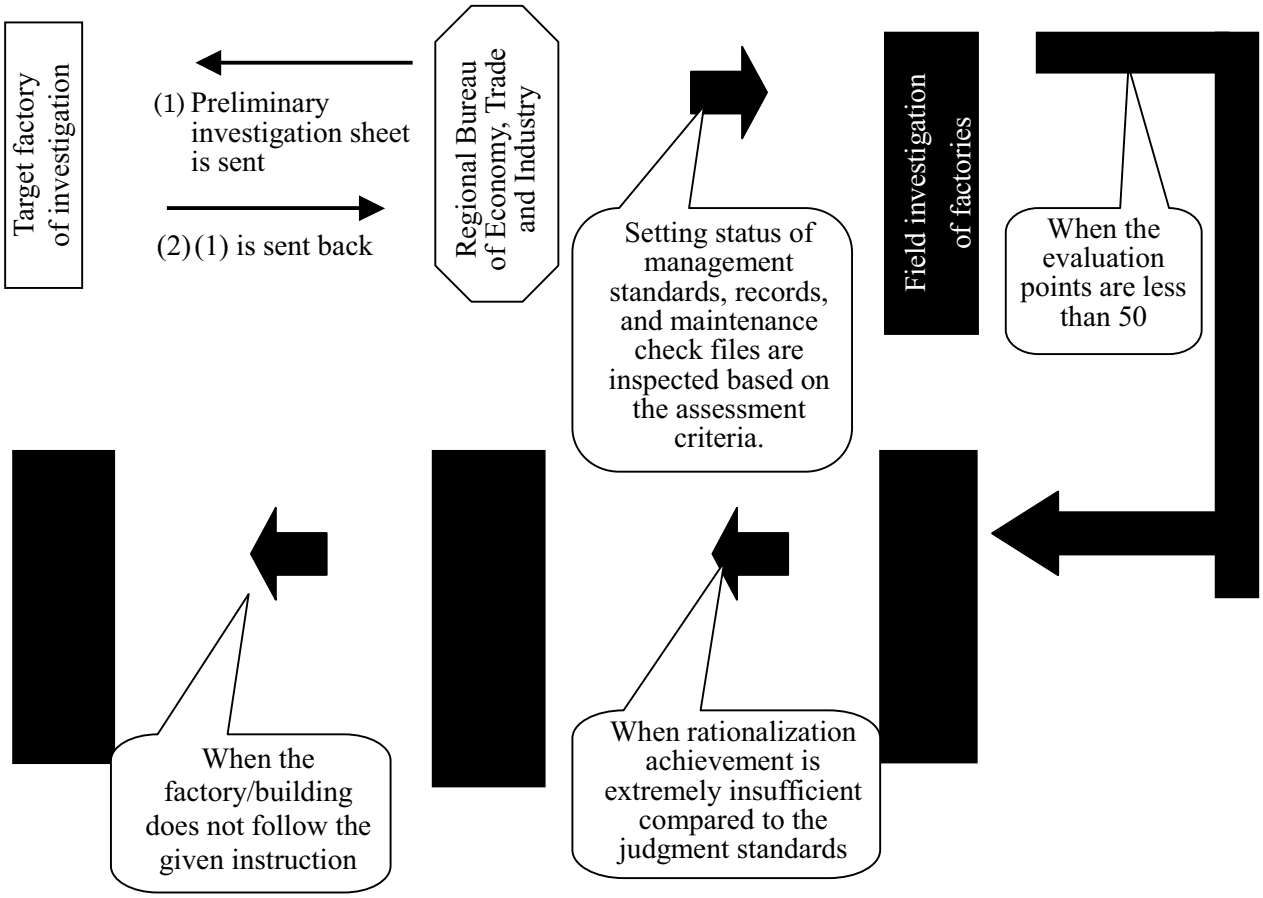
Name of Organization	Target	Measures to Attain Goals
Japan Paper Association	・In the period from FY2008 to FY2012, aim to reduce fossil energy intensity per product by an average of 20% and CO_2 emissions intensity derived from fossil energy by an average of 16% compared to the FY1990 level. ・Strive 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 inverters etc.) 2. Introduction of high efficiency facilities (high-temperature high-pressure recovery boilers, high-efficiency cleaning equipment, low-differential pressure cleaner, etc.) 3. Revision of manufacturing process (shortening and integration of processes) 4. Fuel switch (switch to biomass energy, waste energy)
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. New installation and remodeling of energy conservation equipment (high-efficiency clinker coolers etc.) 4. Replacement of facilities (including repair of facilities)
Japan Automobile Manufacturers Association, Inc. (JAMA)	・In the period from FY2008 to FY2012, reduce the total CO_2 emissions from production plants of 14 member companies by an average of 12.5% compared to the FY1990 level.	1. Energy supply side measures (introduction of energy conservation facilities, improvement of efficiency of boilers, introduction of cogeneration, introduction of high-efficiency compressors, introduction of wind power generation, high efficiency transformers) 2. Energy demand side measures (energy conservation in coating line, introduction of invertors for fans and pumps, energy conservation in lighting and air-conditioners) 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
Japan Gas Association (JGA)	・In the period from FY2008 to FY2012, reduce CO_2 emissions intensity per $1m^3$ of gas in the process of city gas production and supply to an average of 12g- CO_2/ m^3 from 84g- CO_2/ m^3 in FY1990 and CO_2 emission to an average of 0.54 million ton- CO_2 from 1.33million ton- CO_2 in FY1990.	1. Promotion of switching materials (to make high calorie) to natural gas, etc. 2. Further Promotion of energy conservation measures (utilization of LNG cold energy, efficiency improvement of facilities, reduction of heat loss, review of the operation of LNG pumps, speed control of seawater pumps)
Scheduled Airlines Association of Japan	・Reduce CO_2 emission derived from aviation fuel by 12% per production unit (Available seat kilometers) by FY2010 compared to the FY1990 level.	1. Replacement for new and fuel efficient airplanes and promotion 2. Optimization of routes and time by introducing new air traffic control support system (CNS/ATM), etc. 3. Reduction in weight of loaded equipment and goods 4. Expansion of engine washing with water
Japan Department Stores Association (JDSA)	・Reduce energy intensity in stores (Floor space × Energy consumption per store hours) by 6% in the target years (from FY2008 to FY2012) compared to the FY1990 level.	1. Promotion of introduction of ESCO projects 2. Setting of top runner standard (further promotion of energy efficiency by comparing with other stores) 3. Introduction of energy conservation equipment, rooftop gardening, utilization of natural energy

Source) Prepared from "Results of the FY2007 Follow-up to the Keidanren Voluntary Action Plan on the Environment (Section on Global Warming Countermeasures, Version Itemized per Business Category), in March 2008" (Website by Keidanren (Japan Federation of Economic Organization))

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

A field investigation targeting the "Type 1 designated energy management factories" ("overall factory check") has been conducted since FY 2001 guided by METI. 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-the-spot inspection.

The flow diagram of full factory check is shown below.



Source) "Energy conservation measures" (2005 edition) by the Energy Conservation Measures Section, the Agency for Natural Resources and Energy

(5) "Spill-Over" for dissemination and promotion of energy conservation technology

1) The concept of the "Spill-Over"

As energy conservation is an important policy, the Energy Conservation Technology Strategy was formulated in June, 2002 by the government (Agency for Natural Resources and Energy-ANRE). This strategy puts a stress on promoting a concept of "Spill-Over" to actively spread existing energy conservation technologies to meet technological needs across various sectors and fields.

This term "Spill-Over" is originally used as a technical term to indicate the overflow of water, but now used in various specialized fields. In the telecommunications sector it indicates a condition in which information communicated by electric waves is leaked; in chemistry it indicates a condition in which chemical species move on the surface of a catalytic agent, promoting a reaction; and in economics it indicates a condition in which public investment has secondary effects. In the field of energy conservation technology, "Spill-Over" indicates a condition in which cross-sectional/basic technology has impacts on other fields and categories, where further development and improvement generates better energy conservation technology. This energy technology again has impacts on other fields, thereby reaching full growth in a cyclical way.

Applying an excellent energy conservation technology into other fields and categories and expanding its utilization has advantages in that: It does not require duplicated investment in development costs; it requires shorter development duration; and it has quick effects. Highly effective energy conservation technologies are already in place. Spilling over the many excellent technical elements and energy conservation methods of these technologies will immediately contribute to the promotion of energy conservation.

2) Selection and categorization of technologies with high feasibility for spill-over

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. Measures based on results of technology development, those that took a hint from spill-over from other fields and introduced new production methods, and 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 an energy management system which makes the conditions visualized
c) Finding an energy conservation theme by abolishing the existing ideas and reviewing designed values and management criteria
d) Use of surplus energy, or effective use of 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 energy conservation methods by the Energy Service Company (ESCO) projects
h) Effective use of heat, and mutual effective use of heat and materials
i) Energy conservation measures for compressed air
j) Energy conservation measures for steam
k) Energy conservation measures for air conditioning
l) Energy conservation by coordination among factories and workplaces
m) Reduction of the consumption of the fixed consumption of energy

3) 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.

Source) Agency for Natural Resources and Energy-ANRE: Report by the committee of the strategy for energy-saving technology, June 2002

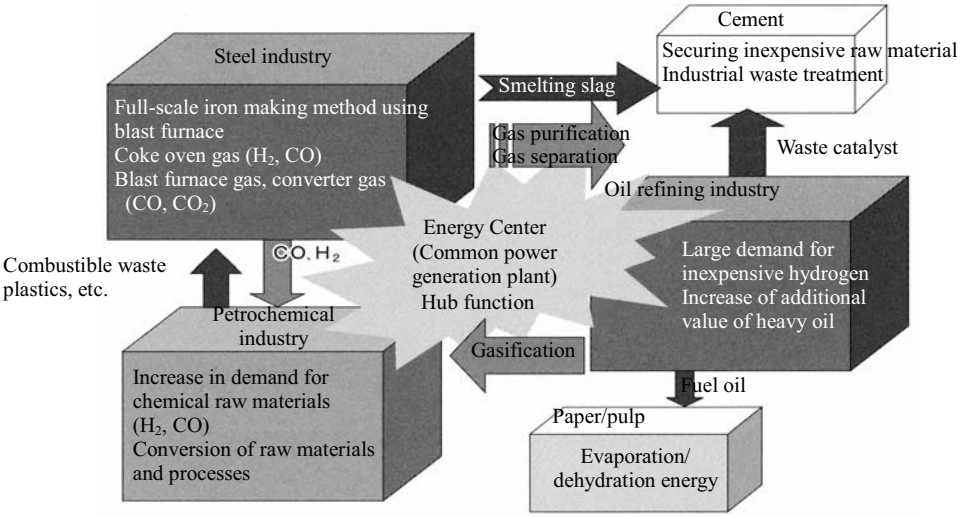
Methods of reducing the fixed consumption of energy introduced by excellent cases

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

Comprehensive energy conservation can be attempted by mutual utilization of exhaust heat and waste in various neighboring factories in an industrial complex, etc. For example, hydrogen, which accounts for 55% of the gas generated in coke ovens of steel plants, can be supplied to oil refineries, where the hydrogen is refined and used for desulfurization, if the oil refinery is close to the steel plant. It is expected that adoption of iron carbide as a raw material used in electric furnaces will not only compensate the electricity required, but also allow surplus electricity to be sold and hydrogen to be supplied to neighboring plants and communities.



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

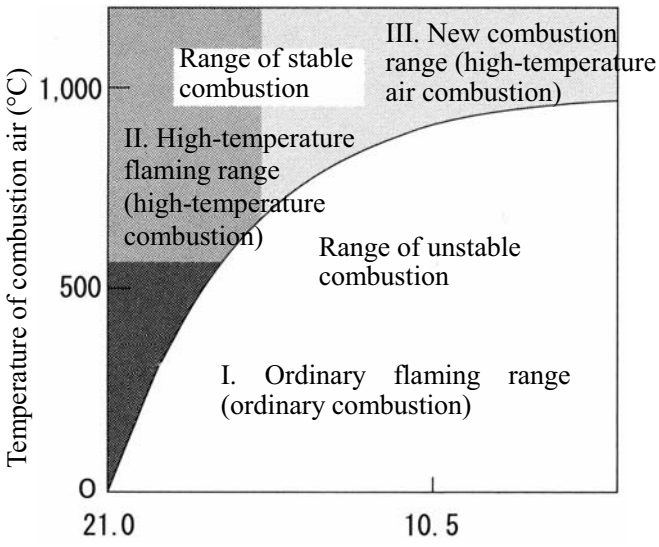
1) Development of high-efficiency industrial furnaces[*1]

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.

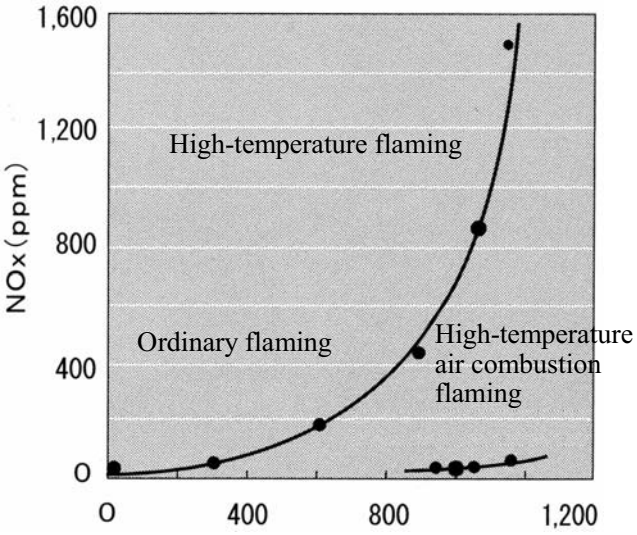
In the "Field test project on high-efficiency industrial furnace introduction,"[*2] high-temperature air combustion technology was applied to commercial furnaces. The field test, which targeted 167 industrial furnaces, confirmed an energy conservation effect corresponding to reduction of 160,000 kL of 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 is being conducted to practically apply this technology to non-industrial combustion and heating facilities that consume a large amount of energy.

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.

Fuel cells are regarded as a prospective technology to solve global warming problems in a future hydrogen-oriented society. This is because fuel cells are applicable to various fields including vehicles such as passenger cars and buses, cogeneration systems for households and office buildings, distributed power generation systems installed in places needing to replace mass-concentrated commercial power generation systems, and power sources to replace secondary batteries for PCs and cellular phones. However, all types of fuel cells face challenges to improve durability, prolong life span, and lower cost. Especially, for the types that require a catalyst, cutting down platinum use and developing alternative catalysts are big challenges.

(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	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 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 Optimization control of intervals of regenerative burner	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

Source) Survey by the Energy Conservation Center, Japan

Business category / Items		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 Operation condition 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
(4) Others			Improvement of defect rate in quality control	Installation of distribution type boiler Introduction of cogeneration system	Heat recovery of solid waste incinerator (power generation steam, etc.) Introduction of cogeneration system

(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
		Multi-purpose converter	Establishment of optimal process
	Development of materials for enabling high-efficiency	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	
		Increase in amount of power generation by gasification technology and re-powering	Development of recovered lignin utilization and improvement or efficiency in recovering chemicals
			Decrease in energy required for gasification

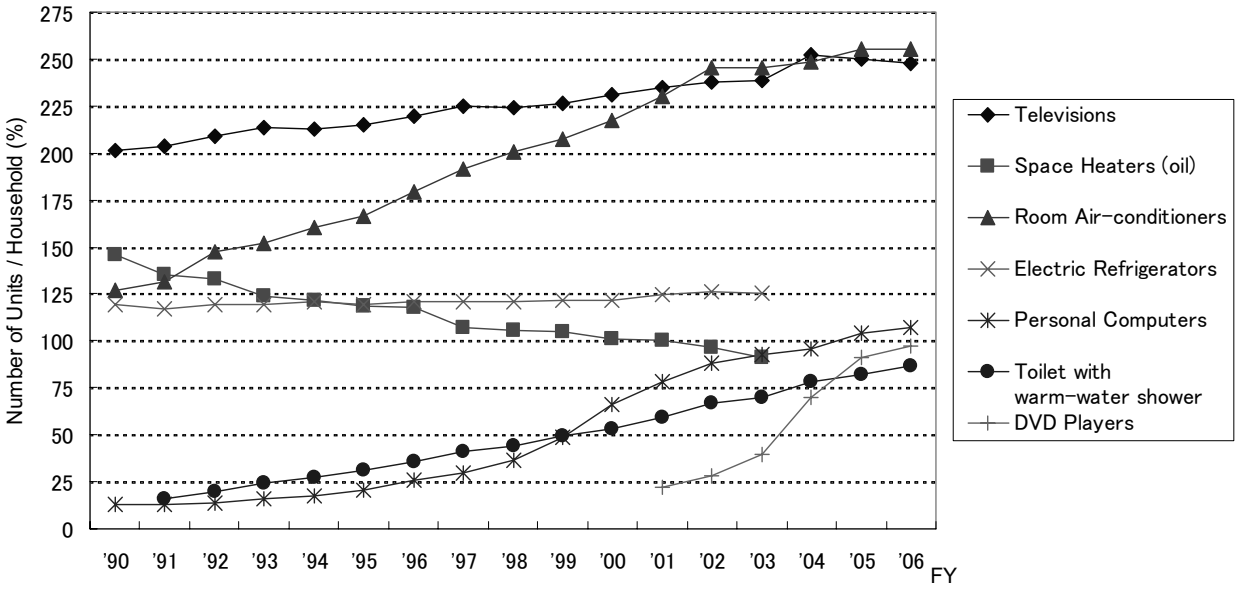
Source) Surveyed by the Energy Conservation Center, Japan

4.2 Equipment

(1) Energy situation for equipment

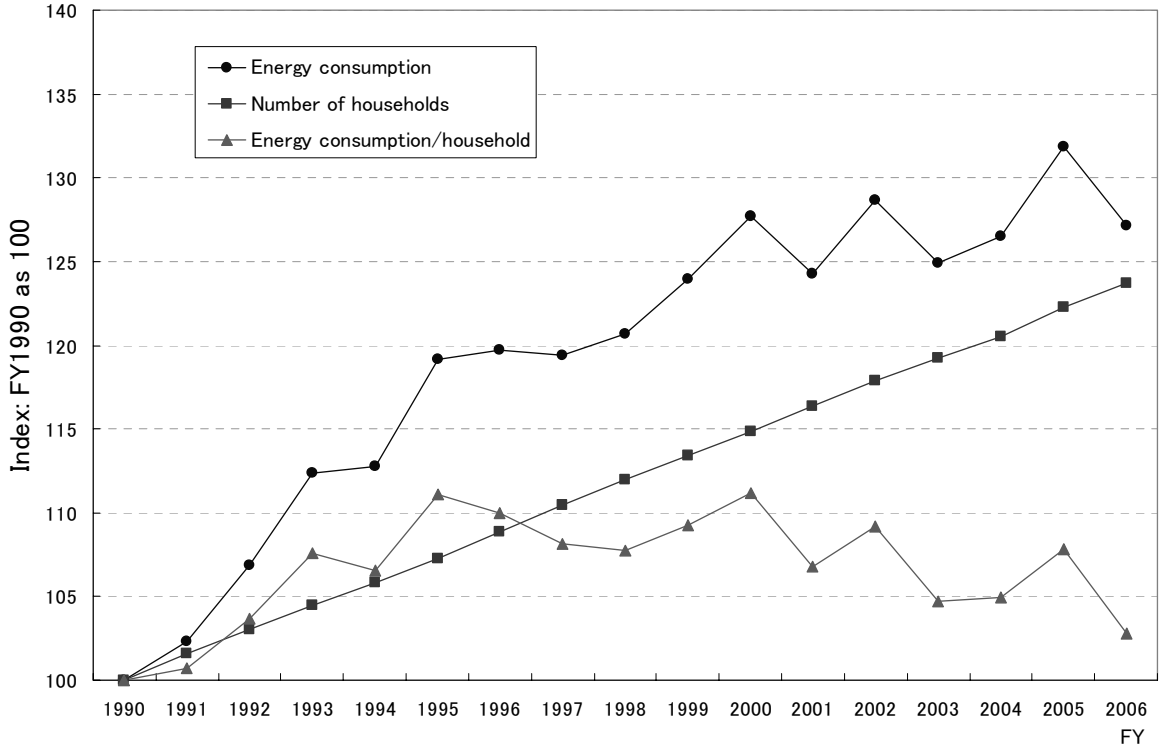
In Japan in the field of equipment, the per-household energy consumption has increased, thus contributing to the country's steady increase in the household sector. This trend is regarded caused by the country's societal factors such as lifestyle change leading to more energy consumption, individual's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

Recent trend of appliance ownership rate at household (1990 to 2006)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

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	Number of owned units (10^3units)	Shipment volume in 2004 (10^3units)	Energy Consumption (crude oil equivalent: 10^3kl)
		2004	2004	2004
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	Flourescent lighting fixtures	384,144	40,705	6,781
7	Standard 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	Rice cookers	37,224	6,310	385
18	Prionters, Monitors	46,532	14,386	373
19	Elevetors	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	Diswashers (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	Copiers, MFDs	4,190	728	83
33	VCRs	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

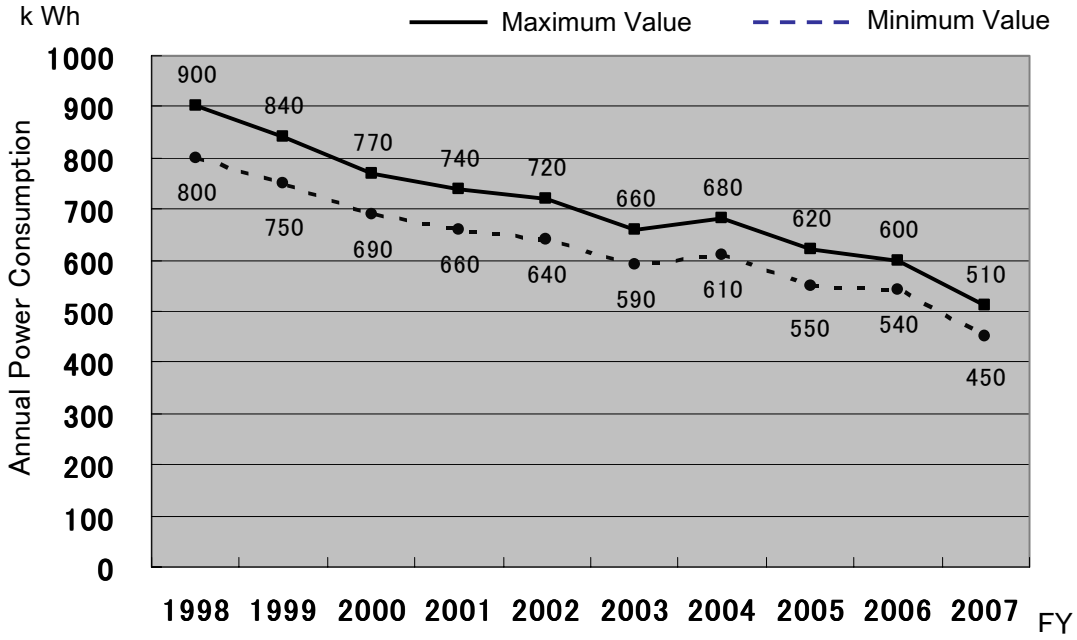
* The value are shown here as reference only because DVD recorders are included in VCRs.

Notes) : Current target products under Top Runner Program

No.12 and 16 are the next target products.

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.

