Japan
Energy Conservation Handbook

2005 / 2006

The Energy Conservation Center, Japan

Contents

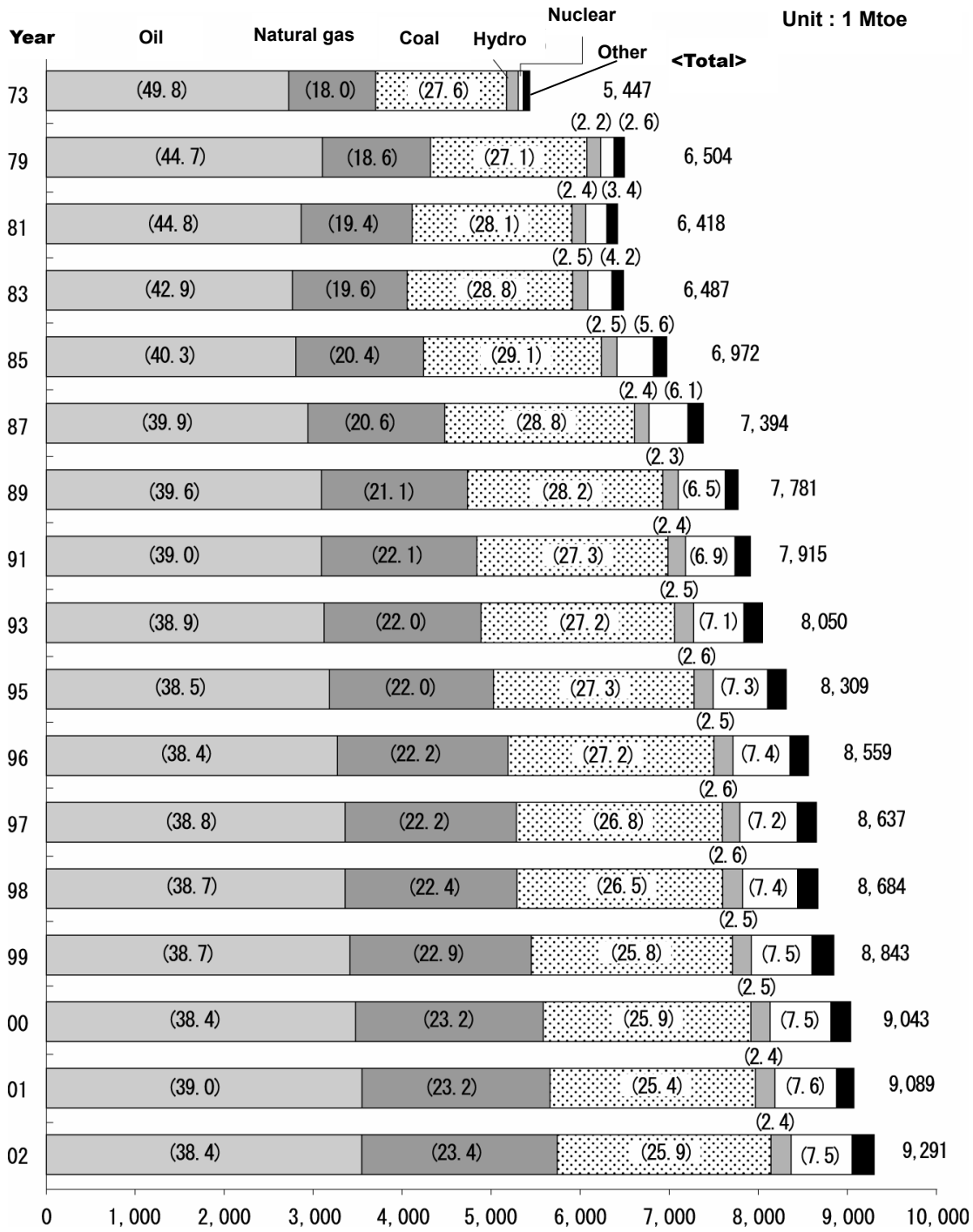
1. World Energy Situations

1.1 Energy resource reserves (2003)[1)]

	Oil	Natural gas	Coal	Uranium
Proved recoverable reserves (R)	1.1477 trillion barrels	176 trillion m^3	984.5 billion tons	4.59 million tons
Allocation by region: North America	4.1%	4.0%	26.1%	17.1%
Central & South America [1)]	10.3	4.3	2.3	3.6
Europe	1.8	3.6	13.4	2.8
Former Soviet Union	7.4	31.8	22.7	28.7
Middle East	63.3	40.8	0.2	0.2
Africa	8.9	7.8	5.6	20.5
Asia / Pacific	4.2	7.7	29.7	27.2