Evolution of refrigerators' annual electricity consumption
(1998-2007 Models, Rating capacity 401~450L)



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) Evaluation criteria for machinery and appliances under top runner program

The evaluation criteria, etc. for manufacturers, etc. regarding improvement of the performance of "Designated Machineries" pursuant to the provision in Paragraph 1 of Article 18 of the Law Concerning the Rational Use of Energy (Law No.49 of 1979) are defined and notified by the category of machinery and appliance. The details of the evaluation criteria for machinery and equipment are shown in the web-site of ECCJ. (http://www.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 (Projected)
1	Passenger Vehicles	Gasoline, Diesel	2015	2004	23.5%
		LP Gas	2010	2001	11.4%
		Small Buses	2015	2004	7.2%
		Route Buses, General Buses	2015	2002	12.1%
2	Freight Vehicles	Gasoline, Diesel	2015	2004	12.6%
		Trucks	2015	2002	12.2%
3	Air Conditioners	Non-ducted/Wall mounted/Cooling･Heating/under 4kW	2010	2005	22.4%
		Other than the above(Cooling･Heating)	2007*	1997**	63.0%
4	TV Sets	LCD, Plasma	2008	2004	15.3%
5	Video Cassete Recorders		2003	1997	58.7%
6	Flourescent Lights		2005	1997	16.6%
7	Copying Machines		2006	1997	30.0%
8	Computers		2008	2001	69.0%
9	Magnetic Disc Units		2008	2001	71.0%
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	11.0%
21	DVD Recorders	non DTB-capable	2008	2004	22.4%
		DTB-capable	2010	2006	20.5%

*2007 freezing year => Oct. 1, 2006 through Sep.30 2007, **1997 freezing year => Oct.1, 1996 through Sep.30, 1997

Source) Prepared from “Annual Energy Report FY2008” (METI), “Top Runner Program (Dec.2007)” (ECCJ)

6) Efficiency improvement achieved by top runner products

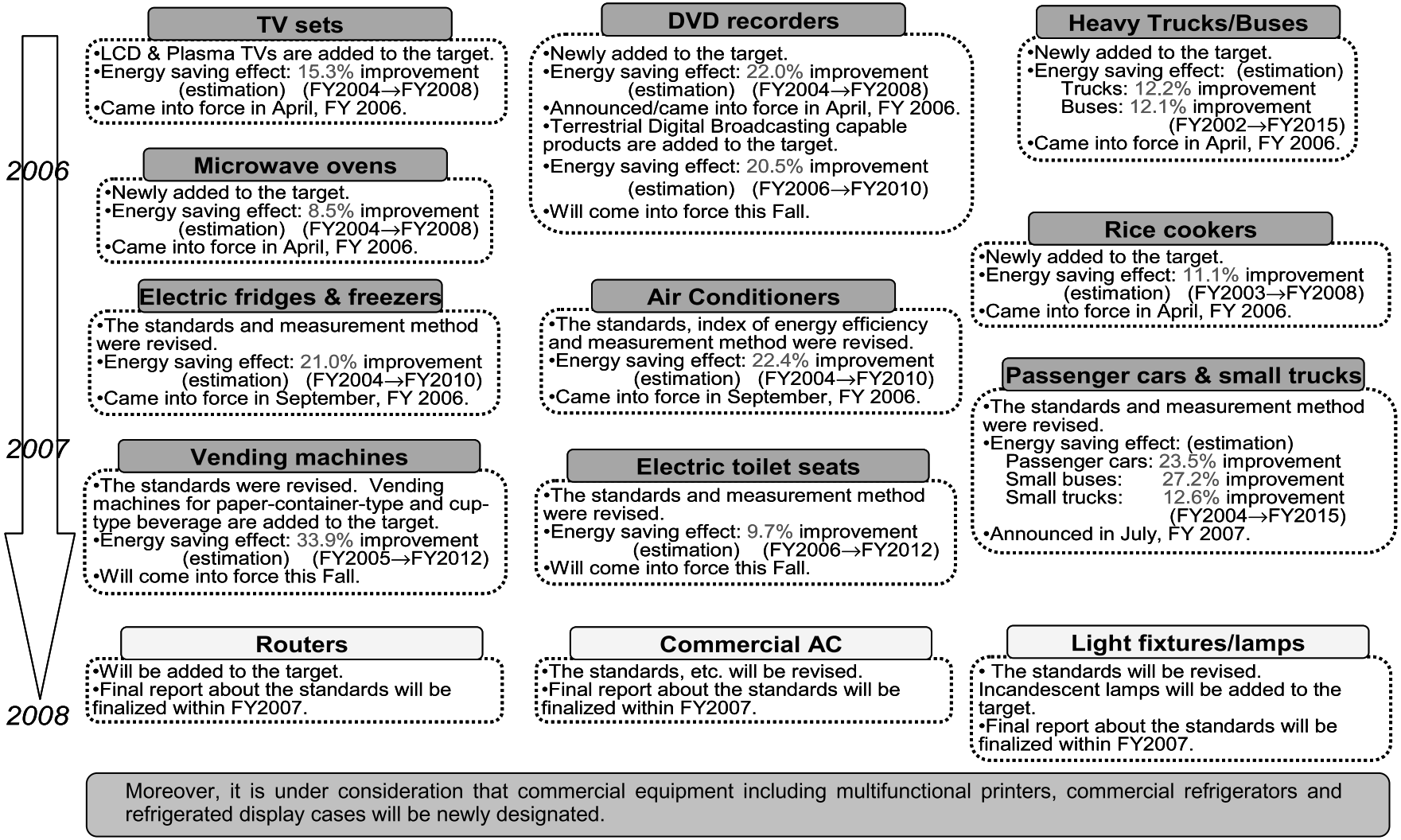
Equipment	Target Fiscal Year	Base Fiscal Year	Efficiency Improvement (Projected)	Efficiency Improvement (Actual)
Gasoline Passenger Vehicles #	2010	1995	22.8%	26.0% (FY2005)
Diesel Freight Vehicles #	2005	1995	6.5%	21.7%
Air Conditioners #	2004*	1997**	66.1%	67.8%
Fluorescent Lamps #	2005	1997	16.6%	35.6%
TV Sets (CRT)	2003	1997	16.4%	25.7%
Video Cassette Recorders	2003	1997	58.7%	73.6%
Copying Machines	2006	1997	30.0%	72.5%
Computers	2005	1997	83.0%	99.1%
Magnetic Disc Units	2005	1997	78.0%	98.2%
Electric Refrigerators	2004	1998	30.5%	55.2%
Electric Freezers	2004	1998	22.9%	29.6%
Vending Machines	2005	2000	33.9%	37.3%

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

Source) Prepared from “Annual Energy Report FY2008” (METI), “Top Runner Program (Dec.2007)” (ECCJ)

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%.

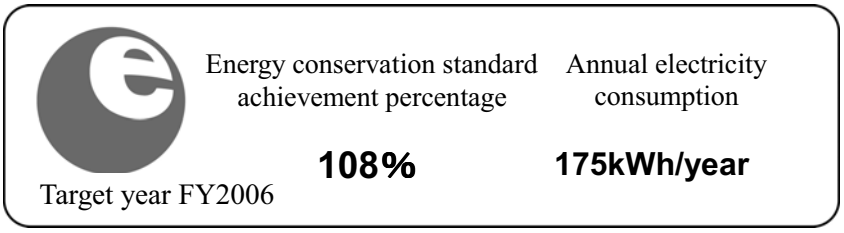
7) Recent revision and expansion of top runner program (after FY 2006)



(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 April 2007, the labeling is applied to 16 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	○		○
Fluorescent Lights	○		○
Electric Toilet Seats	○		○
TV sets	○	○	○
Computers	○		
Magnetic disks	○		
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	○		○

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

3) 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 2004, 43 large-scale stores and in FY 2005 88 large-scale stores and 18 small-scale stores were awarded. Effective in FY2004, Minister of Economy, Trade and Industry Award and Minister of Environment Award were established.

4) International energy star program

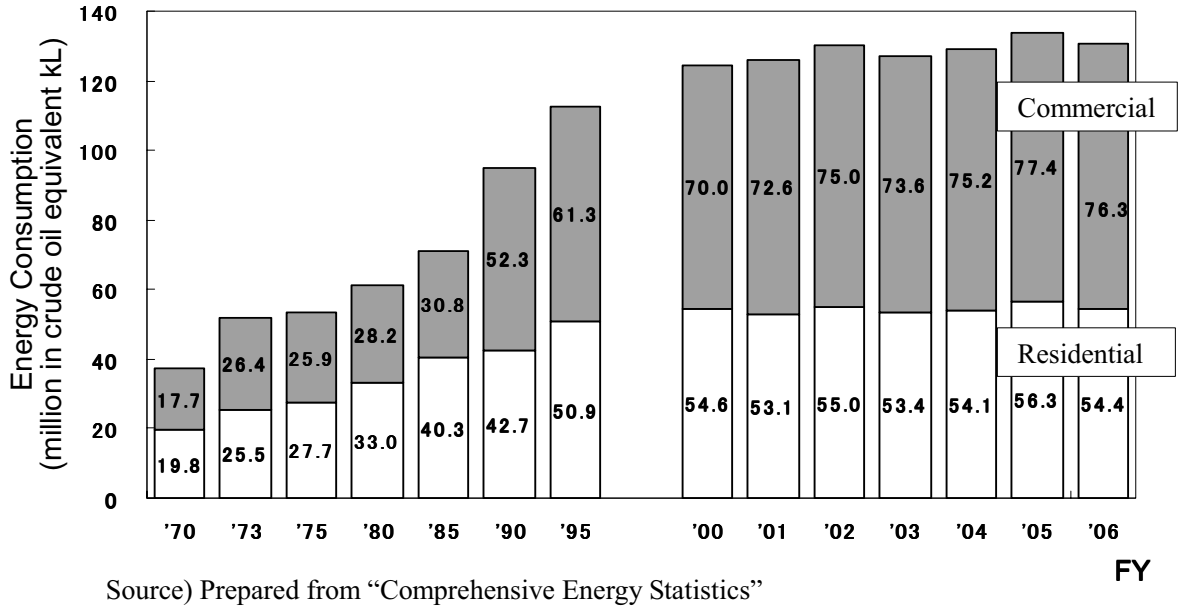
Established in the US in 1992, the international Energy Star program is a voluntary product labeling program designed to promote energy-efficient products. The US program has much wider application including programs for buildings, housings, domestic appliances and more. Japan joined in 1995 and only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

4.3 Commercial and 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 residential and commercial 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.

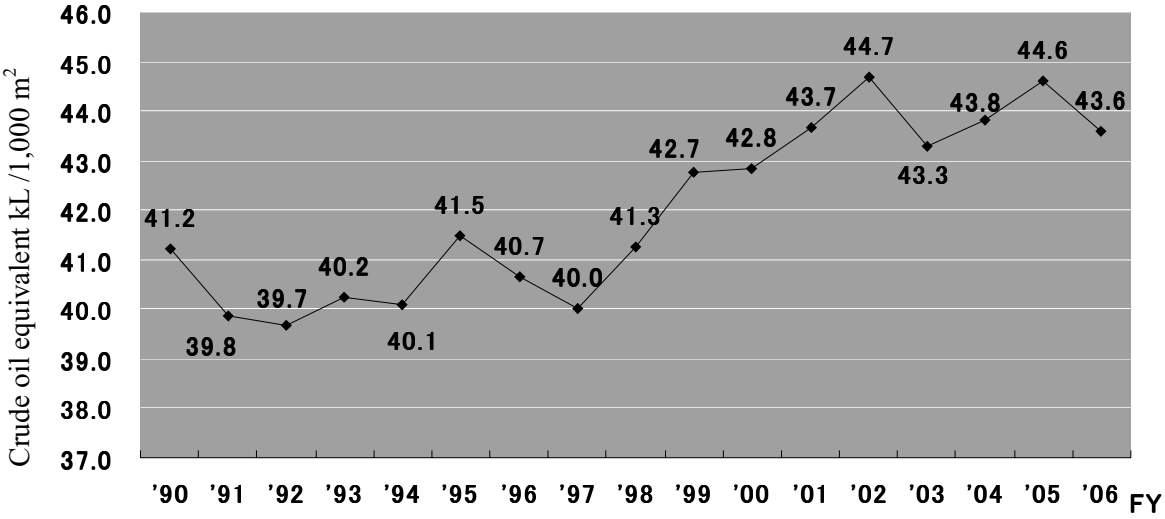
Commercial /residential sector final energy consumption



Source) Prepared from "Comprehensive Energy Statistics"

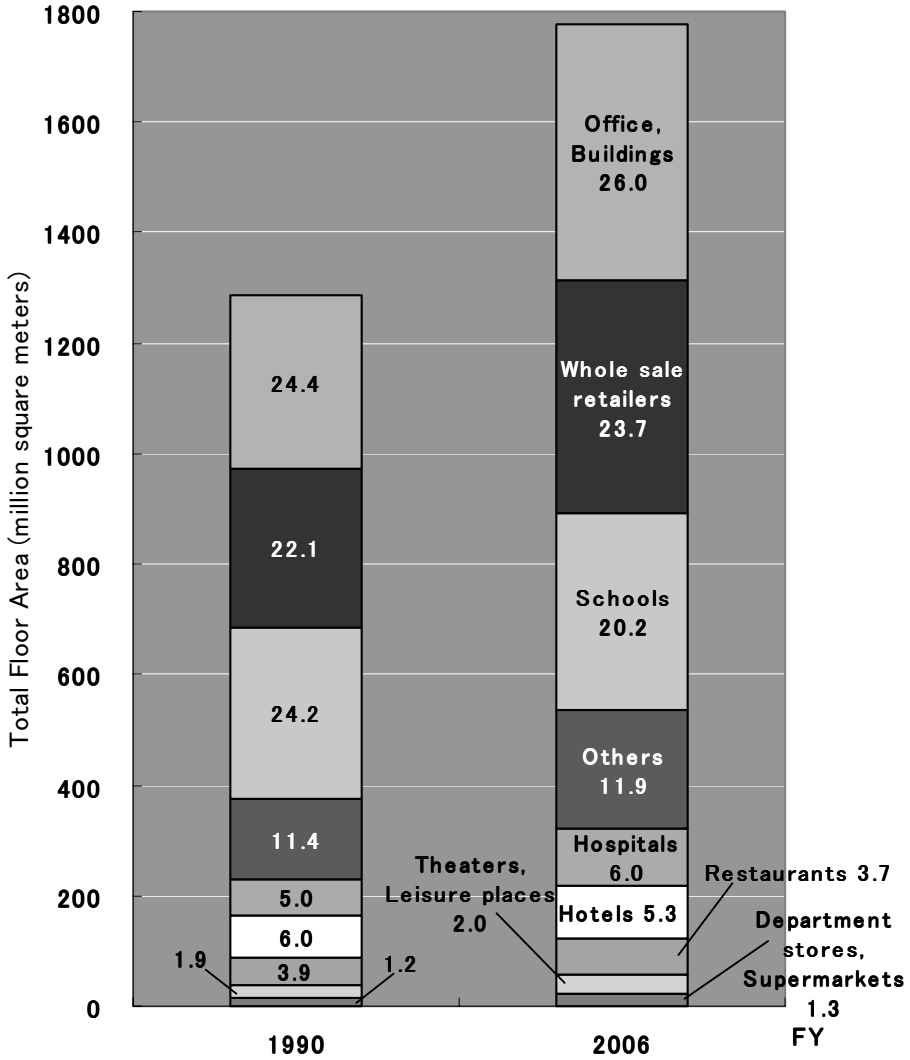
In the commercial sector, the energy demand has still been increasing in this sector, although the per-floor space energy intensity has remained roughly flat in recent years shown as below. This is due to the increase of the total floor-spaces and in FY2006, it showed approximately 38.2% rise from FY1991 in the country in all business types.

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



Source) Prepared from "Comprehensive Energy Statistics", "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

Buildings floor space share by business type (FY1990 and 2006)



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

(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 are 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) Support measures for houses

Extra financing from the Government Housing Loan Corporation is provided for energy conservation-oriented houses

b) Dissemination, publicity, etc. to promote energy conservation

i) To make various measures thoroughly known through the energy conservation.

Measures in summer and winter, which were decided by the Conference to Promote Energy and Resources Conservation Measures

ii) Introduction of energy conservation labeling system

(Japanese Industrial Standards (JIS) C9901)

iii) Spreading and publicity activities, etc., by the Energy Conservation Center, Japan, the Construction Environment and Energy Conservation Organization, etc.;

- 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 C&R sector
- Preparation for Energy Conservation Performance Catalogue (including 7 appliances: air conditioners, TVs, VTR, refrigerators, laundry machines, lighting equipment, and copiers)
- Establishment of a 'Heat Insulation Spreading and Promotion Liaison Conference', for general consumers and builders
- Implementation of a system to acknowledge excellent energy conservation building construction techniques, etc.

(3) 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)

(4) Other energy conservation measures in the commercial sector

1) Outline of the policies and measures in 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. Consequently, the business operators newly subjected to the "Type 1 Designated Energy Management Factory" are required to submit regular reports and mid-to-long term plans like the business operators already subject to the "Type 1 Designated Energy Management Factory".

2) Relevant legislation, etc.

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

i) Evaluation criteria for building owners regarding the rational energy use in buildings (Announcement No. 1 by MITI and Ministry of Construction on 20 March 1999)

ii) Official announcement of performance data of a diathermancy of construction materials (MITI on 8 April 1999)

iii) Outline of the International Energy Star Program System (Announcement No. 258 by METI on 30 March 2001)

b) Support measures

i) As to buildings for business that meet the effort guidelines in evaluation criteria 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)

c) Dissemination and publicity activities on energy conservation

i) Familiarize various measures through the Energy Conservation Measures in Summer and Winter, which were decided by the Conference to Promote Energy and Resources

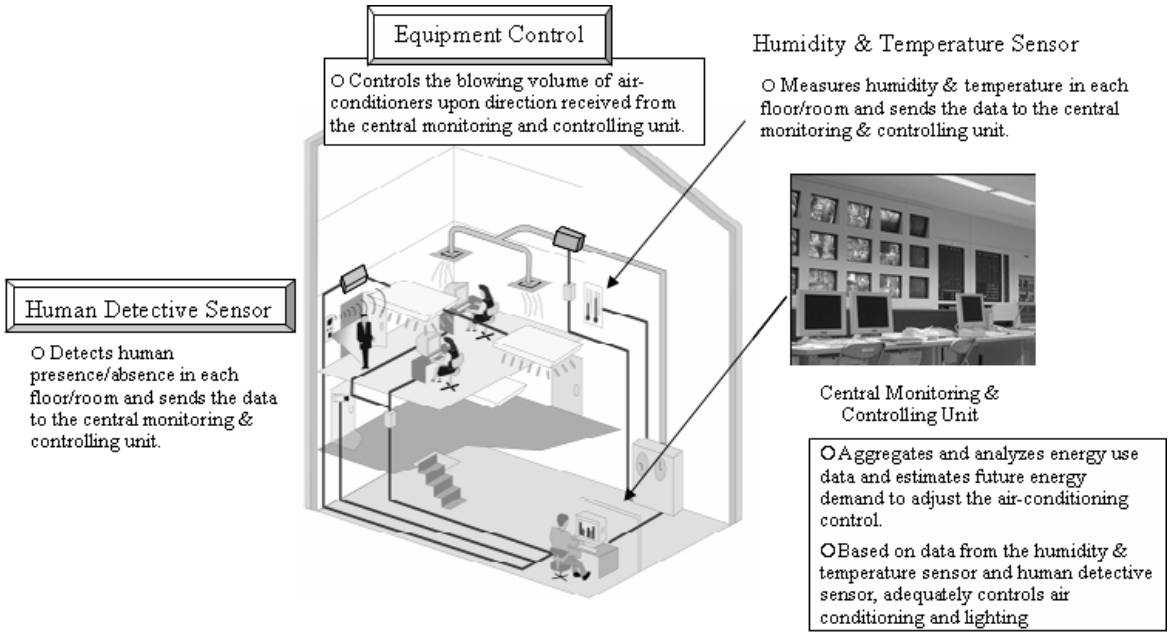
Conservation Measures.

ii) Dissemination and publicity activities pushed through by the Energy Conservation Center, Japan, the Construction Environment and Energy Conservation Organization, etc.

- 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, and grant an award to buildings performing well for environment and energy conservation
- National for energy conservation outstanding cases
- Evaluation on energy conservation for buildings, and business sector
- Japan Association of Energy Service Company (JAESCO)
- Certified mark system for Environment-and-energy friendly buildings

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

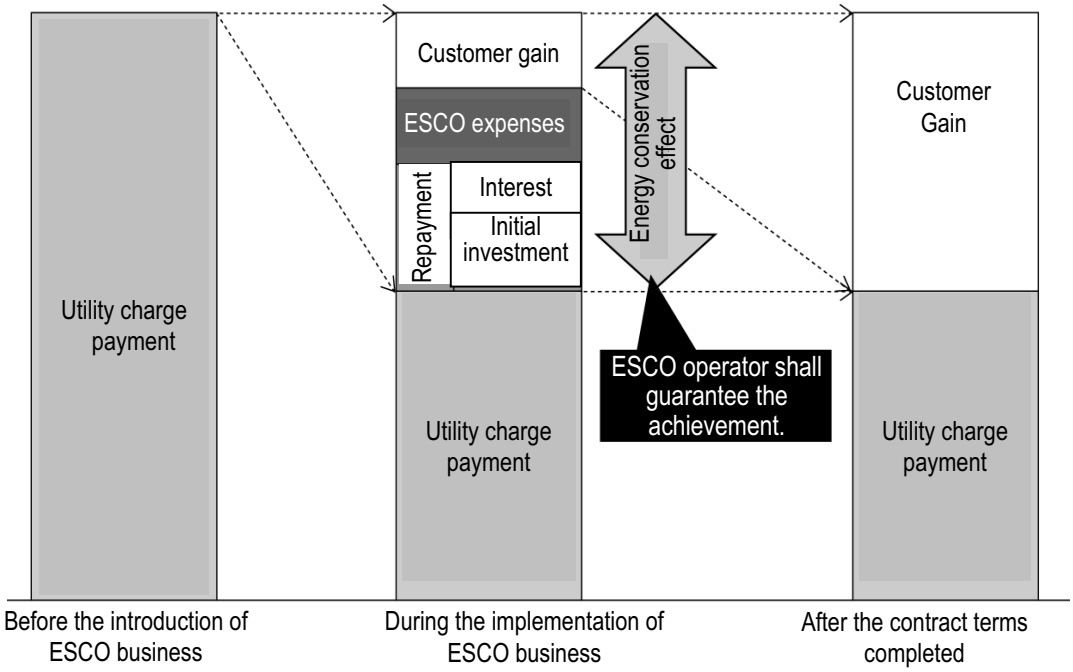
By using IT technology, BEMS system promotes and facilitates energy demand management for commercial buildings. The system ensures recognizing real-time room conditions in buildings by temperature sensors and/or the optimal operation of lighting and air-conditioning responding to conditions in the room.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



(6) Promotion of ESCO business

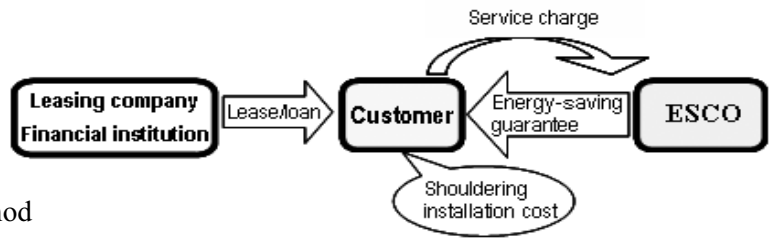
1) Outline of ESCO business

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

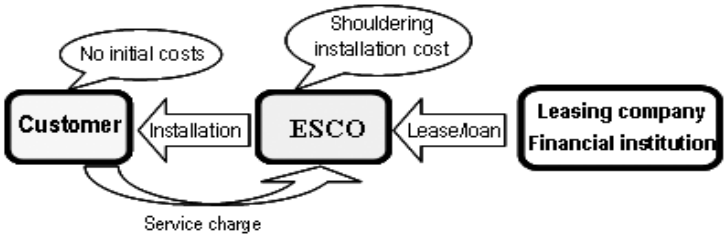


There are two methods of ESCO business as follows.