Annual production (P)	28 billion barrels (76.8 million barrels/day)	2.6 trillion m^3	5.12 billion tons	36,000 tons
Recoverable years (R/P)	41.0 years	67.1 years	192 years	85 years [2)]
Source	BP statistics (year 2004)			OECD/NEA, IAEA URANIUM (year 2003)

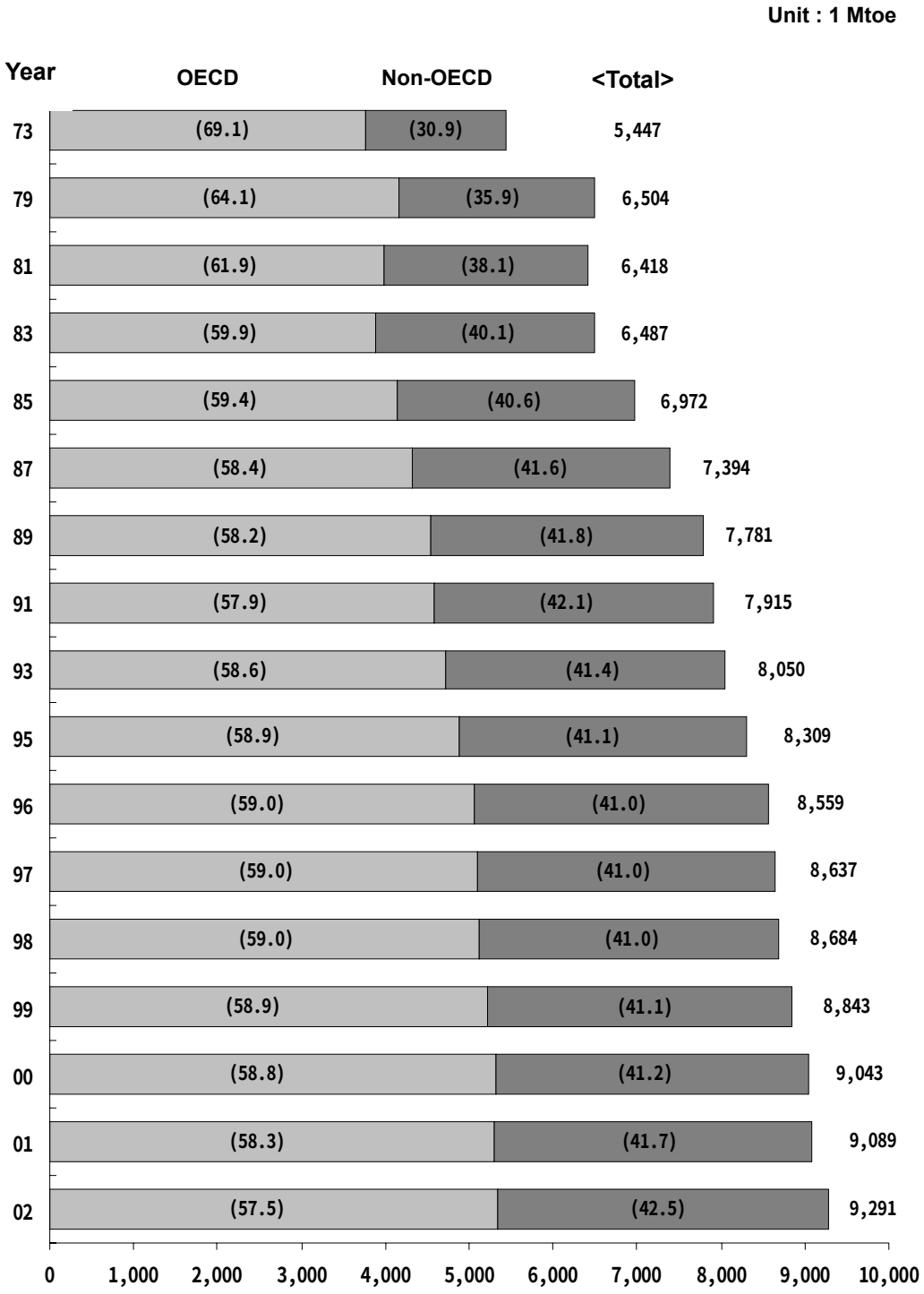
1) Mexico was included in South & Central America category since 2000. You need to take account of that when comparing with the previous fiscal year.
2) The recoverable reserves years in case of using uranium for a light water reactor by one through. Therefore, uranium's recoverable year is figured out by dividing the value of the proven recoverable reserves by the annual demand of uranium in the world in 2002.