(a) Guaranteed method



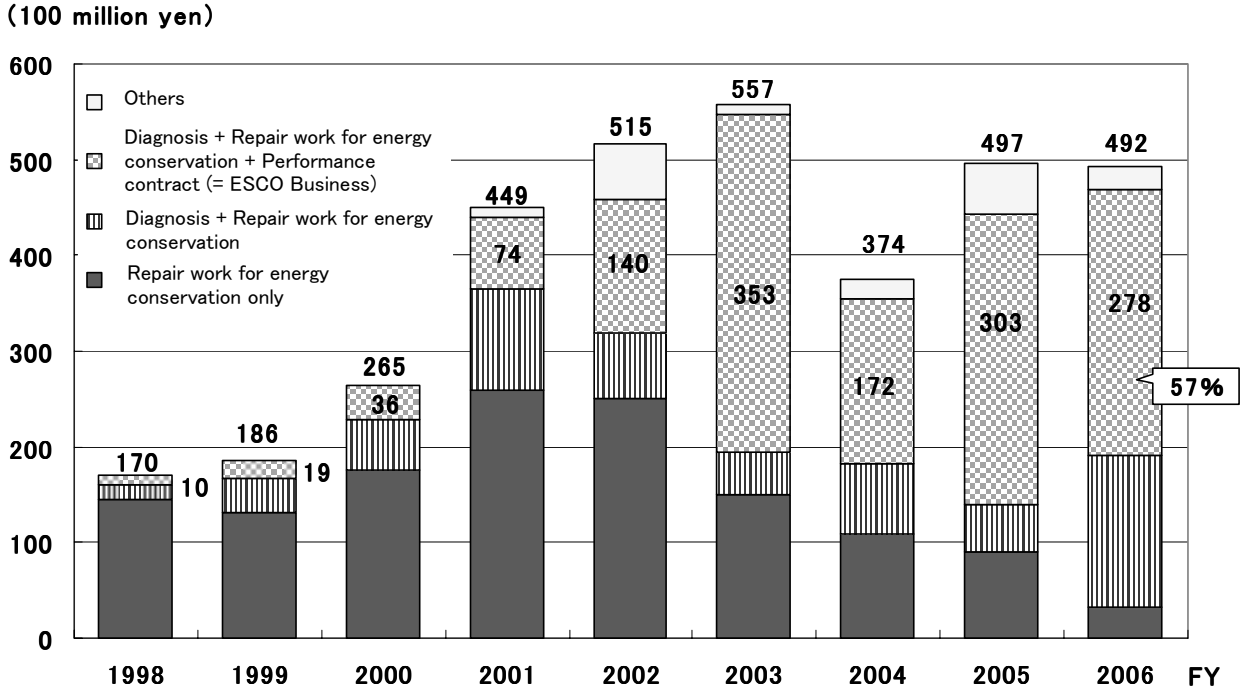
(b) Shared method



2) Size of the ESCO-related market

The ESCO-related market has been growing rapidly in these years. Though the amount of orders decreased in 2004, it recovered up to 90% of its 2003 level in the following year. In 2006, the total amount of orders was almost the same as that in the previous year, but the amount of orders received of ESCO business declined by 8% because the number of large plans decreased due to the rising cost of fuel. 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

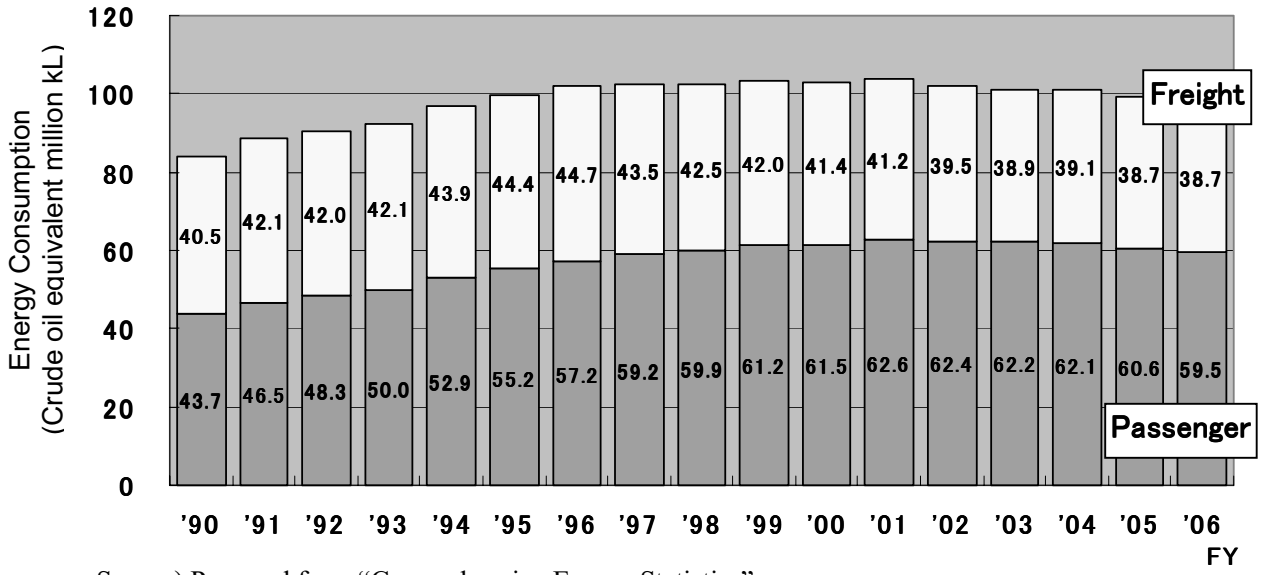
For further promotion of ESCO business, we have to make efforts to (1) promote the ESCO business in the public sector, (2) facilitate fund procurement, and (3) improve the recognition of the business. With respect to the item (1), we carried out the ESCO business as a model case at the Ministry of Economy, 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.

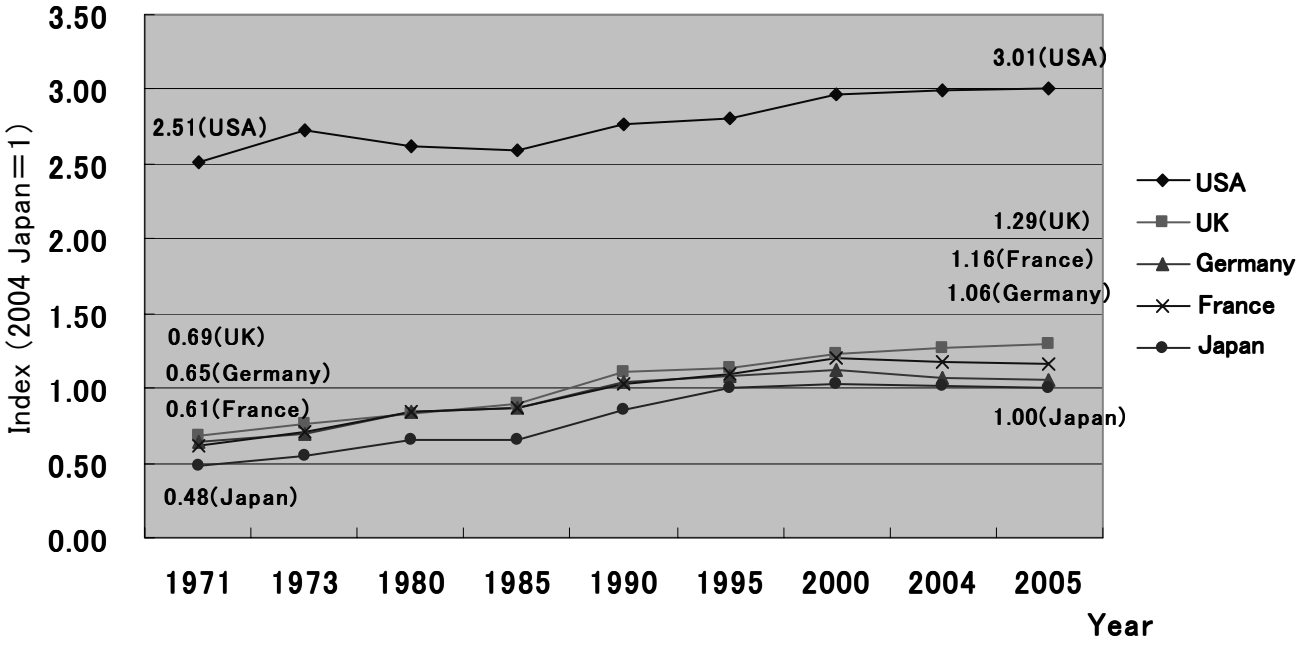
Evolution of energy consumption in freight and passenger transportation



Source) Prepared from "Comprehensive Energy Statistics"

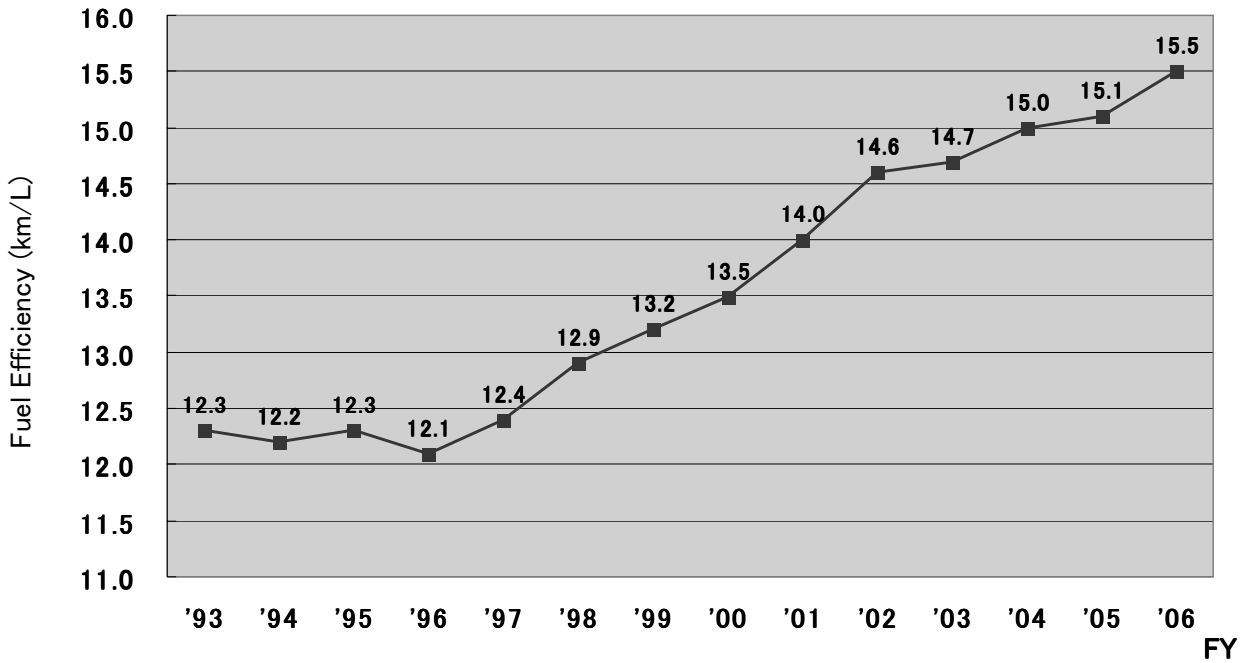
As shown in the below figure, Japan's per-capita transportation energy consumption marked lower compared to other major selecting countries, but those countries have successfully lessened the consumption level, as shown that Germany coming closer to Japan's lowest level. The energy consumed by passenger vehicles accounts for 90 % of the total fuel consumption in this sector. 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.

Transition of per-capita energy consumption in the transportation sector



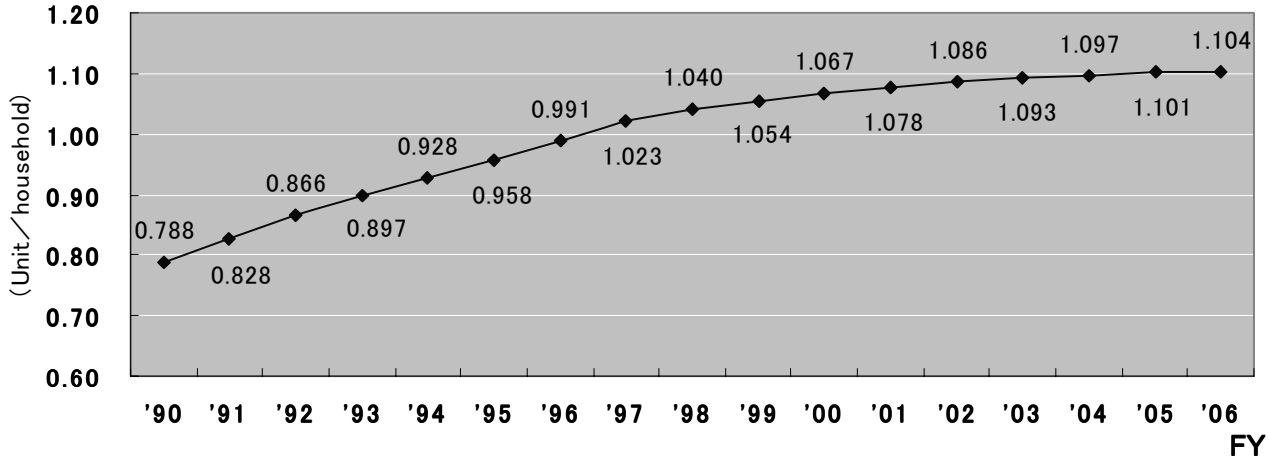
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

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



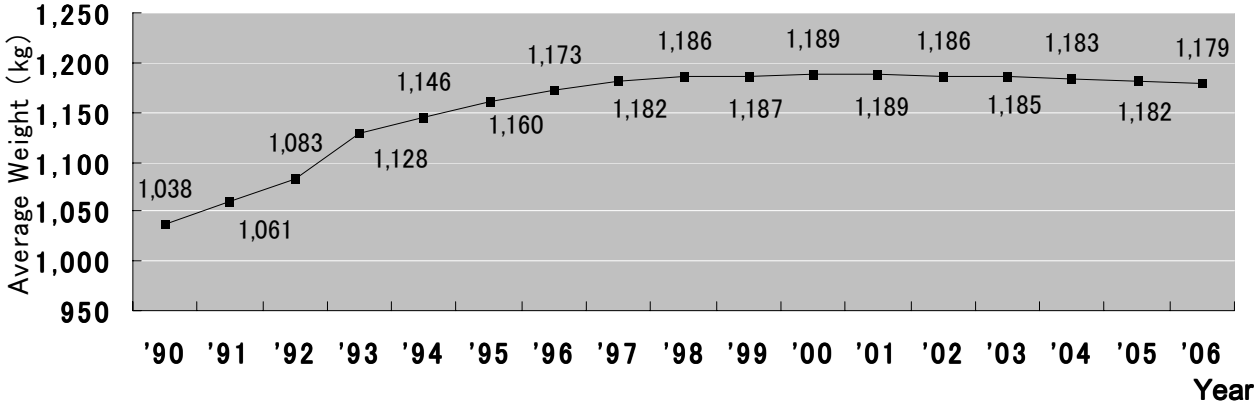
Source) Prepared from "Vehicle Fuel Consumption List" by Ministry of Land, Infrastructure, Transport and Tourism

Car ownership per household (1990-2006)



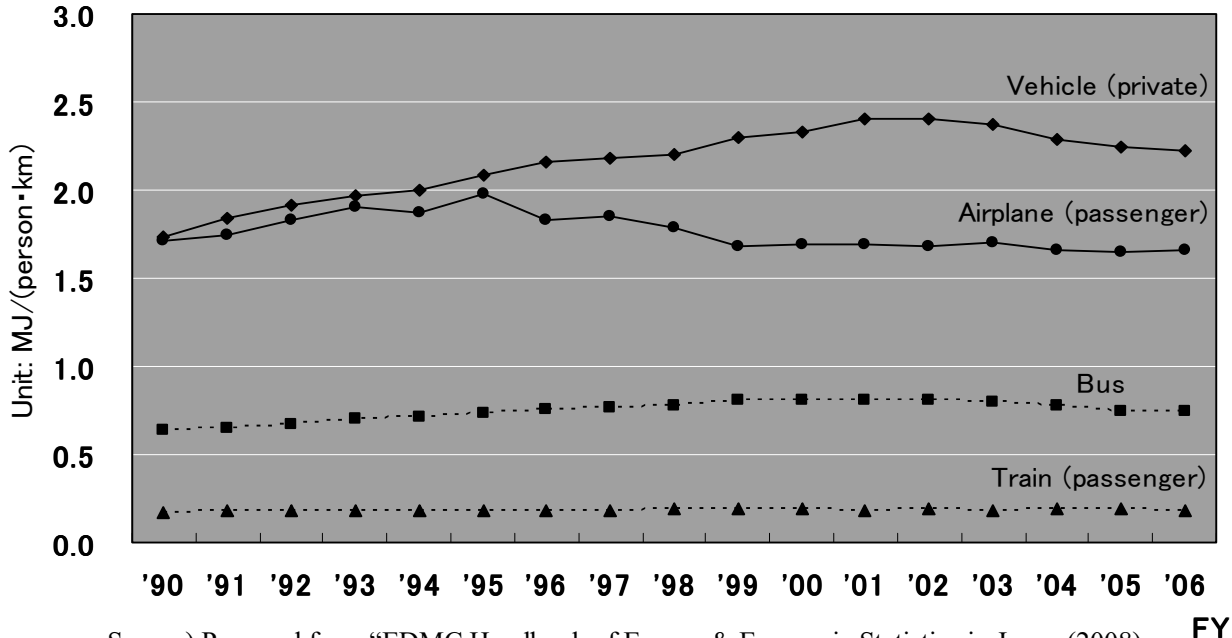
Source) Prepared from "Basic Residential Resister" and "Website of Automobile Inspection & Registration Information Association"

Average weight of owned vehicles (1990-2006)



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

Energy consumption intensity by transportation



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)

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

1) Outline of energy conservation measures in the transportation sector

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

i) Given the continuing increasing trend of the transportation sector's energy consumption and the growth from FY1990 to 2005 of energy consumption of passenger vehicles accounting for almost 90 % of that in the sector, 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.

ii) 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) Support 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

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.

ii) Improvement of energy efficiency of individual transportation equipment. Implementation of investment and financing, etc. to introduce energy efficient equipment.

c) Dissemination and publicity, etc., on energy conservation

i) To make various measures thoroughly known through the Energy Conservation Measures in summer and winter, of which measures were decided by the Conference to Promote Energy and Resources Conservation Measures.

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

iii) 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

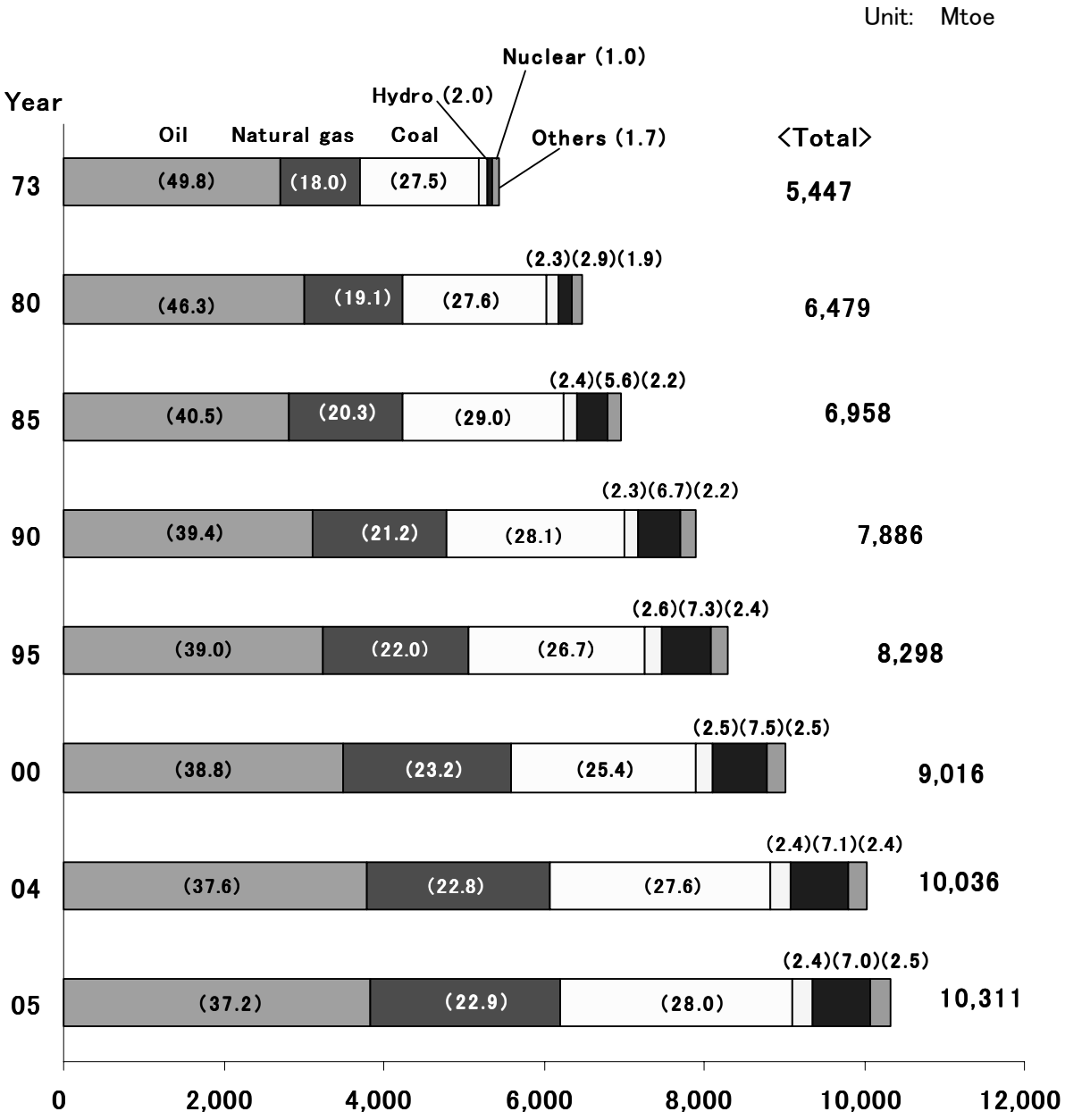
(1) Energy resource reserves

(in 2007)

		Oil	Natural gas	Coal	Uranium
Proved recoverable reserves (R)		1.2379 trillion barrels	177.36 trillion m^3	847.5 billion tons	5.47 million tons
Allocation by region	North America	5.6%	4.4%	29.6%	14.0%
	Central & South America	9.0	4.4	1.9	5.0
	Europe	1.4	3.2	5.9	-*
	Former Soviet Union	10.2	30.3	26.2	31.0
	Middle East	61.0	41.3	0.2	2.0
	Africa	9.5	8.2	5.8	18.0
	Asia / Pacific	3.3	8.2	30.4	26.0
Annual production (P)		29.7 billion barrels (81.5 million barrels/day)	2.94 trillion m^3	6.4 billion tons	40,263 tons
Recoverable years (R/P)		41.7 years	60.3 years	132 years	132 years
Source		BP statistics (year 2008)			【Reserves】 OECD・ NEA/IAEA Uranium (year 2007) 【Production】 World Nuclear Association

*With regard to Uranium, there is not “Europe” in the category of allocation by region, and 4% is allocated to “Others”.

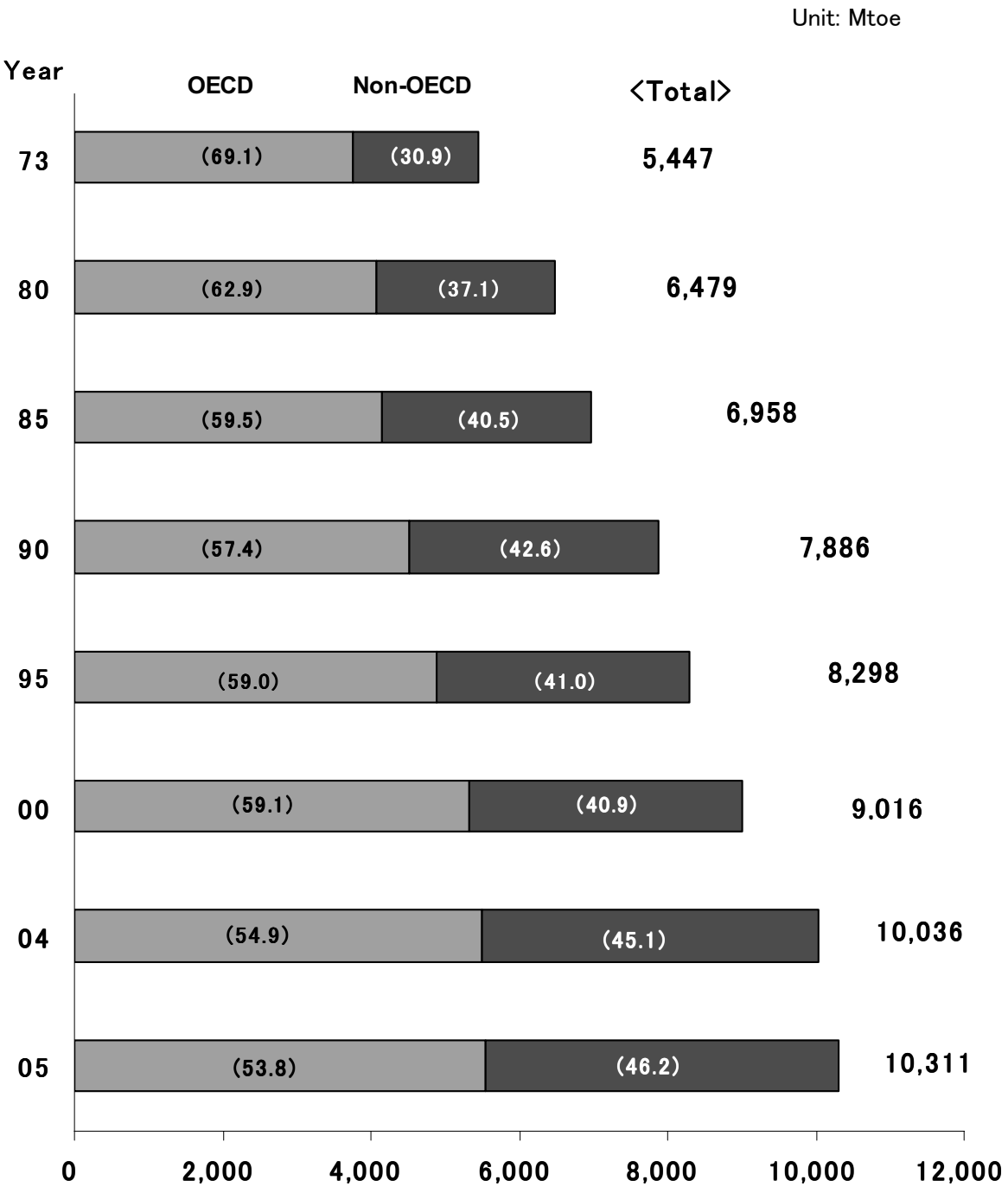
(2) Primary energy consumption by energy resource



Note) Figures in parenthesis represent percentage.

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

(3) Primary energy consumption by region

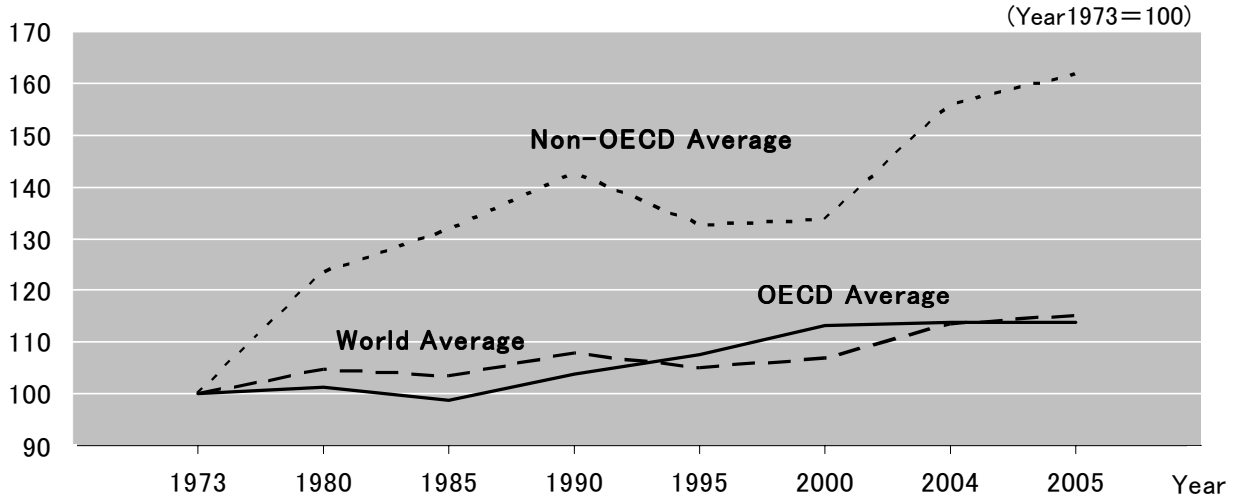


Note) Figures in parenthesis represent percentage.

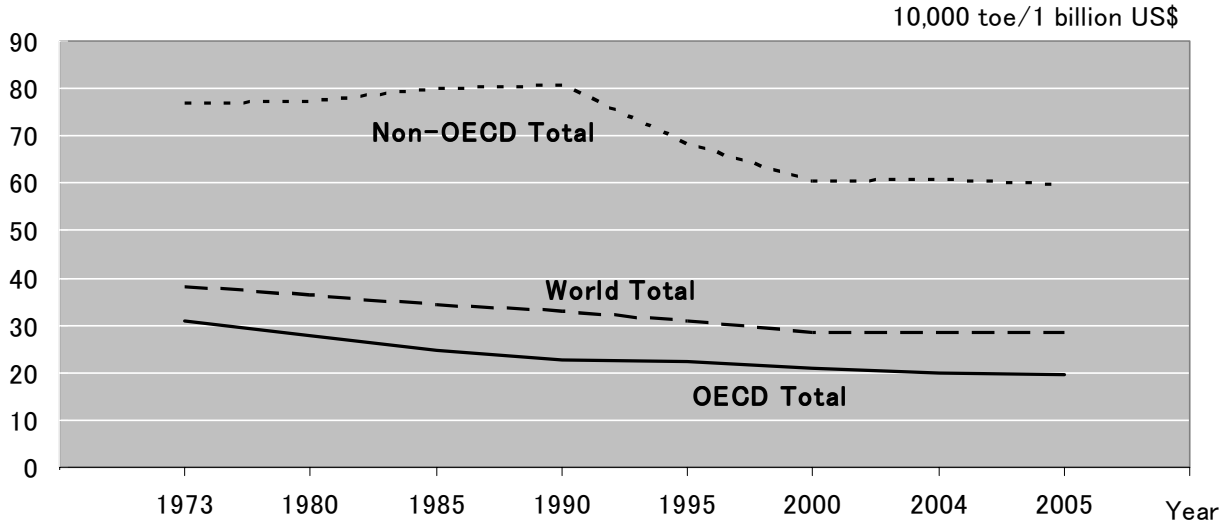
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan"

(4) Trend of primary energy consumption

1) World per-capita primary energy consumption



2) World per-GDP primary energy consumption



3) World energy consumption, GDP, and population (2005)

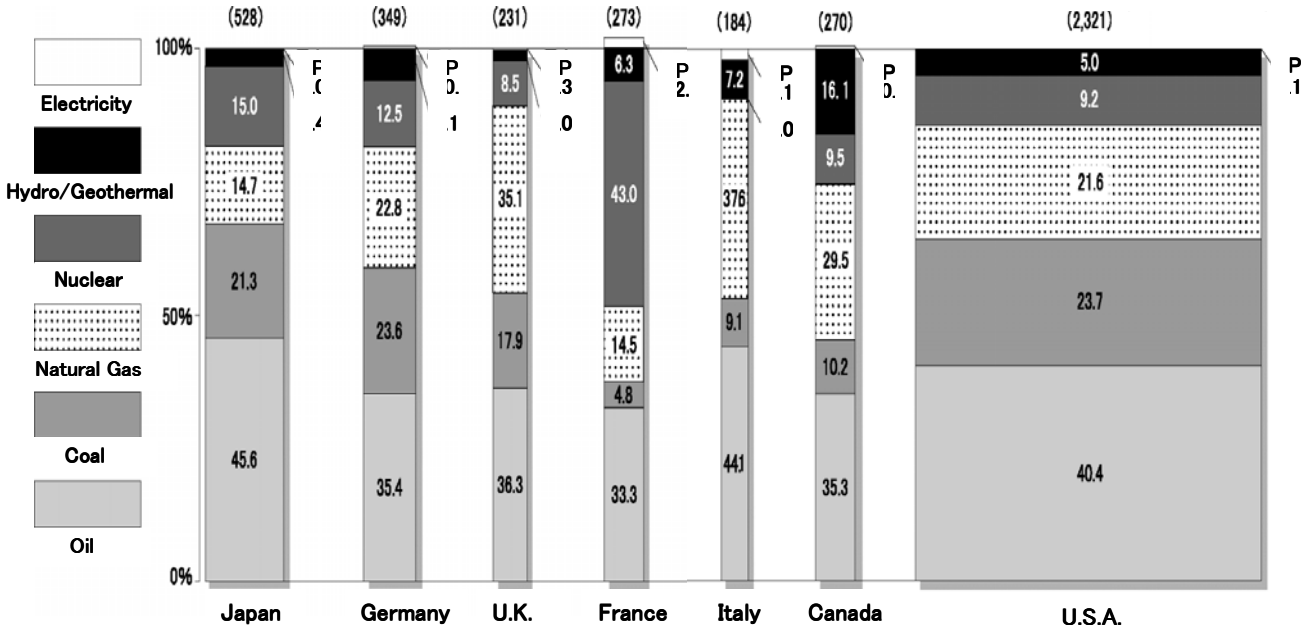
	Primary Energy Consumption			Real GDP (2000US $ standard)			Population		
	Mtoe	Y/Y Growth Rate	Avg. Growth Rate (1973-2005)	Billion US$	Y/Y Growth Rate	Avg. Growth Rate (1973-2005)	Million	Y/Y Growth Rate	Avg. Growth Rate (1973-2005)
OECDTotal	5,548	0.77%	1.22%	28,382	2.58%	2.70%	1,167	0.68%	0.81%
Non-OECD Total	4,763	5.15%	3.30%	7,965	6.90%	4.13%	5,243	1.29%	1.76%
World Total	10,311	2.75%	2.01%	36,347	3.50%	2.96%	6,410	1.17%	1.57%

Source) Prepared from “EDMC Handbook of Energy & Economic Statistics in Japan (2008)”

(5) Energy supply in major countries

1) World total primary energy supply (TPES) and shares of energy sources (2006)

Unit: %, Figures in parentheses are Million toe



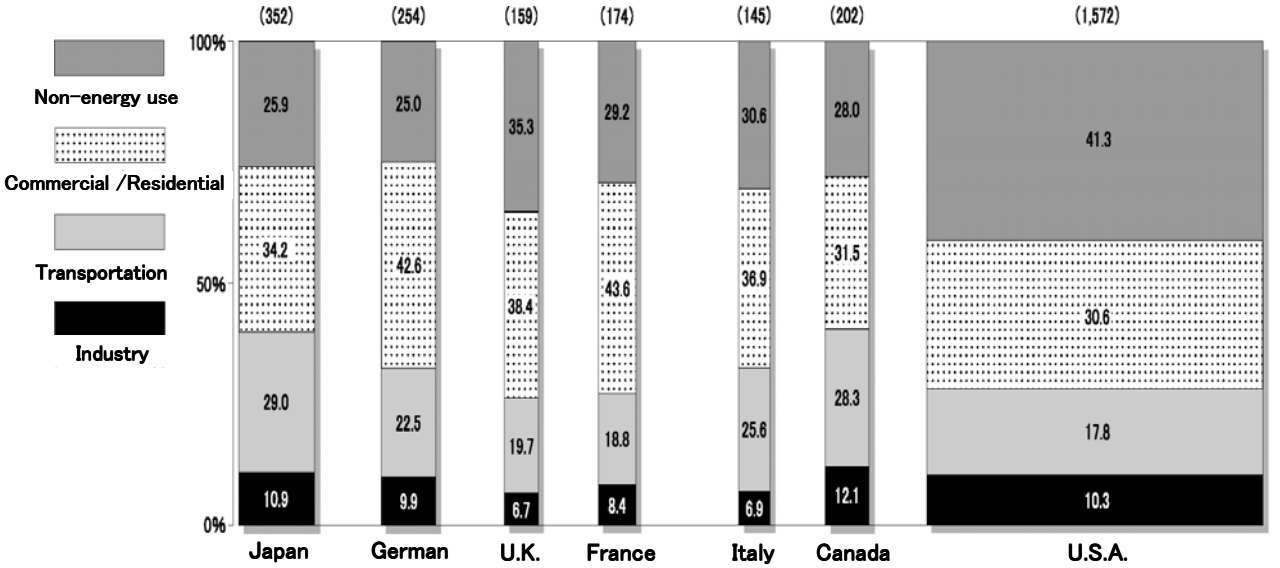
Note) 1) The import and export of electric power are also included in the primary energy supply.
("minus" in the chart represents excess of export.)
2) Coal includes other solid fuels.

Source) Prepared from "Energy balance of OECD Countries 2008" (IEA)

Comment) 1) The share of oil is especially high in Japan and Italy, accounting for about 45%.
2) In the U.S.A. and Germany, the share of coal is as high as about 24%.
3) In Canada, the share of hydraulic power is as high as 16%.
4) In France, the share of nuclear power is especially as high as 43%.

2) World sector shares in final energy consumption (2006)

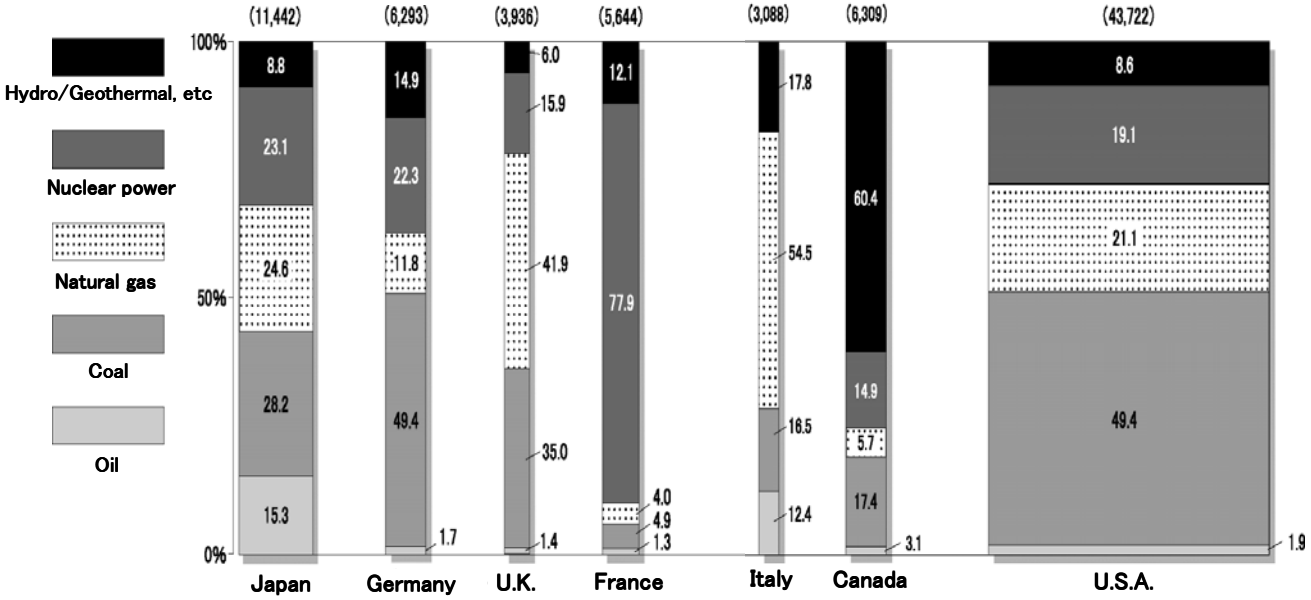
Unit: %, Figures in parentheses are Million toe



Source) Prepared from "Energy balance of OECD Countries 2008" (IEA)

3) World total electricity generated and shares of power (2006)

Unit: %, Figures in parenthesis represent 100 million kWh



Source) Prepared from "Energy balance of OECD Countries 2008" (IEA)

(6) Energy consumption in major countries

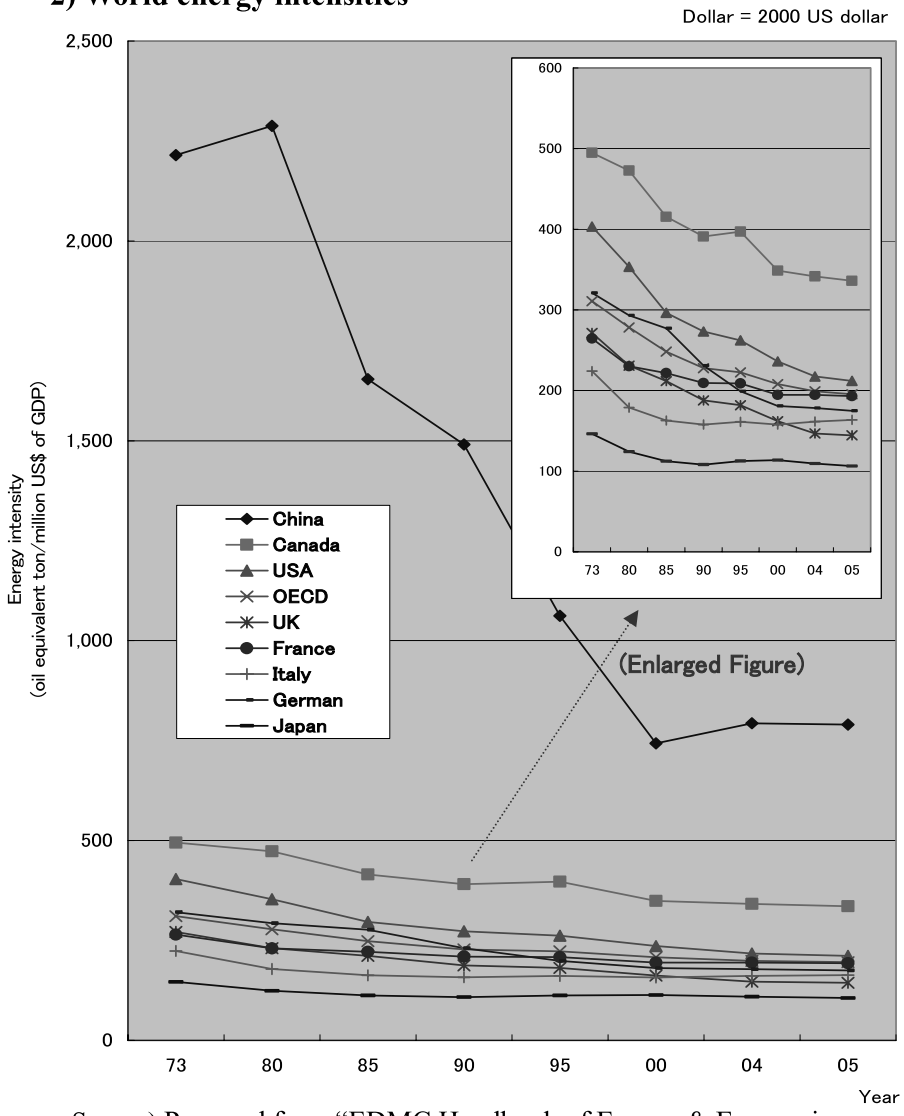
1) World trend of energy consumption, GDP, oil consumption and dependency

(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	
	2004	2005	2004	2005	2004	2005	2004	2005
US	4.2	3.2	2.0	0.5	2.8	0.6	40.7	40.7
UK	3.1	1.8	0.5	0.2	2.2	1.2	35.8	36.2
Germany	1.6	1.0	0.3	-1.0	-1.0	-1.4	36.0	35.8
France	2.3	1.2	1.3	0.4	1.1	-0.8	33.5	33.1
Italy	1.1	0.0	1.2	1.3	-4.5	-2.0	45.7	44.2
Russia	7.1	6.4	0.2	0.8	-0.5	2.0	20.6	20.9
China	10.0	10.2	19.3	9.7	15.3	-2.3	22.9	21.3
Japan	-0.4	2.6	3.3	-0.3	-1.3	-1.3	47.9	47.4

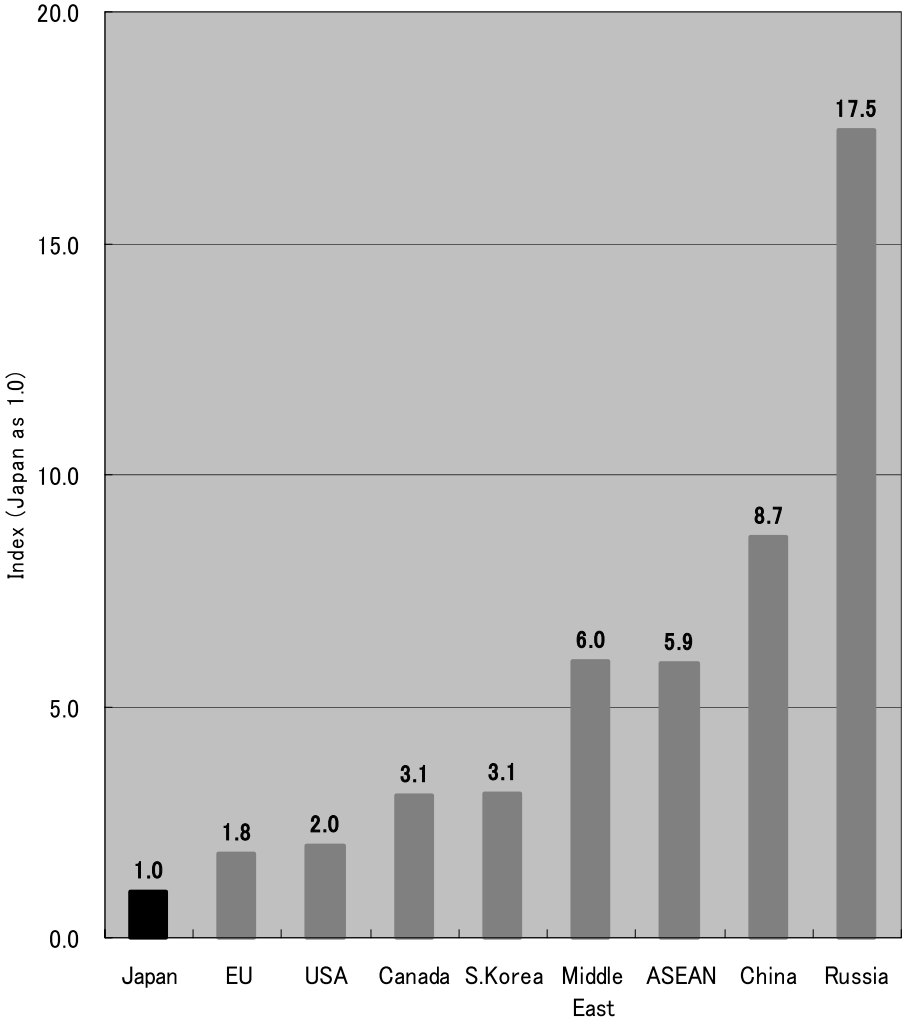
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

2) World energy intensities



Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

3) Primary energy consumption per unit of GDP of countries



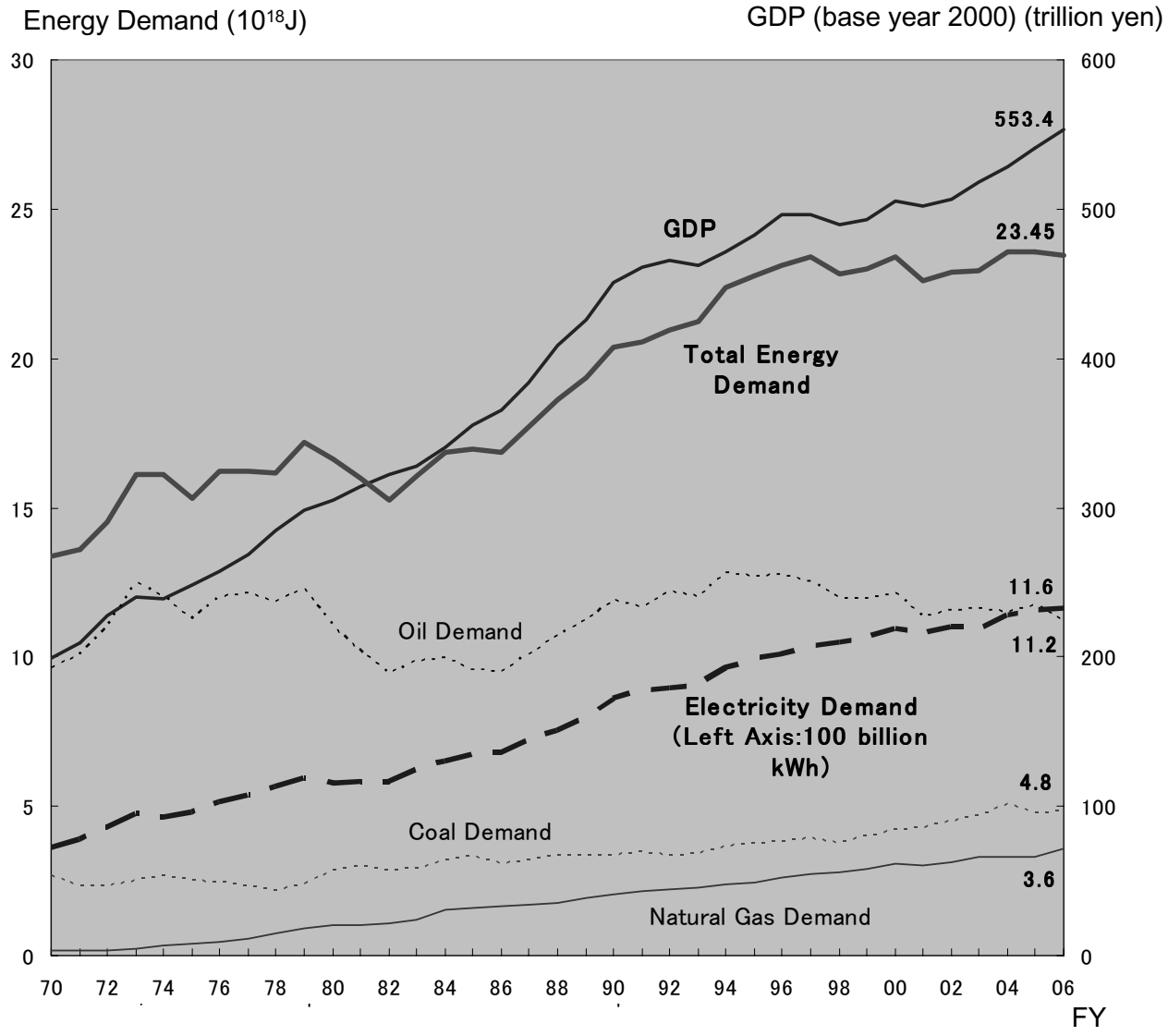
Note) Calculated as Japan set at 1 for the primary energy consumption (oil equivalent) /GDP (price set at 2000 US dollar). Values are all 2006 actual values.