1.2 Primary energy consumption by energy resource



Note) Figures in parenthesis represent percentage.
The figure of the other sources (renewable energy etc.) are neglected from the bar chart.
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)"

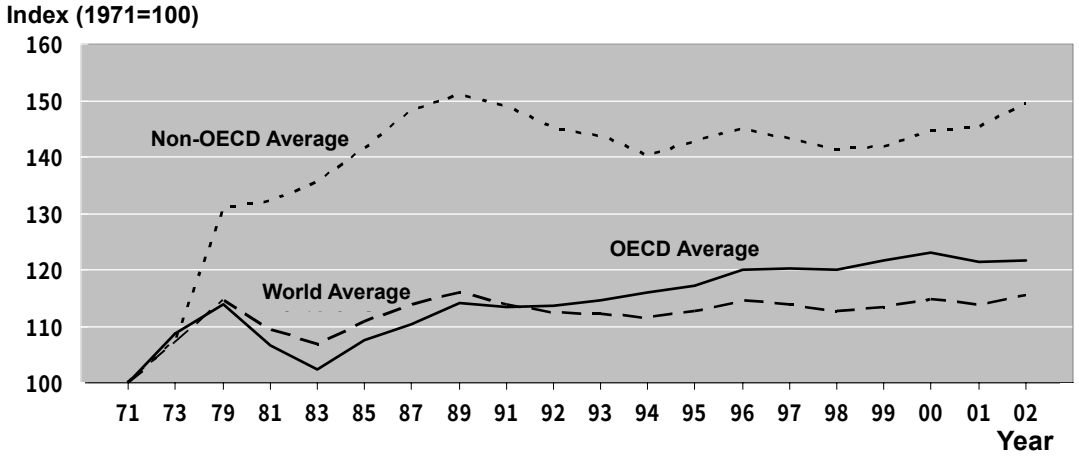
1.3 Primary energy consumption by region



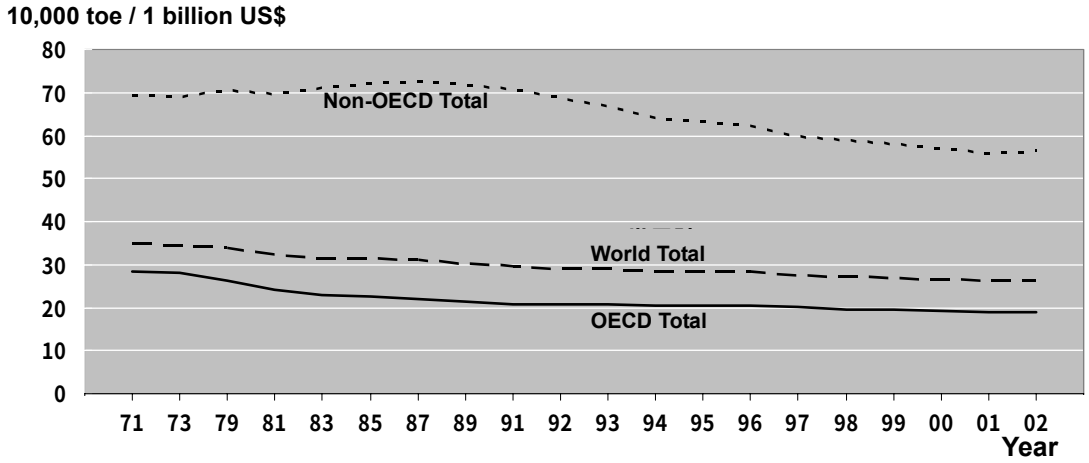
Note) Figures in parenthesis represent percentage.
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)"