Source) Prepared from "IEA Energy Balance 2008"

1.2 Domestic Energy Data (Outlook)

(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	2000～06
GDP Growth Rate	9.06%	3.49%	3.97%	1.16%	1.52%
Annual Average Growth Rate of Energy Demand	10.86%	0.43%	2.04%	1.40%	0.04%
Energy/GDP Elasticity	1.20	0.12	0.51	1.21	0.03

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

(2) Outlook of energy consumption and supply

1) Final energy consumption

(Unit : million kL of crude oil equivalents)

Items \ Fiscal Year	1990		2005		2010 Current Measures (Expected Maximum Effect)		2010 Additional Measures (Expected Maximum Effect)	
		%		%		%		%
Final Consumption Total	359	100%	413	100%	403	100%	392	100%
Industrial Sector	181	50%	181	44%	178	44%	172	44%
Civil Sector	95	26%	134	32%	130	32%	127	32%
Household Sector	43	12%	56	14%	53	13%	51	13%
Commercial Sector etc.	52	15%	78	19%	77	19%	76	19%
Transportation Sector	83	24%	98	24%	95	24%	93	24%

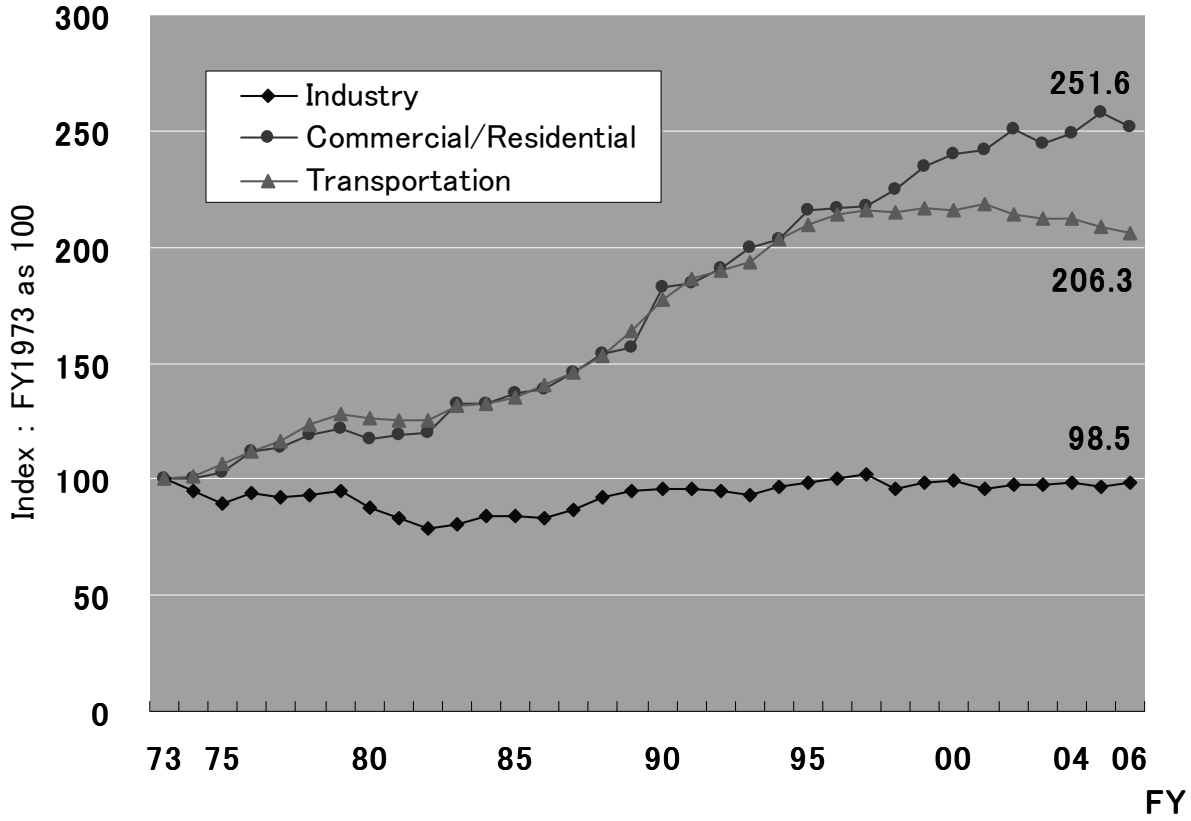
2) Primary energy supply

(Unit: million kL of crude oil equivalents)

Items \ Fiscal Year	1990		2005		2010 Current Measures (Expected Maximum Effect)		2010 Additional Measures (Expected Maximum Effect)	
Primary Energy Supply	508		587		583		566	
Fuel	Amount	%	Amount	%	Amount	%	Amount	%
Oil	265	52%	255	43%	227	42%	218	39%
L P G	19	4%	18	3%	19	3%	19	3%
Coal	85	17%	123	21%	117	18%	113	20%
Natural Gas	54	11%	88	15%	94	15%	89	16%
Nuclear power	49	10%	69	12%	83	14%	83	15%
Hydro power	22	4%	17	3%	19	4%	19	3%
Geothermal	0	0%	1	0%	1	0%	1	0%
New Energy,etc	13	3%	16	3%	24	4%	24	4%

Source) Prepared from the report of "Long-term Outlook of Energy Demand and Supply" issued by the Demand &Supply Subcommittee of the Advisory Committee for Natural Resources and Energy in May 2008.

3) Final energy consumption by sector



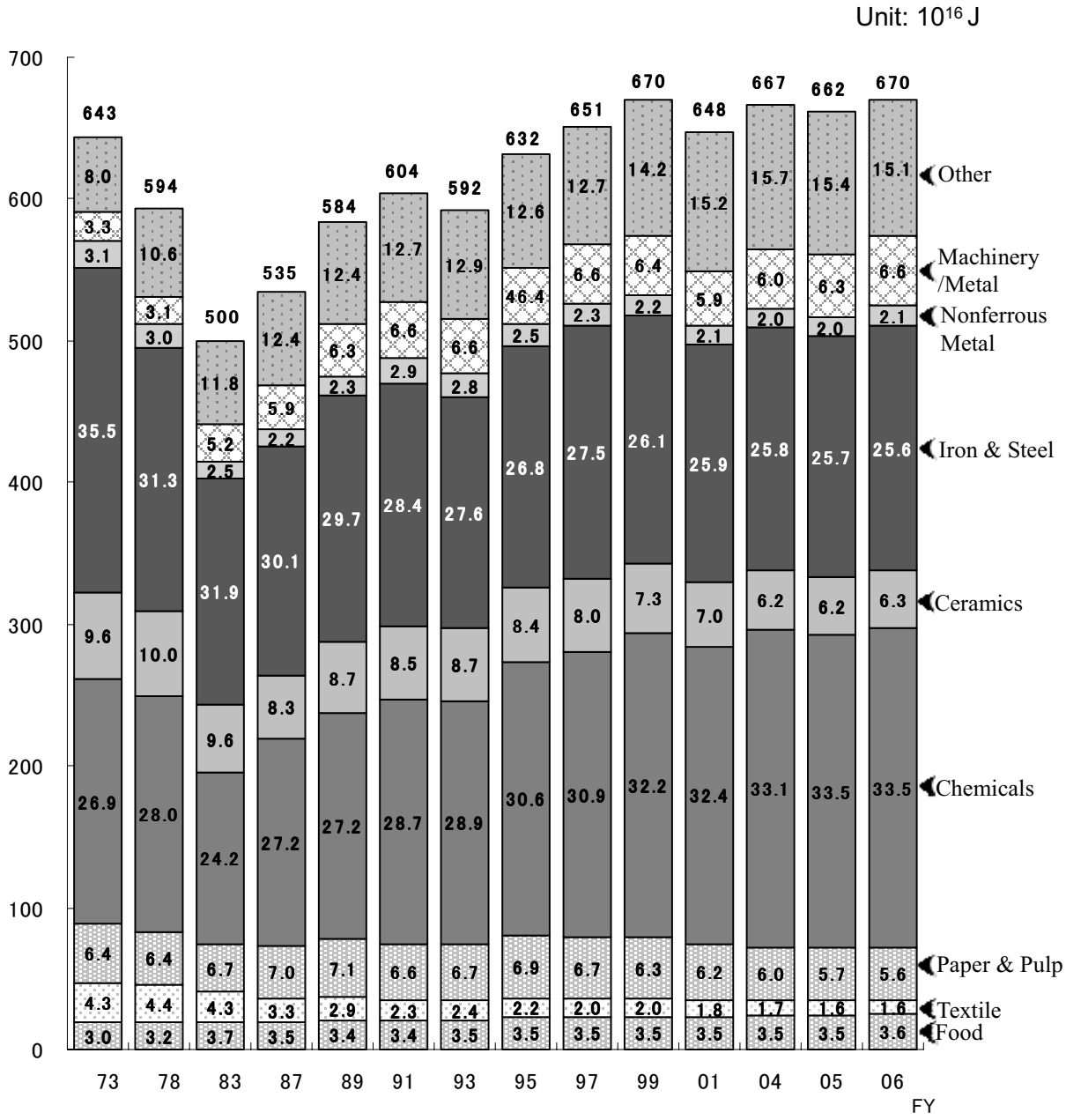
Note) Due to revision of the aggregation method in Energy Balance Tables in Japan, values for FY1990 onwards and values for preceding years are the results of utilizing different methods.

Source) Prepared from “Comprehensive Energy Statistics”

1.3 Domestic Sectoral Energy Data

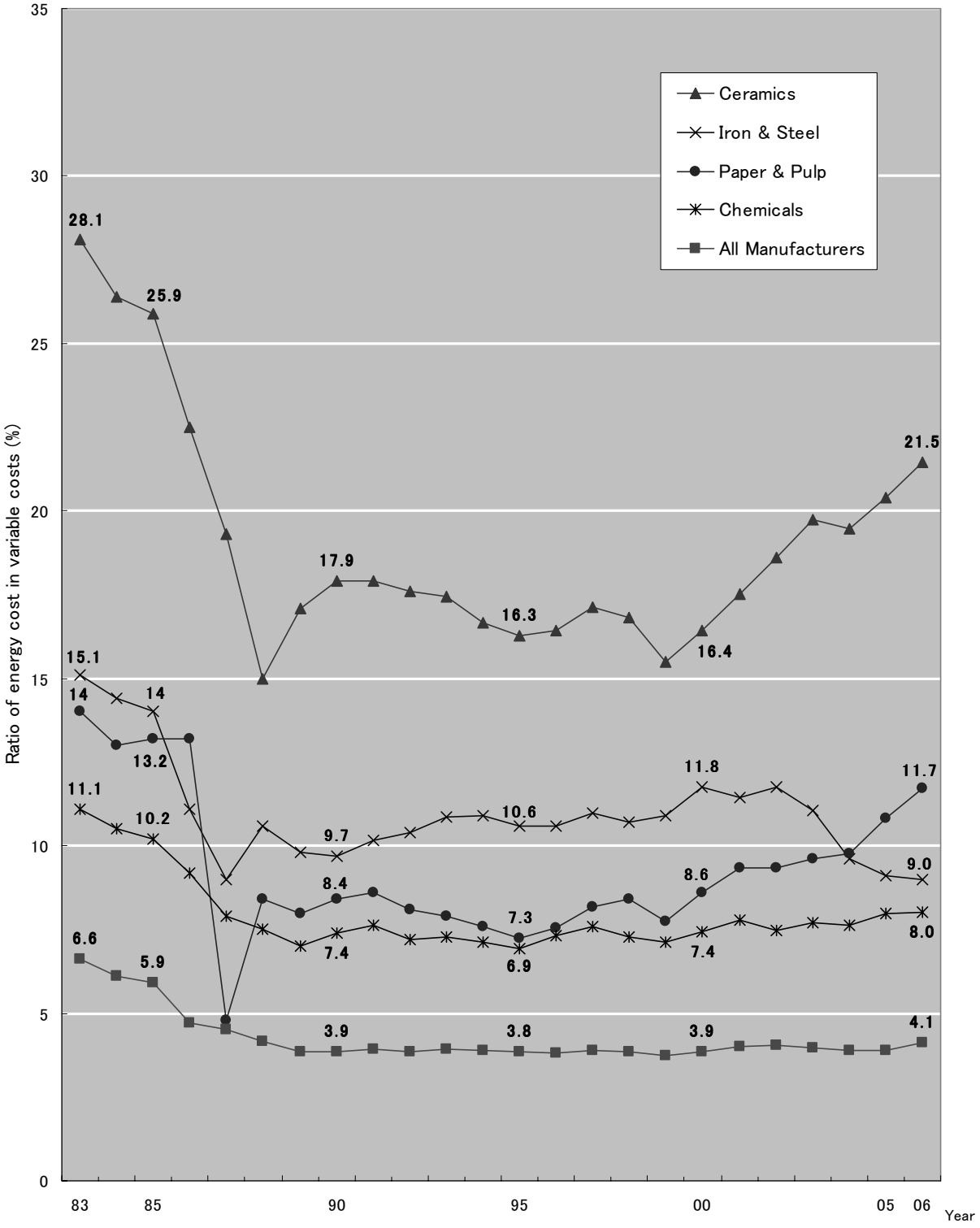
(1)Industrial sector

1) Manufacturing industry's energy consumption



Note) Units in the parentheses: %
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

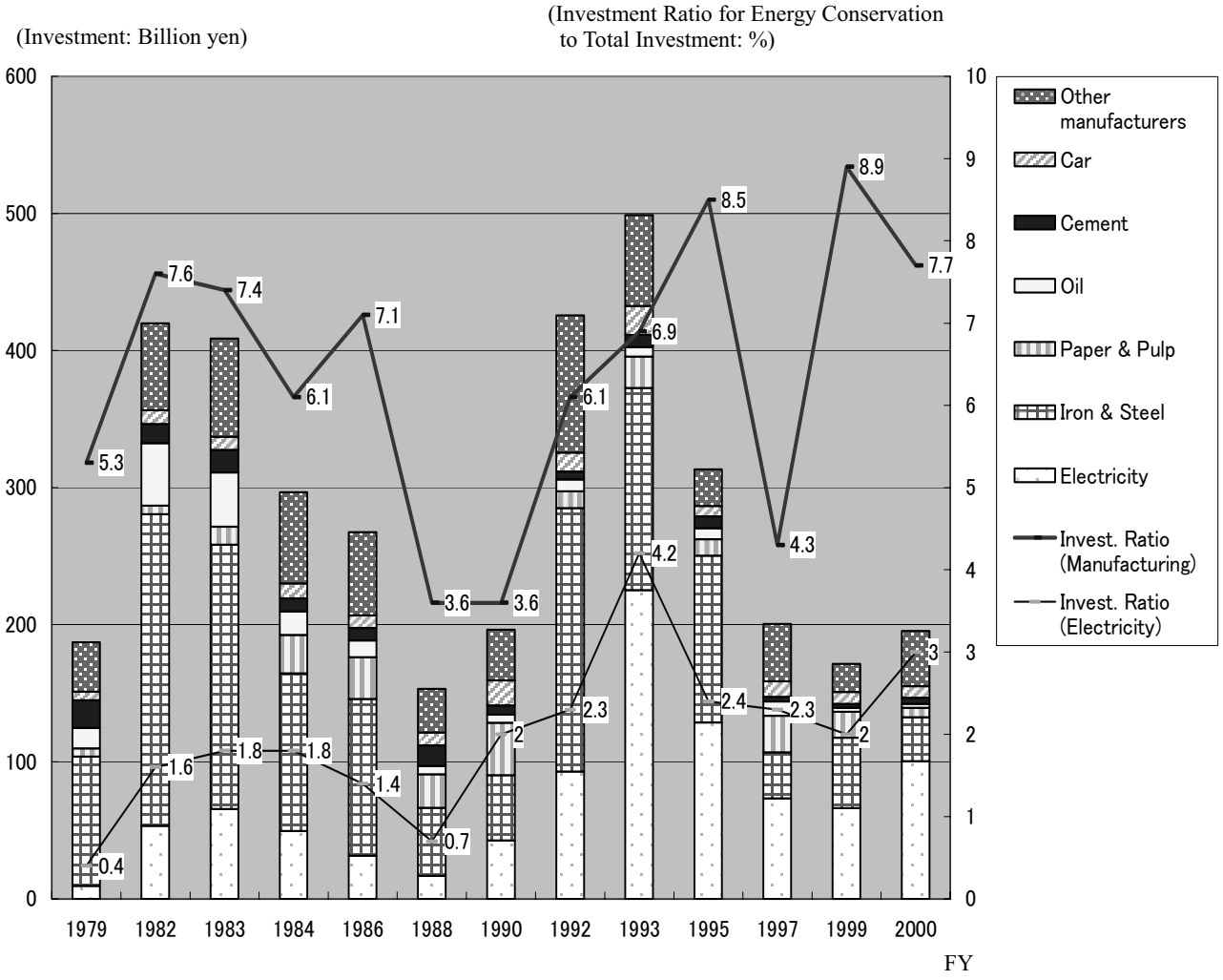
2) Major industries' energy costs to variable costs



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)" by Ministry of Economy, Trade and Industry

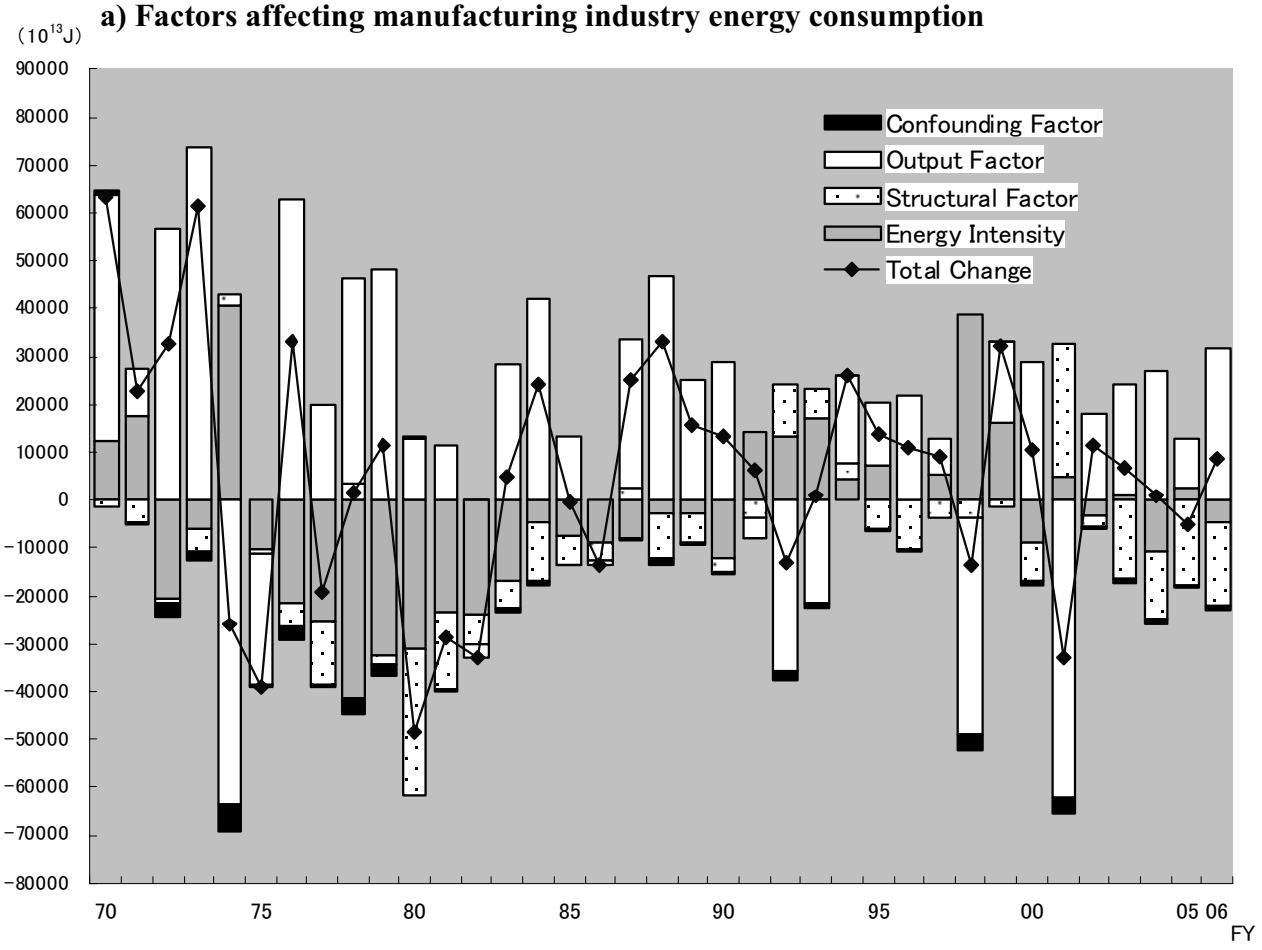
3) Trend of investment for energy conservation facilities



Source) Prepared from the research report by METI in FY2001 for 444 companies

4) Energy demand analysis for the industrial sector

a) Factors affecting manufacturing industry energy consumption



b) Trend of factors of manufacturing sector energy consumption change

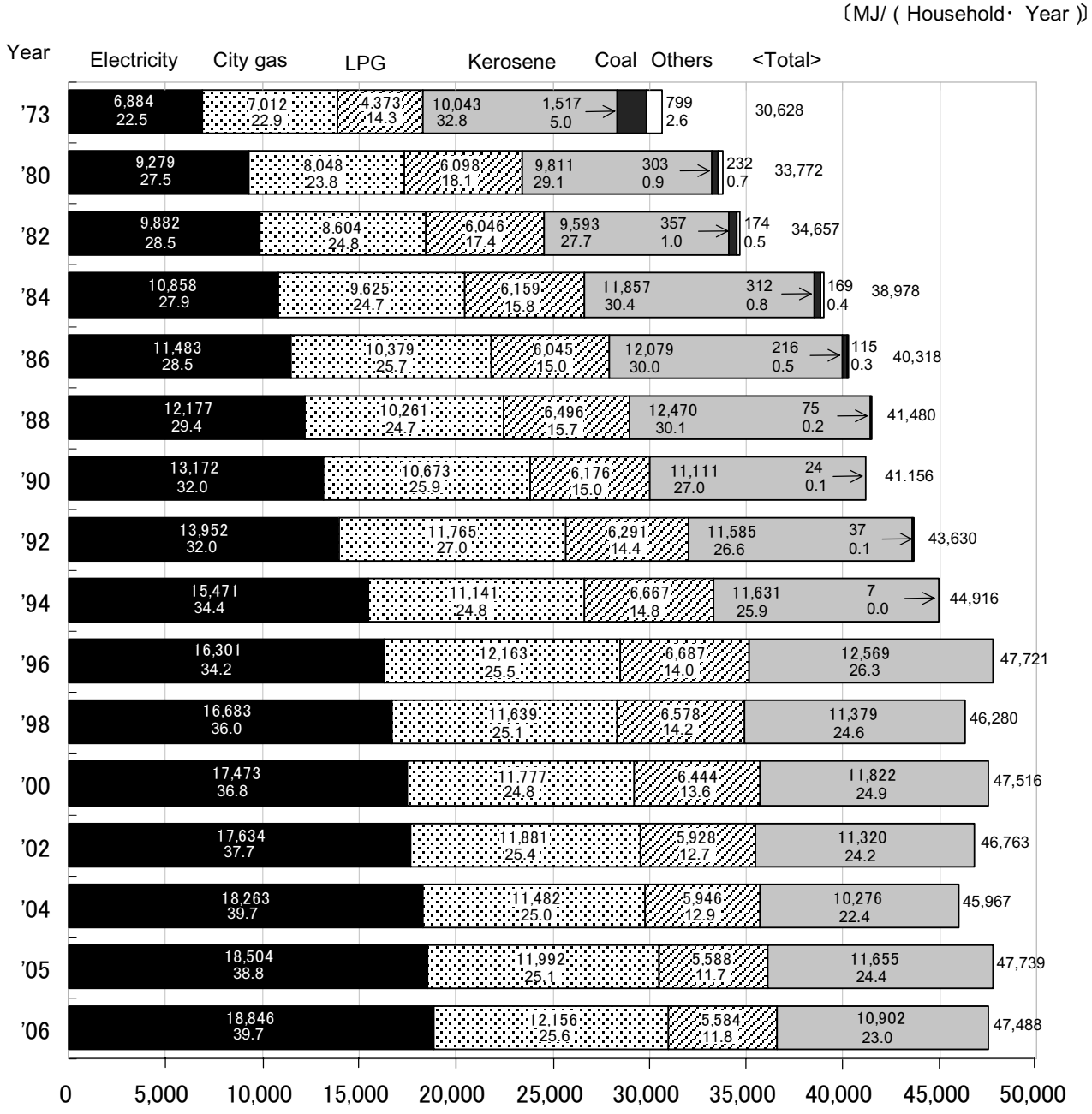
(Unit: 10^{16} J)

Fiscal Year		'90	'92	'94	'96	'98	'00	'02	'04	'05	'06
Energy Consumption Changes		13.5	-13.3	26.1	10.7	-13.7	10.7	11.6	0.8	-5.1	8.6
Factor	Output Effect	29.0	-35.9	18.2	21.5	-45.2	28.7	17.8	26.9	10.6	31.8
	Structure Effect	-2.7	10.9	3.1	-10.4	-3.8	-7.9	-2.2	-14.4	-17.6	-17.4
	Intensity Effect	-12.3	13.4	4.4	0.1	38.6	-8.8	-3.3	-10.7	2.4	-4.7

Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)"

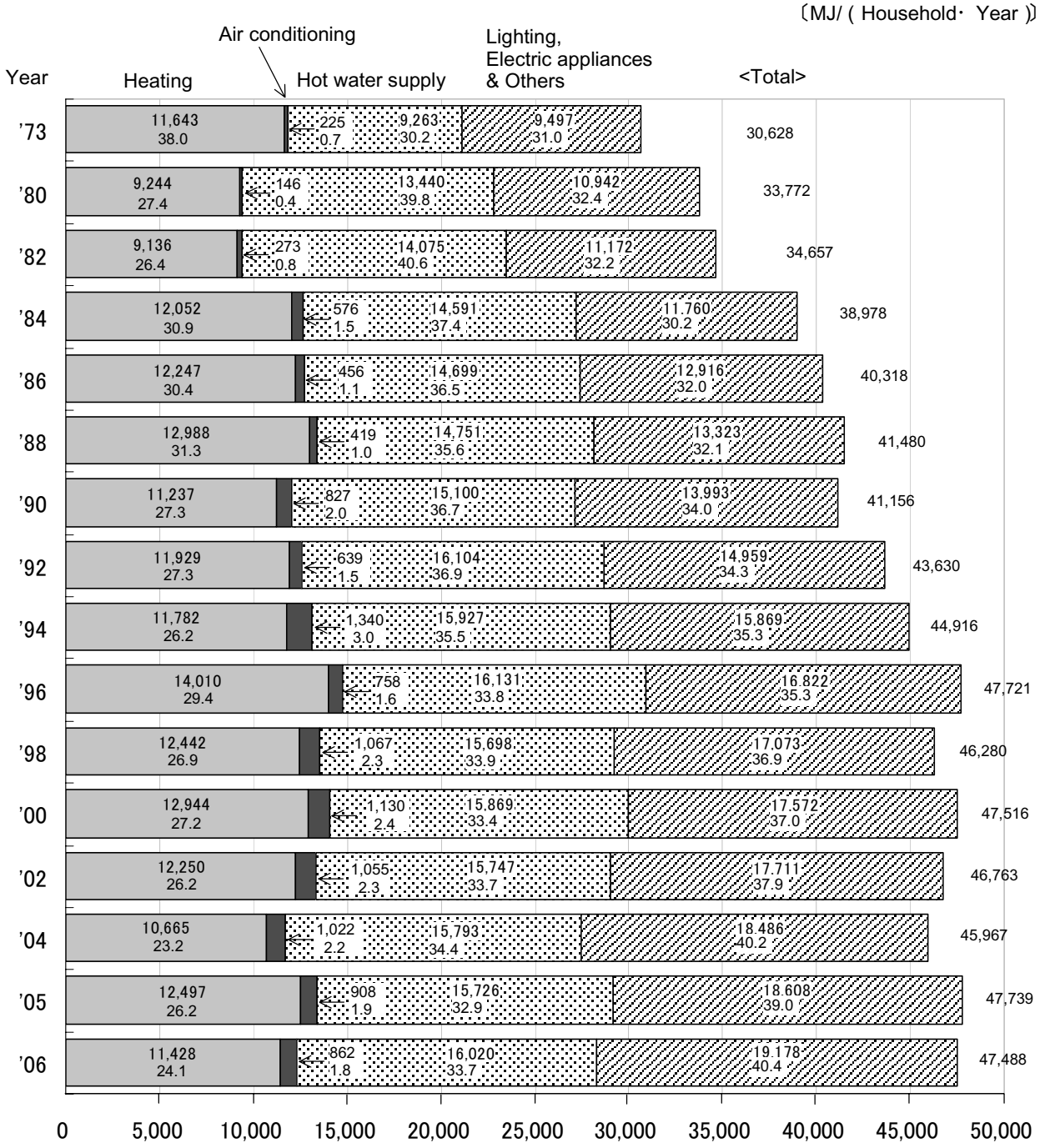
(2) Residential sector

1) Per household energy consumption (by energy sources)



Note) The lower figures in the bar represent percentage distribution.
Source) Prepared from "Domestic Energy Statistics Annual Report 2006" (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 2006" (Residential Environment Planning & Research Center)

3) Rate of home appliance stock owned by household

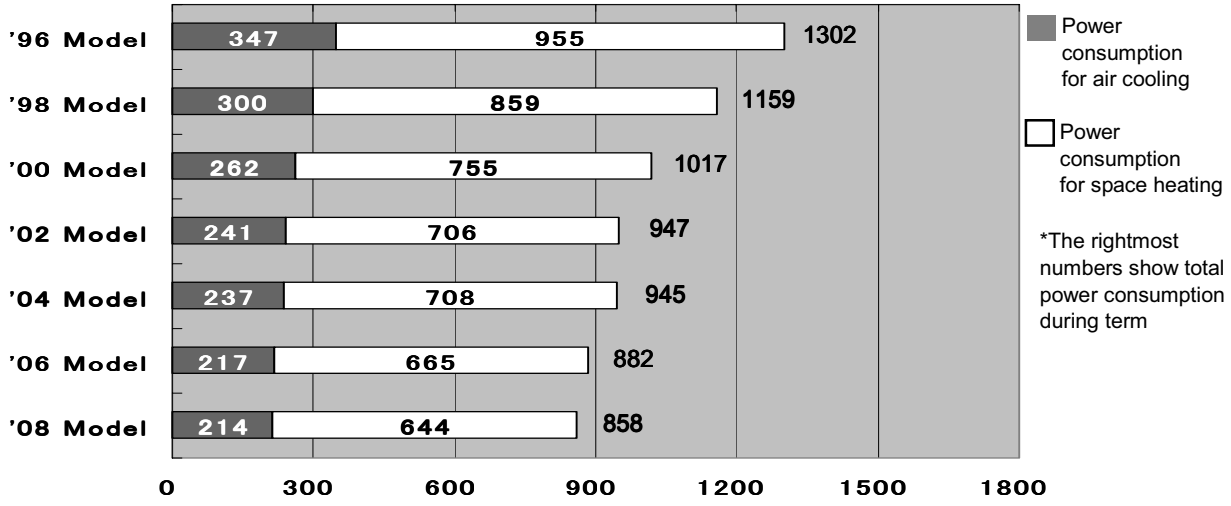
Appliances \ Fiscal Year	1970	1980	1990	2000	2004
Warmed toilet Seat (with warm water shower)				0.461	0.685
Refrigerator	0.917	1.112	1.112	1.148	1.199
Microwave oven	0.012	0.316	0.713	0.989	1.029
Washing machine	0.921	1.027	1.05	1.055	1.072
Electric clothes dryer			0.143	0.226	0.234
Electric futon dryer		0.157	0.261	0.395	0.426
Vacuum cleaner	0.738	1.084	1.267	1.349	1.402
Air conditioner	0.036	0.528	1.1	2.009	2.424
Electric carpet			0.523	0.928	0.901
Color television	0.248	1.375	1.877	2.17	2.322
Personal computer			0.123	0.543	1.024
Real disposable income	3,910,717	4,875,782	5,739,922	5,673,876	

Note 1) Employees' household only.
Note 2) Real disposable income is the actual value which was derived by revising the result for fiscal year with consumer price index (General, year 2000-base).
Source) Prepared from "Annual Report on Consumer Confidence Survey" by Cabinet Office, "Annual Report on the Family Income and Expenditure Survey" by Ministry of Internal Affairs and Communications, "Comprehensive List of Consumer Price Linked Index (year 2000-base), Annual Report on Consumer Price Index" by Ministry of Internal Affairs and Communications

4) Improvement of energy efficiency of home electric appliances

a) Air Conditioners (1996-2008 Models)

Simple average values of typical models of energy conservation type wall-mounted cooling and heating air conditioners with 2.8kW cooling capability.

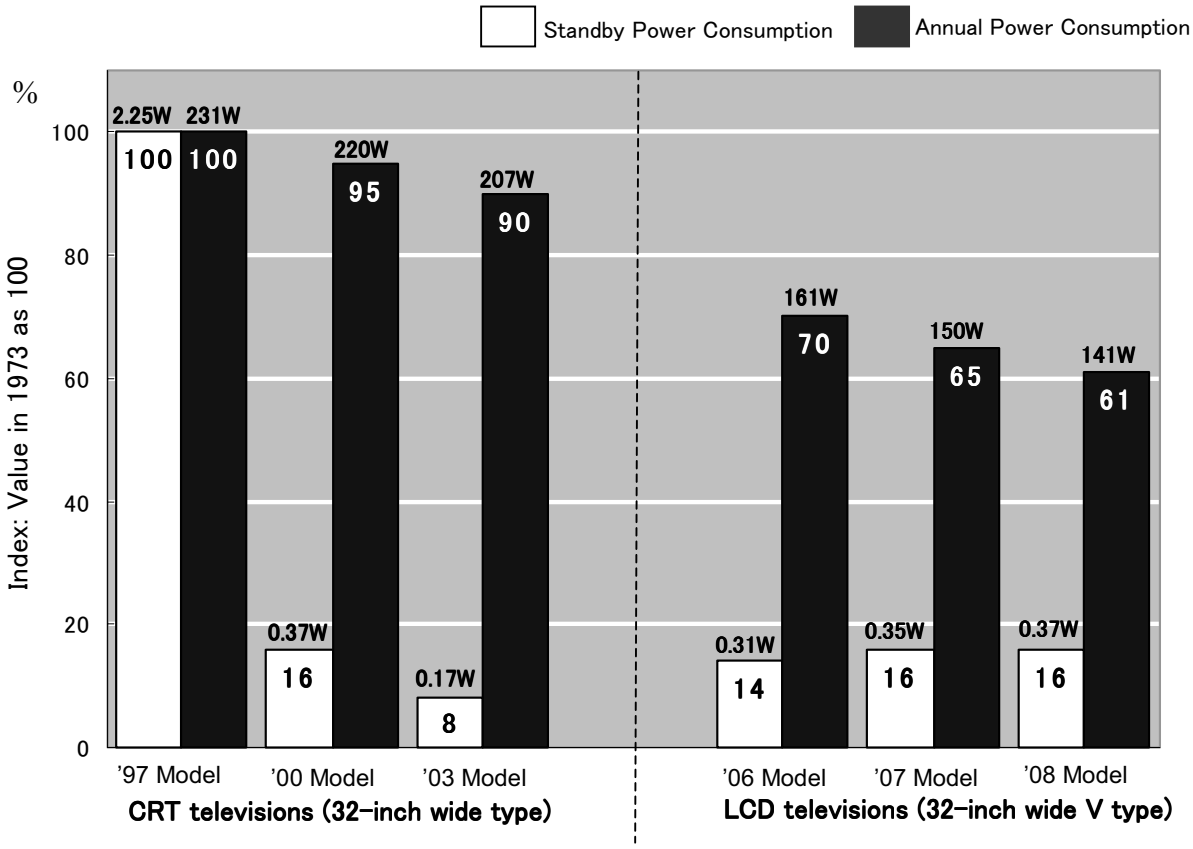


Note) Based on Japan Refrigeration and Air Conditioning Industry Association standards JRAS4046
(standards for calculating room air conditioner term power consumption)

Source) Prepared from the data by Japan Refrigeration and Air Conditioning Industry Association

b) TVs (1997-2008 Models)

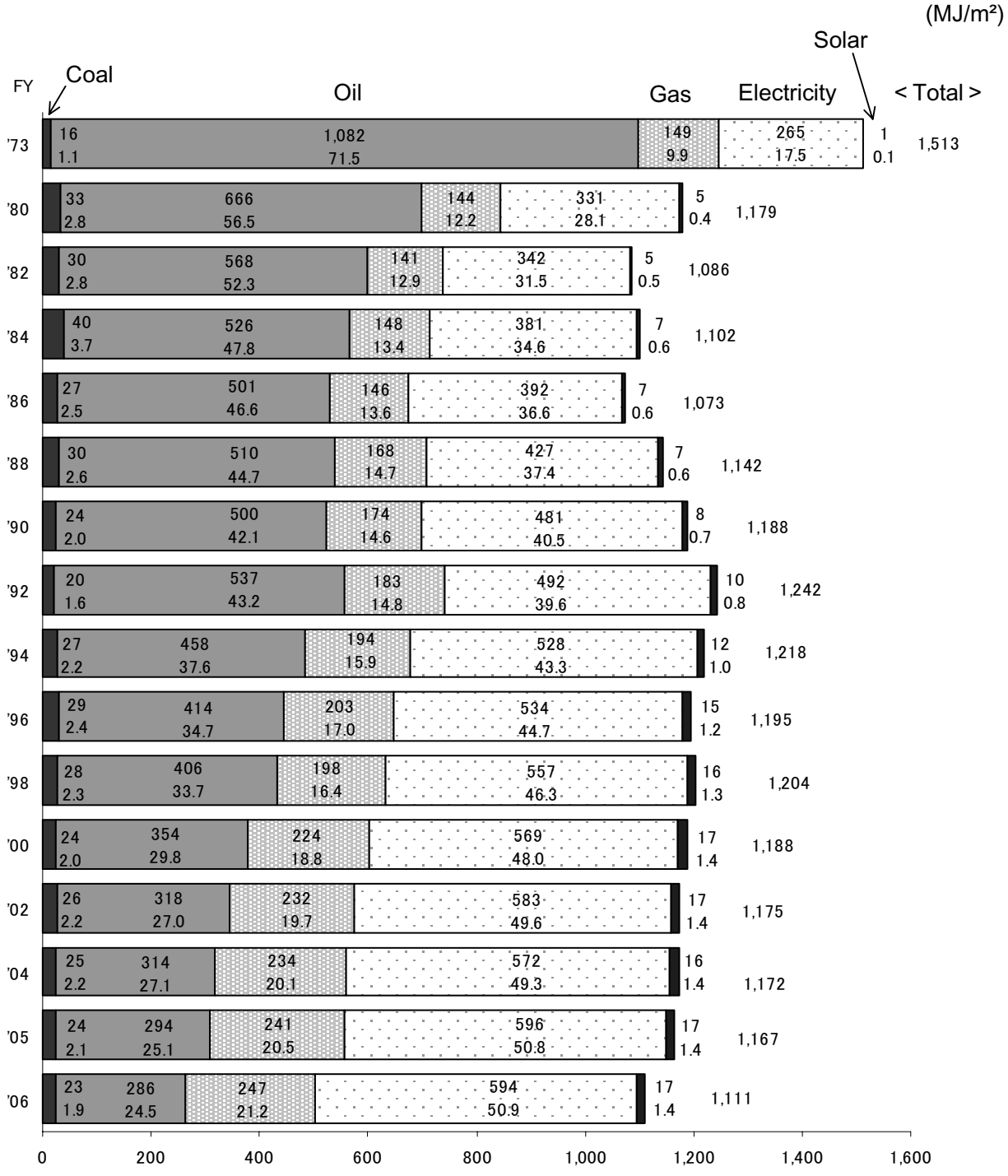
Simple average values of the products.



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

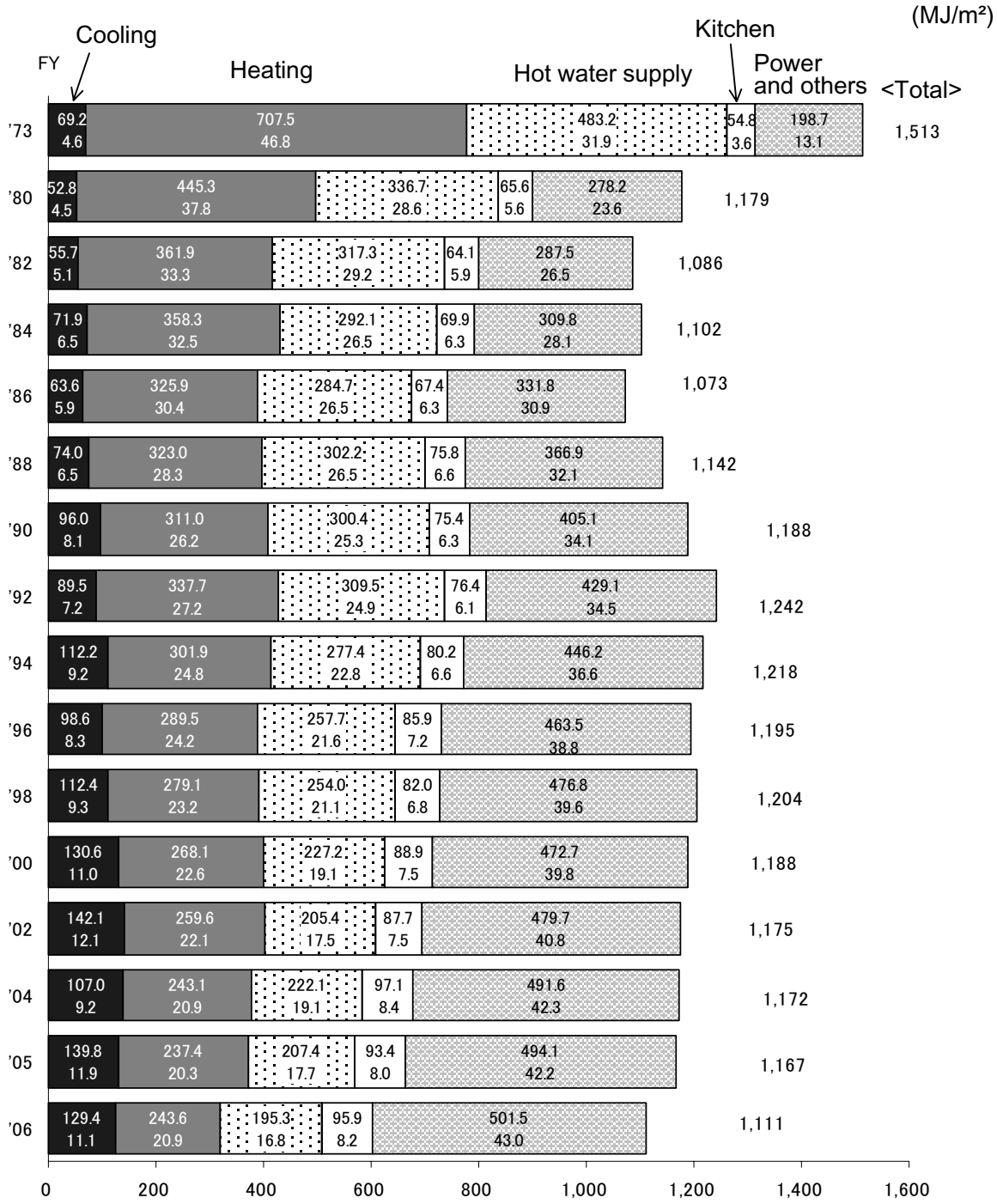
(3) Commercial sector

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 (2008)

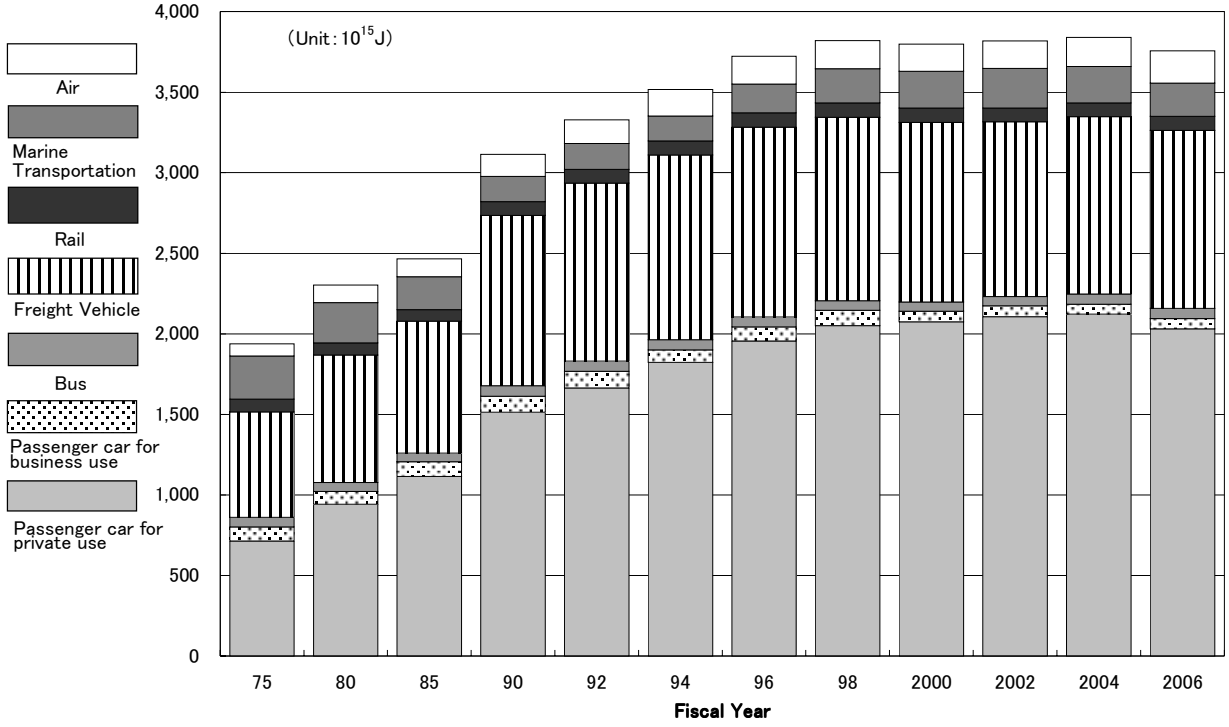
2) Per-floor energy consumption in commercial buildings (by usage)



Note) Lower figures in the bars represent percentage.
Source) Prepared from "EDMC Handbook of Energy & Economic Statistics in Japan (2008)

(4) Transportation sector

1) Transportation energy consumption (by type of transport)

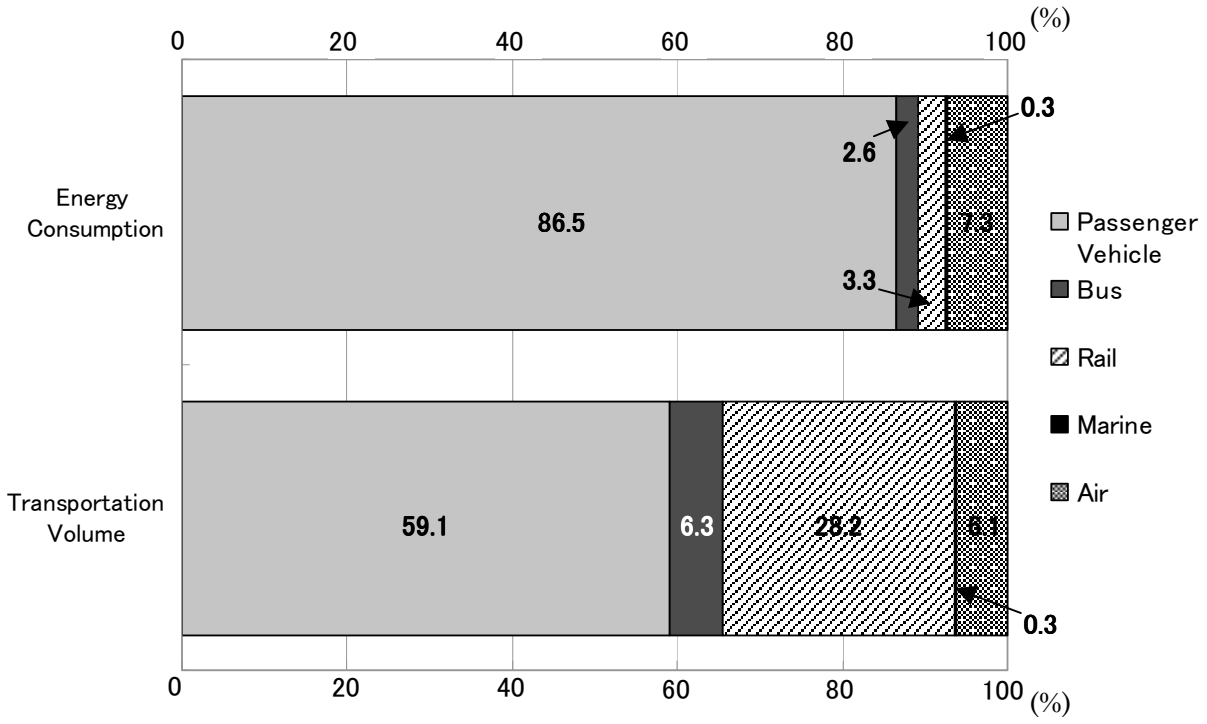


	75	80	85	90	92	94	96	98	2000	2002	2004	2006
Grand total of Transport sector energy consumption	1,938	2,302	2,465	3,114	3,327	3,516	3,722	3,820	3,798	3,817	3,839	3,756
	(5.3)	(-1.2)	(2.4)	(4.5)	(2.3)	(4.7)	(2.6)	(1.1)	(-2.2)	(0.1)	(1.0)	(-1.2)
Total of passenger sector energy consumption	996	1,244	1,424	1,880	2,044	2,193	2,345	2,449	2,432	2,465	2,493	2,422
	(7.4)	(0.9)	(3.6)	(8.0)	(3.5)	(5.3)	(3.4)	(1.7)	(-2.6)	(0.0)	(1.2)	(-1.9)
Passenger car for private use	713	942	1,116	1,513	1,664	1,823	1,955	2,050	2,075	2,106	2,122	2,032
Passenger car for business use	87	78	88	100	104	76	87	94	64	67	63	62
Bus	59	56	54	64	62	64	62	61	58	57	62	64
Rail	61	63	64	77	79	81	81	82	81	80	80	80
Marine transportation	6	5	4	7	8	7	9	8	9	7	8	7
Air	70	99	98	119	127	143	151	154	145	147	157	176
Total of freight sector energy consumption	941	1,058	1,041	1,233	1,283	1,323	1,377	1,372	1,366	1,352	1,346	1,334
	(3.1)	(-3.7)	(0.9)	(-0.5)	(0.2)	(3.8)	(1.4)	(0.1)	(-1.5)	(0.2)	(0.6)	(0.2)
Motor truck	657	791	819	1,058	1,105	1,147	1,178	1,140	1,116	1,085	1,101	1,105
Rail	17	13	8	7	7	6	6	6	6	6	6	6
Marine transportation	262	244	200	151	153	149	171	203	221	239	217	199
Air	5	9	14	17	18	21	21	23	24	22	23	24

Note) Values in parentheses represent the increase rate (%) compared with the previous fiscal year.

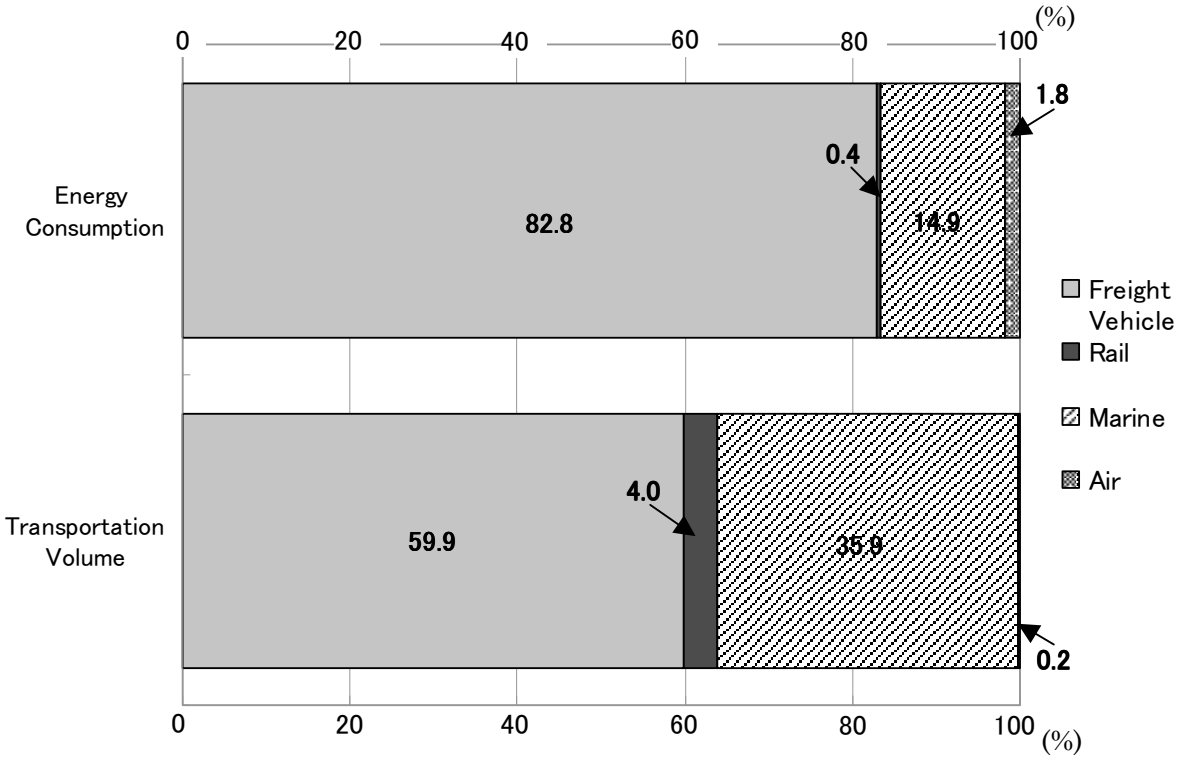
Source) Prepared from “EDMC Handbook of Energy and Economic Statistics in JAPAN (2008)”

2) Energy consumption and transportation volume share (FY 2006)
(by type of passenger transport)



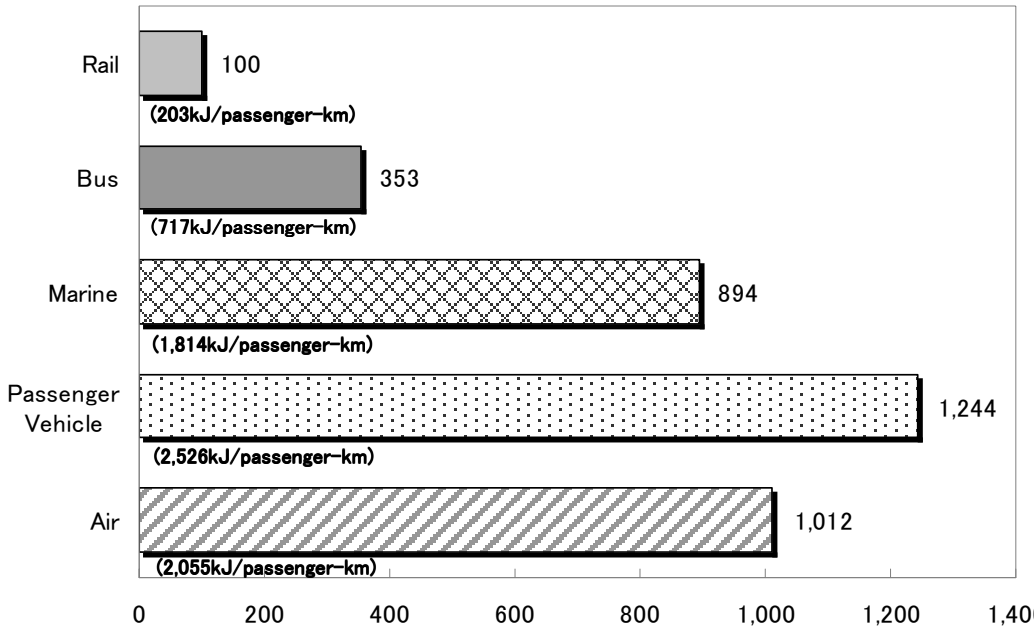
Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2008)"

3) Energy consumption and transportation volume share (FY 2006)
(by type of freight transport)



Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2008)"

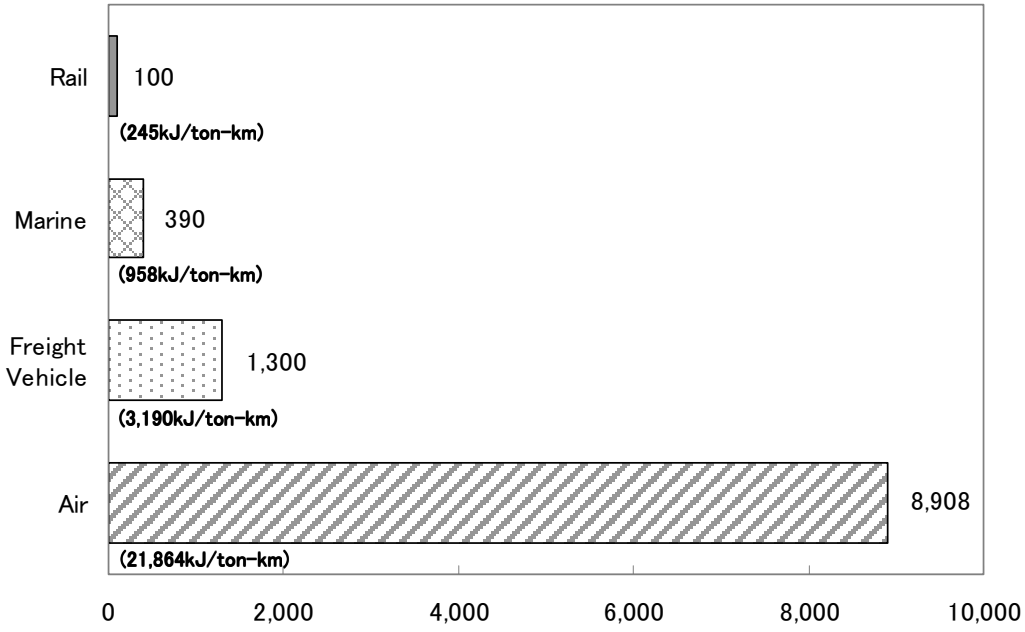
4) Energy intensity by type of transport (FY 2006)
(Energy consumption per passenger-kilometer)



Note) Index Rail =100

Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2008)"

5) Energy intensity by type of transport (FY 2006)
(Energy consumption per freight ton-kilometer)



Note) Index Rail =100

Source) Prepared from "EDMC Handbook of Energy and Economic Statistics in Japan (2008)"

2. RECENT NATIONAL STRATEGIES AND ACTIVITIES

2.1 New National Energy Strategy

The Ministry of Economy, Trade and Industry formulated the "new national energy strategy" aiming at energy security, in view of the recent stringent energy situation such as a sharp rise in crude oil prices, and publicized an interim result of the study on March 30, 2006. Subsequently, based on the discussions in the Coordination Subcommittee of the Advisory Committee on Natural Resources and Energy (Chairperson: Masahiro Kuroda, President of Economic and Social Research Institute, Cabinet Office, Government of Japan), specific items of the strategy were finalized. The following three goals will be achieved through the strategy:

1) Establishment of energy security that is trusted by the people
2) Establishment of the basis for sustainable growth by solving energy and environmental issues simultaneously
3) Positive contribution to solving Asian and global energy problems

To be more specific, the following actions will be taken:

(1) Establishment of the world's most advanced energy supply-demand structure

The oil dependency of Japan is now 50%. The following four plans will be launched to lower the figure to 40% or less by the year 2030:

1) Energy conservation frontrunner plan	
Goal:	To improve energy efficiency by 30% by the year 2030.
Measures:	To establish a virtuous circle of technological innovation and social system reform by formulating the strategy for technology that supports future energy conservation, improving the criteria to certify top runners, strengthening supportive measures, and studying a mid- and long-term energy-saving social systems.
2) Next-generation transportation energy	
Goal:	To lower the oil dependence in the transportation sector to about 80% by the year 2030.
Measures:	To present an action plan for achieving the three pillars (i.e., improvement of fuel efficiency, promotion of the introduction of new fuels such as bio-fuel and GTL, and development and diffusion of the electric car and fuel-cell vehicle). To promote the utilization of bio-fuel, , introduce electric cars and fuel-cell vehicles at an early stage through intensive technological development of the storage battery.
3) New energy innovation plan	
Goal:	To lower the cost of photovoltaic power generation to the same level as those of thermal power generation by 2030. To support local production for local consumption by utilizing biomass, aiming at the energy self-sufficiency in communities.
Measures:	To present supportive measures to develop technical capabilities and self-sustain as new energy industries. To promote the construction of a "next-generation energy park," where people

	can actually see, touch, and understand new energy, and to develop innovative technology such as the next-generation storage battery.

4) Nuclear energy national plan	
Goal:	To increase the proportion of nuclear power generation in the total generated output to 30 to 40% or more, in and after the year 2030. To establish the nuclear fuel cycle at an early stage and to practically exploit the fast-breeder reactor.
Measures:	To promote nuclear power generation, which has an excellent supply stability and is a clean energy source with little CO_2 emissions during operation, as far as safety is ensured. To improve the investment environment for promoting nuclear power generation, establish the nuclear fuel cycle at an early stage, and promote a peaceful use of nuclear power internationally.

(2) Comprehensive strengthening of resource diplomacy and cooperation in the energy and environment field

1) Comprehensive strategy for securing resources	
Goal:	To raise the independently-developed oil resources to about 40% of total oil requirement on a transaction basis by 2030.
Measures:	To intensify a comprehensive relationship with resource-rich countries by actively using ODA, promoting investment exchange, and expanding human exchange at all levels. In order to do so, to provide policy-based finance, trade insurance, and economic cooperation, etc. in collaboration with the government and agencies concerned through formulating resource securing guidelines. Also, in this framework, to strengthen support to core businesses which assume the responsibility of developing resourses. Furthermore, to promote the following measures strategically and comprehensively in collaboration with the government and agencies concerned aiming to develop mineral resources such as rare metals in overseas countries and diversify supply sources, as well as to act as the world's leading country which develops and exploits methane hydrate and utilizes clean coal.

2) Asia energy and environment cooperation strategy	
Goal:	To cooperate in the field of energy, including energy conservation, and aim at coexistence with other Asian countries.
Measures:	To cooperate strategically with China, India, and other Asian countries, where there is a rapidly increasing demand for energy, in various fields such as energy conservation, effective coal utilization and safety in coal production, new energy, and nuclear power.

(3) Improving emergency program

Emergency program will be improved, such as the revising of the oil stockpiling system and the strengthening of functions, including the introduction of stockpiling of petroleum products, and the improvement of the emergency action system for natural gas supply.

(4) Others

In order to support efforts under the cooperation between the public and private sectors, technological problems to be solved toward the year 2030 will be summarized in the form of a development strategy for energy technology, taking into consideration the technologies to be required in retrospect to the present from an ultra-long-term perspective (for the year 2050 or 2100).

Source) Press release by the Ministry of Economy, Trade and Industry

2.2 Strategy for Energy-Saving Technology

(1) Background

The "new national energy strategy" was formulated in May 2006 with the objectives of establishing energy security that is expectedly trusted by the people, establishing the basis for sustainable growth by solving energy and environmental issues simultaneously, and positively contributing to solving Asian and global energy issues. In the strategy, a numerical goal was set toward the year 2030, which is to be shared by the public and private sectors. More specifically, efforts will be made for further promoting energy conservation and improve the energy efficiency by 30% or more.

Thanks to Japan's energy-saving efforts since the 1970s, a considerable success was achieved by introducing new manufacturing technologies, etc. In order to obtain similar achievements over the next 30 years, it is essential for all sectors, including industrial sector, to develop technology that contributes to enhancing energy efficiency and to encourage the introduction and diffusion of the technological results.

(2) Purpose of the program

In the "new national energy strategy", the "strategy for energy-saving technology" was formulated from a long-term perspective as a main pillar to improve the energy efficiency by 30% or more, in which the development of energy-saving technology and support for it was presented.

The purpose of the "strategy for energy-saving technology" is to promote the development of innovative technology by encouraging cooperation among different entities, for example, among the industry, government and academia, among different business categories, or between manufacturers and users, and, at the same time, to share the stages of technological development among the entities concerned in order to meet the social and economic needs anticipated in the future. In the strategy, energy-saving technology is positioned as a "source of competitiveness of Japanese industry", which will make Japan respected as "the world's No. 1 energy conservation country" to have overcome the unfavorable situations, for example, limited resources and tight environmental restrictions, in the international society toward the year 2030.

(3) Extraction of technological challenges and prioritized fields

Energy consumption is a basic human activity. Energy-saving technology, including energy conservation in daily life, improvement in the equipment efficiency, and optimization of energy supply methods, is a wide range of technologies related to all human activities. Several considerations were taken in studying energy-saving technology according to the energy flow from

the primary energy conversion to the final energy consumption. In particular, important are ,for example, the energy-saving technology which does not hamper convenience and benefit in the final energy consumption and, at the same time, use out all the potential of energy in the energy production and distribution field.

Also, although the development of energy-saving technology without hampering convenience and benefit on the consumption side is strongly requested, it is important to develop with a gradual pace in each individual field. Meanwhile, in order to achieve a significant breakthrough, collaboration among various business entities and the resulting creation of synergy effect are required. Therefore, a comprehensive assessment was made on the energy-saving potential, the degree of technology maturation, and the propagating effect to other fields, etc, and then energy-saving technologies to become a stem in the future were extracted. The extracted technologies were rearranged and incorporated as the five prioritized fields so as to be exploited across multiple fields.

< Five prioritized fields >
- Super-efficient combustion system technology
- Technology of energy utilization beyond space-time restriction
- Technology for creation of informative living space
- Technology to establish an advanced transport society
- Next-generation energy-saving device technology

Source: Strategy for energy-saving technology (interim report)
http://www.eccj.or.jp/rodemap/index.html

2.3 International Cooperation / Asia Energy Conservation Program

(1) Significance of energy conservation cooperation

The significance of Japan's international cooperation in the energy conservation field with Asian countries is as shown below.

1) Improving energy supply-demand structure in Asia

Cooperation in the energy conservation field with Asian countries will improve energy efficiency, suppress a sharp increase in demand for energy, and improve the energy supply-demand structure. Consequently, the cooperation will contribute to stabilizing the mid- and long-term energy supply-demand in Asia, while at the same time stabilizing the crude oil market price and improving the global energy supply-demand structure. In particular, the suppression of energy demand and the reform of energy supply-demand structure in foreign countries through energy conservation cooperation will contribute to the energy security of Japan, which is heavily dependent on overseas countries for most of its energy resources.

2) Solving global environmental problems

Asian countries consume a large amount of energy and at the same time are attributed to a large proportion of CO_2 emissions in the world. The promotion of cooperation in the energy conservation field will lead to the reduction of CO_2 emissions in Asian countries and contribute

to solving global environmental problems.

3) International contribution

Generally speaking, Asian countries are heavily dependent on imported oil and have a fragile energy supply-demand structure. For this reason, under present circumstances, with oil prices at historically high levels, there is an increasing need for the stabilization of energy supply-demand in Asian countries. Against the above problem, there are great expectations for Japan, which has the world's top track record in terms of energy conservation, to cooperate in the energy conservation field. Japan's active promotion of cooperation in the energy conservation field with Asian countries will meet their expectations and externally show our attitude of a firm commitment to energy security in Asia. This international contribution is of great significance and will help to strengthen Japan's leadership in Asian countries in energy and other fields.

4) Reduction of destabilizing factors in the Asian economy

Recently, Japan has undergone an extremely profound economic interdependence with Asian countries, including China, in both export/import and investment exchange. However, the energy problem remains a destabilizing factor for growing Asian economy. The promotion of cooperation in the energy conservation field will make Asia's economic structure invulnerable to fluctuations in energy price, prevent the energy problem from hampering economic growth, and result in the reduction of destabilizing factors of the whole economy in Asia, including Japan.

5) Deepening the business exchange between Japan and Asian countries

In order to promote energy conservation in Asian countries, it is necessary to improve energy conservation-related systems, develop human resources, and diffuse energy-saving appliances and facilities. Energy conservation is needed in all fields, including the industrial, commercial and household fields of each country. It is expected that the market size of energy-saving appliances and facilities in Asian countries will substantially expand with future economic growth. Asian countries have a big expectation of the transfer of globally leading energy-saving technology possessed by the Japanese industry. Responding to such expectations will contribute to encouraging energy conservation in Asia and deepening the business exchange between Japan and Asian countries.

(2) Future course to strengthen cooperation in the energy conservation field

The energy supply-demand structure needs to be improved in Asian countries by promoting energy conservation on their own initiative, in the light of the above-mentioned. In order to do so, efforts for international cooperation in the energy conservation field will be drastically made to implement the "Asia energy conservation program" based on the following ideas:

1) Support for establishing the legal/policy system in Asian countries

Some improvements have been made on the legal system concerning energy conservation, including the Energy Conservation Law and energy-efficiency standards. However, it is still pointed out that the legal system has not been working satisfactorily due to lack of substantial enforcement, although the foundation of the legal system concerning energy conservation has been built in Asian countries.

Under these circumstances, Japan will reinforce a support for establishing and implementing the legal system concerning energy conservation in Asian countries. To be more specific, Japan will support for the development of human resources, including the dispatch of long term experts to Asian countries, and receiving of trainees in the training course, and for the formulation of energy efficiency standards and the establishment of energy statistics system. Japan will also support for establishing an energy conservation center in various countries and regions.

2) Cooperation in the household, transportation, and electric power sectors

In the heavy-energy-consuming countries in Asia, including China and India, the industrial sector consumes considerable amount of energy, and Japan has been cooperating with these countries, mainly in the industrial sector. Because energy demand is forecasted to increase sharply due to the drastic improvement in the standard of living and the progress in motorization, a growing need arises for the promotion of energy conservation in the household and transportation sectors. In response to the above, Japan will start to cooperate in the energy conservation of the household and transportation sectors, while continuing a cooperation in the industrial sector as before. Specifically, Japan will cooperate in internationally expanding the energy-efficiency standards, the labeling system and the ESCO system. There are many countries where low efficiency is kept unimproved in the electric power generation and distribution, for which Japan will cooperate.

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

In order for Asian countries to voluntarily promote energy conservation, it is helpful to introduce energy-efficient appliances and facilities in the industrial, commercial, household, and transportation sectors, as well as to establish the legal systems. In order to activate an investment in energy conservation in Asian countries, it is necessary for Japanese companies to support the business activities in Asian countries, through transferring their own energy-saving technology. In order to support the business activities of the Japanese companies in Asian countries, it is necessary to promote business exchange through dialog among industries, business meeting, etc. Policy-based finance will be provided by the Japan Bank for International Cooperation (independent administrative agency) and others. The CDM scheme will be also helpful from the viewpoint of supporting energy-saving businesses.

4) Collaboration with international organizations

The energy supply-demand problem in Asia is important, not only to Japan but also to the global energy market. As known well, European countries, the USA and international organizations have cooperated with Asian countries in the energy conservation field. Under present circumstances, in order to lend effective cooperation in the energy conservation field, it is necessary to establish an international cooperation system in collaboration with overseas donors, including the IEA and APEC, and international financial institutions, such as the ADB, to facilitate smooth financing for energy conservation projects. In addition, it is presented to support the formulation of energy efficiency standards of electric appliances in

collaborate with international NPOs, for which Japan is ready to provide the necessary financial support.

5) Collaboration with the government and agencies concerned

The New Energy and Industrial Technology Development Organization, Japan International Cooperation Agency, Japan Bank for International Cooperation, Japan External Trade Organization, The Energy Conservation Center, Japan, and other agencies concerned have been enthusiastically striving to implement an international cooperation in the energy conservation field. To be more effectively and efficiently, close communication and coordination are strongly requested among the international projects supported by overseas donors, while reinforced coordination between the government and agencies concerned is essential. The "energy conservation/new energy international cooperation council", consisting of some cooperation agencies and the Ministry of Economy, Trade and Industry, should play an active role as a principal gathering to orientate an effective international cooperation in both the energy conservation and new energy fields. In order to cope with international cooperation needs in the energy conservation field, the functions of the agencies concerned should be reexamined and strengthened, as necessary.

6) International development of the benchmark approach using the international framework

The benchmark approach that enables the comparison of energy efficiency in each sector is an effective means of promoting energy conservation. Japan will strongly support the IEA in preparing an energy efficiency benchmark. Based on the benchmark approach, Japan will help companies with technical capabilities to carry out business activities, participate in the energy conservation technology transfer project proposed in the Asia-Pacific Partnership (APP), and diffuse the benchmark approach through the international framework of APEC, ASEAN plus 3 and others. In addition, the benchmark approach can be employed for raising the technological rating of the Japanese companies which have an excellent energy-saving technology.

(3) Future efforts

1) Countries to be concentrated

It is necessary to consider the following factors and select the Asian countries on which Japan should concentrate a cooperation in energy conservation field:

a) Size for energy demand
b) Importance of a country in the energy policy of Japan
c) Economic relation with Japan
d) Commitment to the promotion of energy conservation

After considering the above, China, India, Thailand, Indonesia, and Vietnam are prioritized candidate for cooperation.

2) Implementation plan

Bilateral policy dialogs will be held with the above-mentioned countries to discuss future

directions for Japan's cooperation. Considering the energy situation and cooperation needs of each country, an action plan will be formulated to promote a cooperation in the energy conservation field.

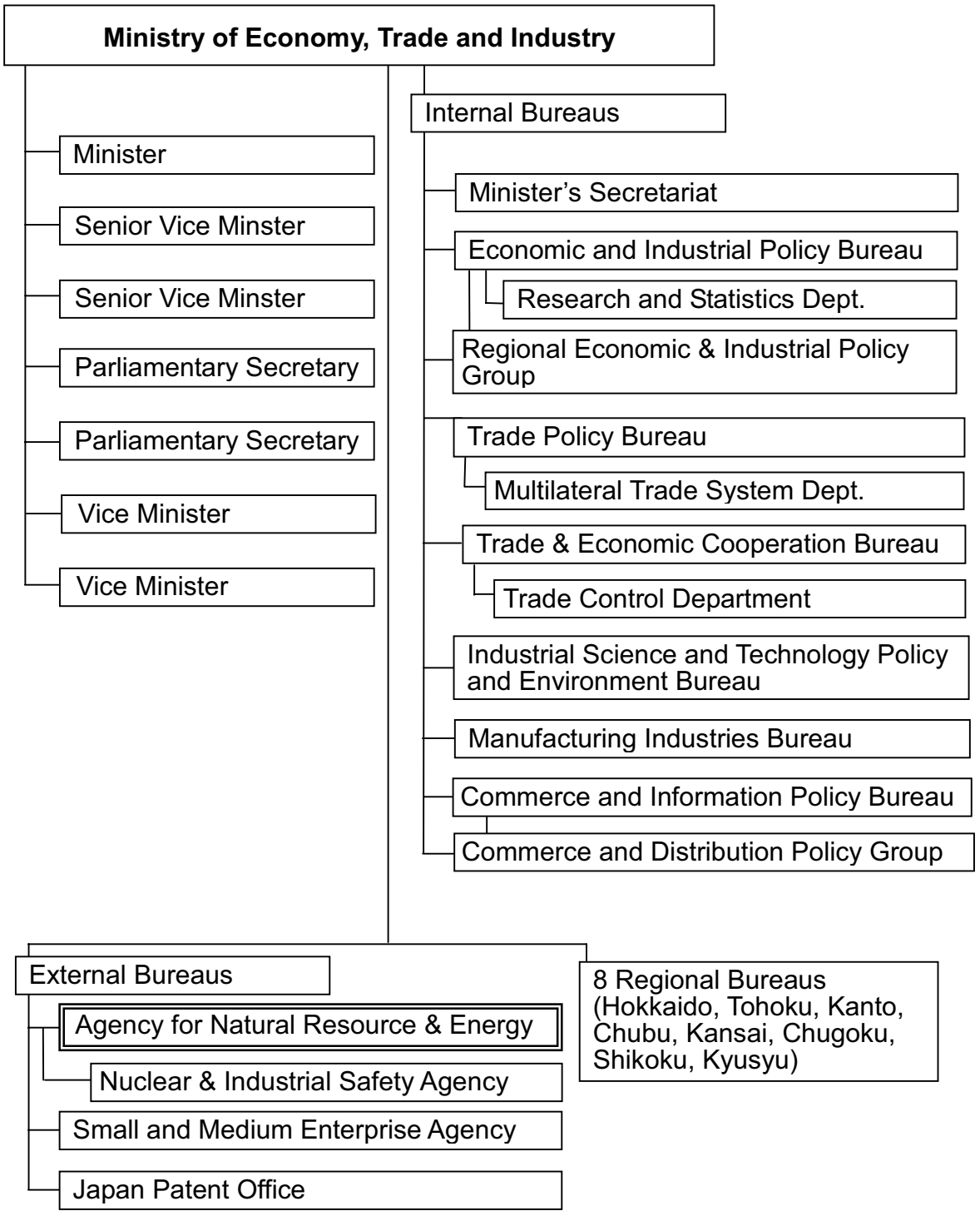
Source) Material at the 9th Energy Efficiency and Conservation Subcommittee of the Advisory Committee on Energy and Natural Resources (May 2006)
http://www.meti.go.jp/committee/materials/downloadfiles/g60607h11j.pdf

REFERENCE

1. RELATED ORGANIZATIONS

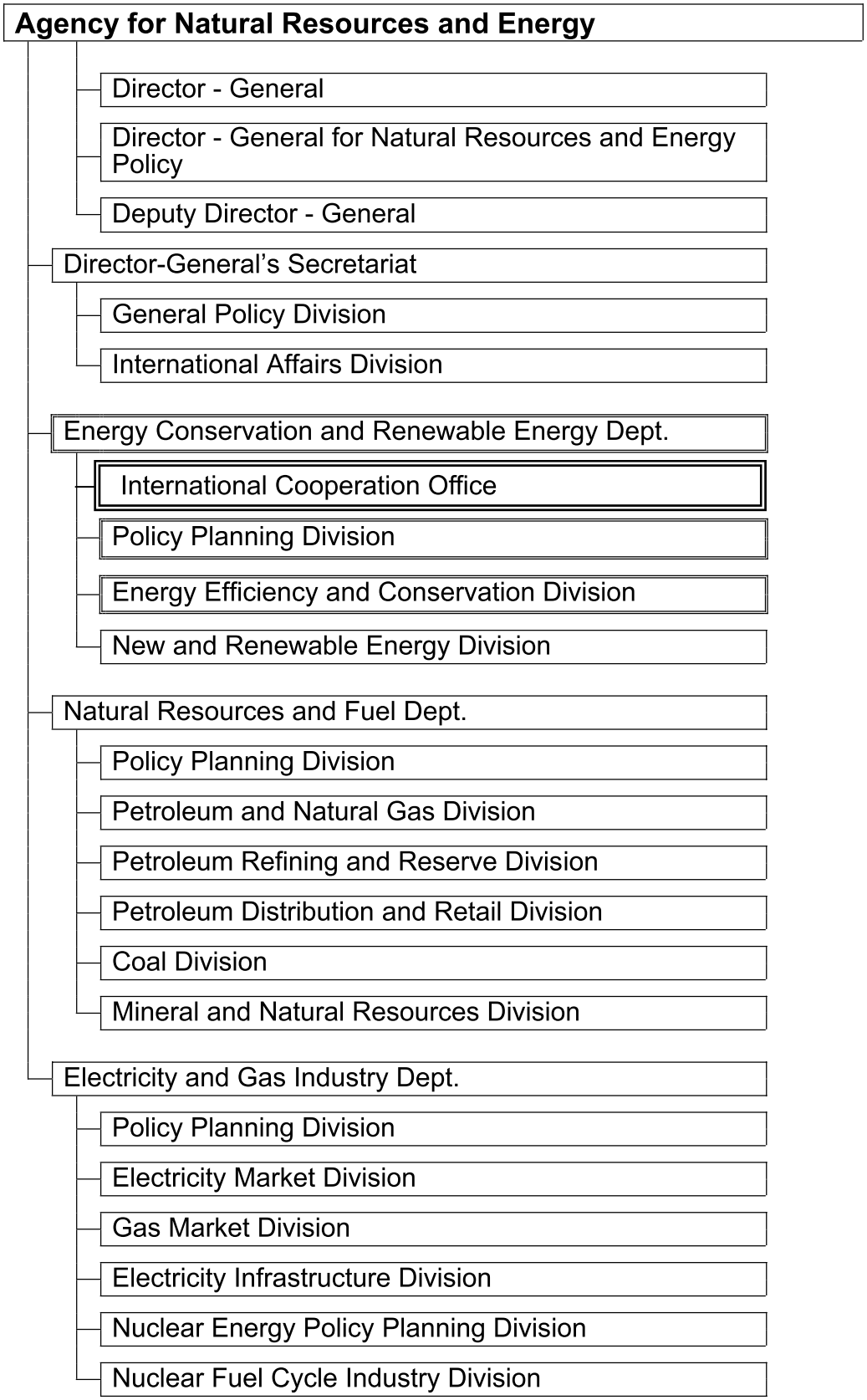
1.1 Ministry of Economy, Trade and Industry (METI)

(1) Organization of METI **(as of April 2007)**



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

(as of April 2007)



1.2 Energy Conservation Center, Japan (ECCJ)

(as of August, 2008)

(1) About ECCJ

Legal status:	An incorporated foundation under the supervision of METI
Establishment:	1978 (just when hit by the 2nd oil crisis)
Mission:	Core organization responsible for promotion of energy conservation
Office location:	Head office & eight branches in Japan
Supporting member:	2,861 members (as of July, 2008)
Number of employees	133 persons
Budget:	3,892 million yen in FY2007 (39 million US$: @100¥/US$)
Fields of activity:	Industrial, Residential / Commercial and Transportation sectors

Major activities:

Industry sector;

- Energy conservation audits services for factories
- Education & training on energy conservation
- State examination for energy managers (assigned by the government)
- Dissemination (conference for successful cases of energy conservation activities, excellent energy conserving equipment, etc.)
- Technological development and spillover

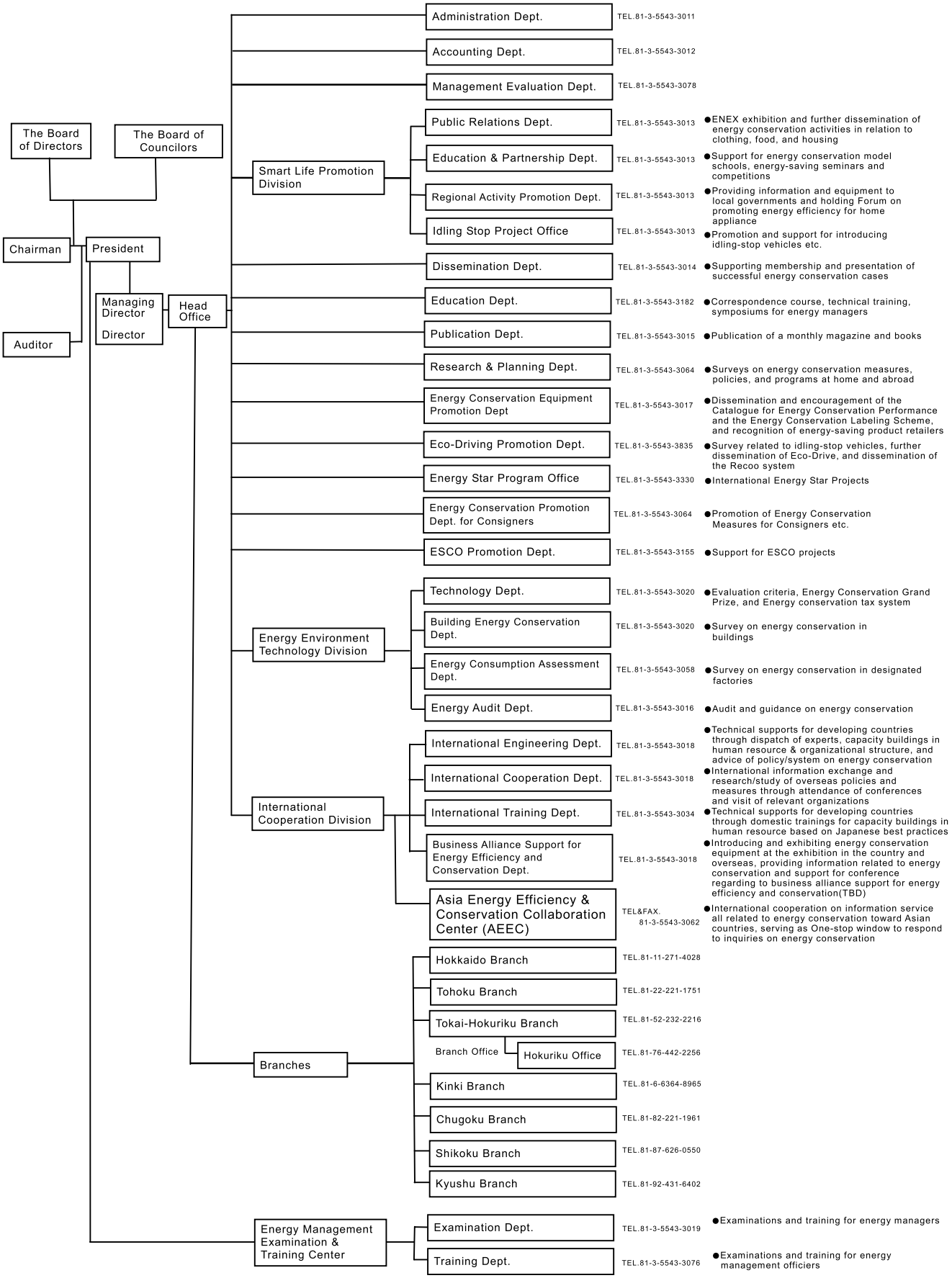
Residential / Commercial and Transportation sector;

- Energy conservation audits services for buildings
- Ranking catalogue for energy efficient appliances (dissemination of Top Runner Program)
- Promotion of energy labeling system
- International Energy Star program implementation
- Energy efficiency product retailer assessment system
- Dissemination of energy conservation indicator "E-Co Navigator"
- Energy education at primary and middle schools
- ESCO research and development

Cross sector:

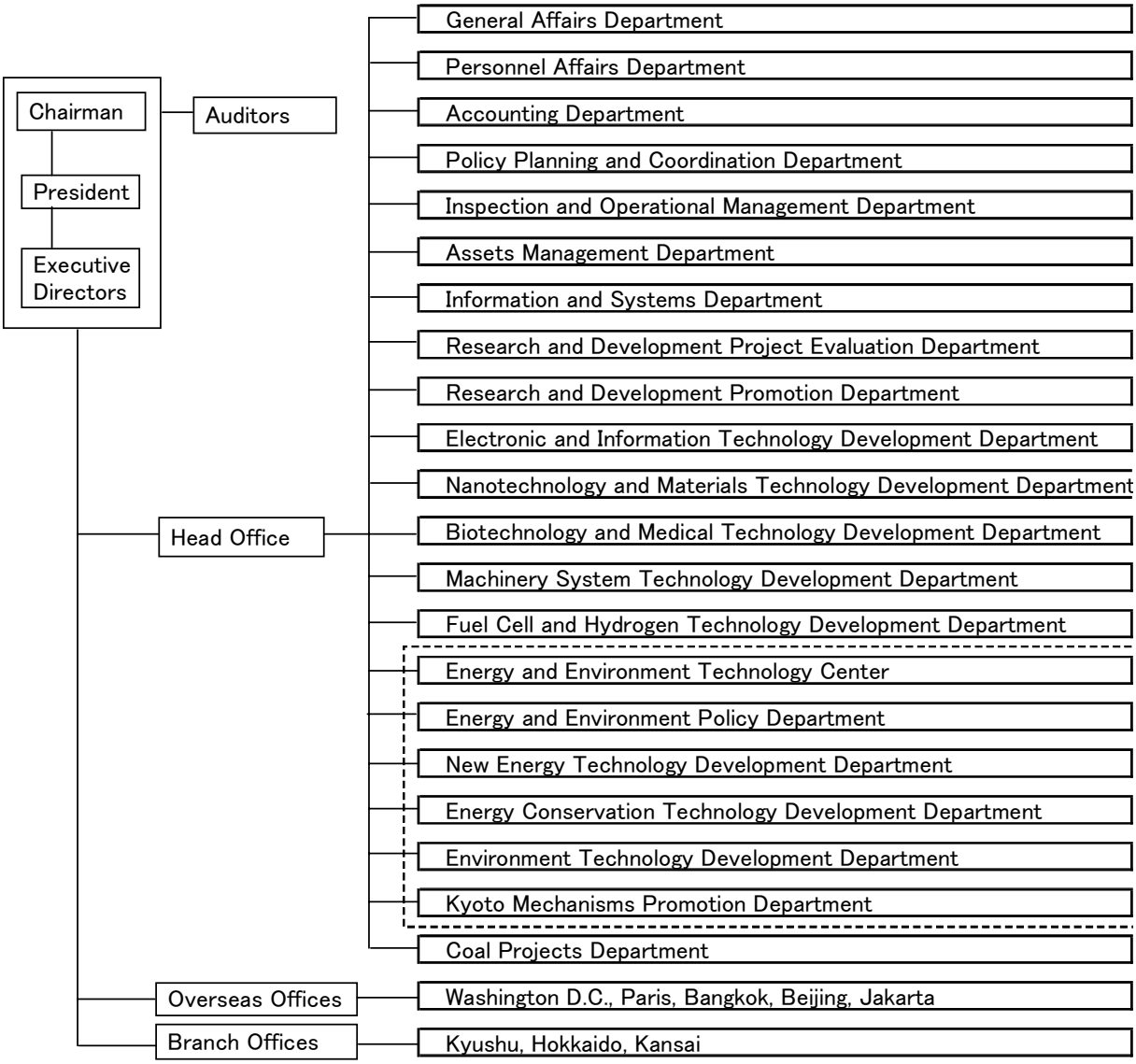
- Energy conservation campaign & exhibition (ENEX)
- Commendation (grand energy conservation prize)
- Information & data base, publicity and publishing
- Survey and monitoring
- International cooperation & communications

(2) Organization Chart (As of August 5 2008)



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

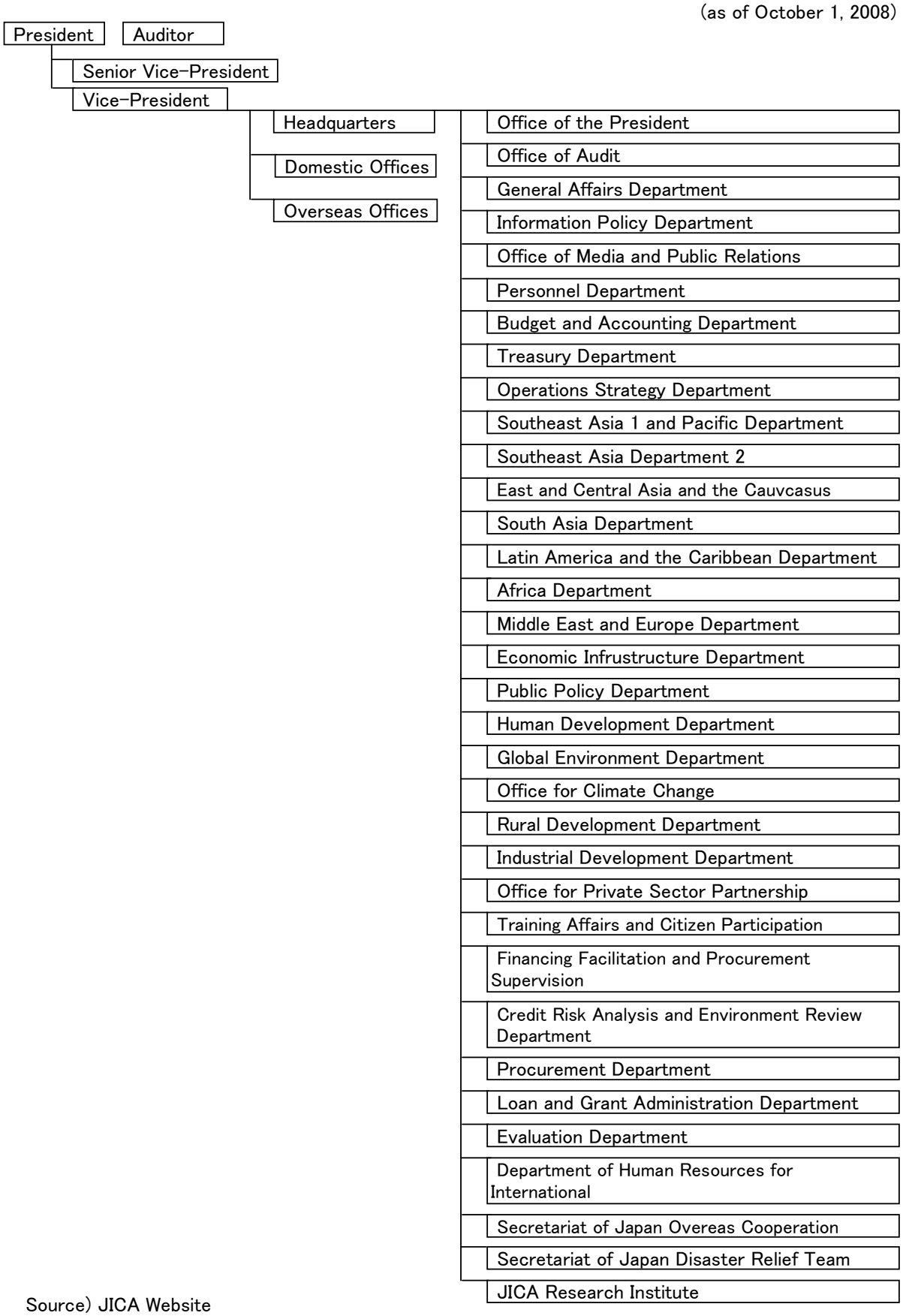
(as of April, 2007)



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

1.4 Japan International Cooperation Agency (JICA)

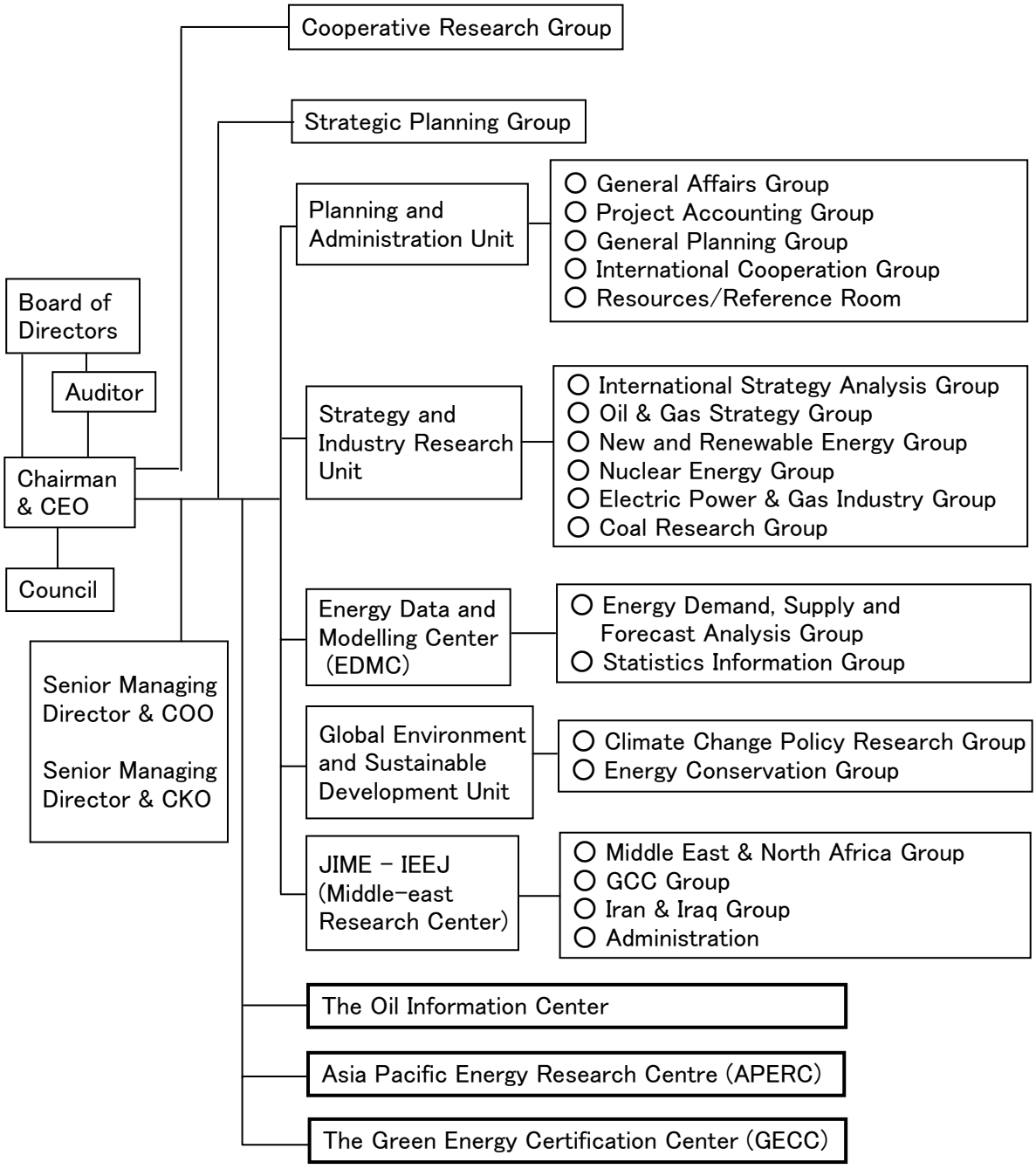
(as of October 1, 2008)



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

1.5 The Institute of Energy Economics, Japan (IEEJ)

(as of April, 2008)



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

2. ENERGY CALORIES (JAPAN)

Energy	Unit	Average Calorie (kcal)		Energy	Unit	Average Calorie (kcal)	
<Coal>		F.Y.		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 (2008)”