1.4 Trends of Primary Energy Consumption

(1) Per-capita primary energy consumption



(2) Primary energy consumption per GDP



(3) World energy consumption (2002)

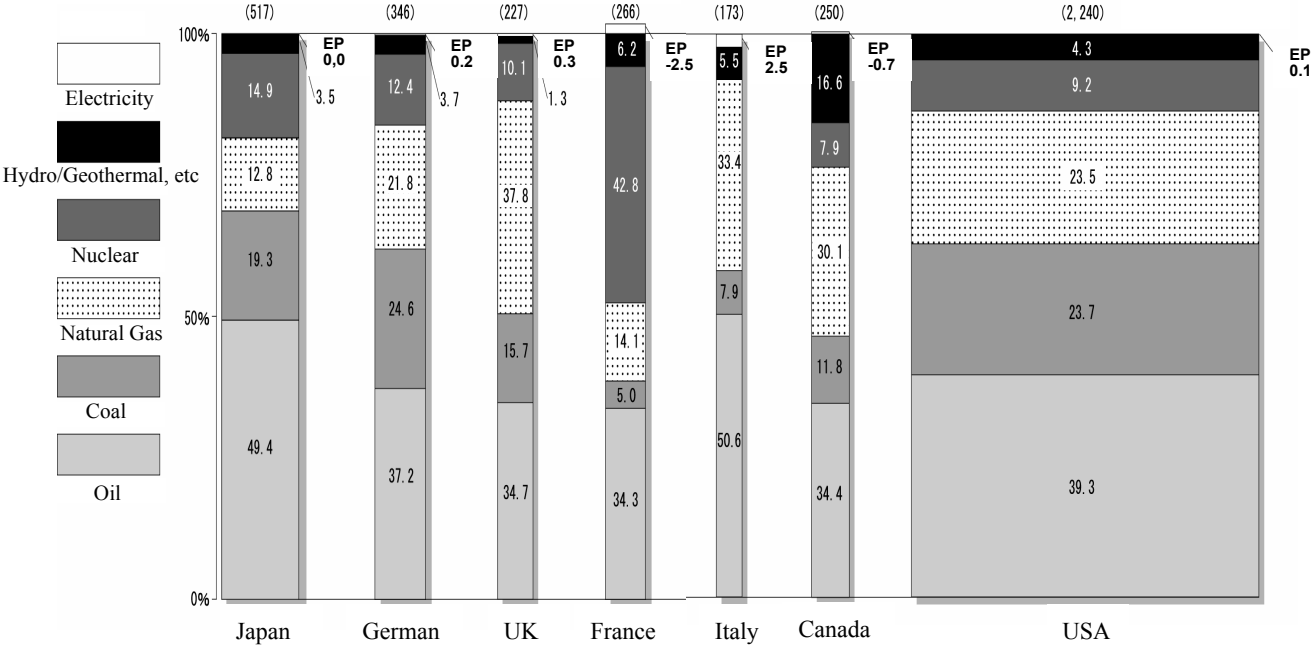
	Primary Energy Consumption			Real GDP (1995 US $ standard)			Population		
	1 Mtoe	Y/Y Growth Rate	Avg. Growth Rate (1973-2001)	1 billion US $	Y/Y Growth Rate	Avg. Growth Rate (1973-2001)	Million	Y/Y Growth Rate	Avg. Growth Rate (1973-2001)
OECDTotal	5,346	0.94%	1.22%	28,401	1.60%	2.65%	1,144	0.70%	0.82%
Non-OECD Total	3,946	4.03%	2.98%	6,995	3.17%	3.67%	5,024	1.27%	1.81%
World Total	9,291	2.22%	1.86%	35,396	1.91%	2.83%	6,168	1.16%	1.60%

Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)"

1.5 Energy supply in major countries (2002)

(1) Total primary energy supply (TPES) and percentage shares of energy sources

Unit : %
Figures in parentheses are Million toe



EP = Electric power

Note)

1) The import and export of electric power are also included in the primary energy supply (－ in the chart represents excess of export).

2) Coal includes other solid fuels.

Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)"

Comment)

1) The ratio of petroleum is especially high in Japan and Italy, accounting for 50%.
2) In the U.S.A. and Germany, the share of coal is as high as 24%.
3) In Canada, the share of hydraulic power is as high as 17%.
4) In France, the share of nuclear power is especially as high as 43%.

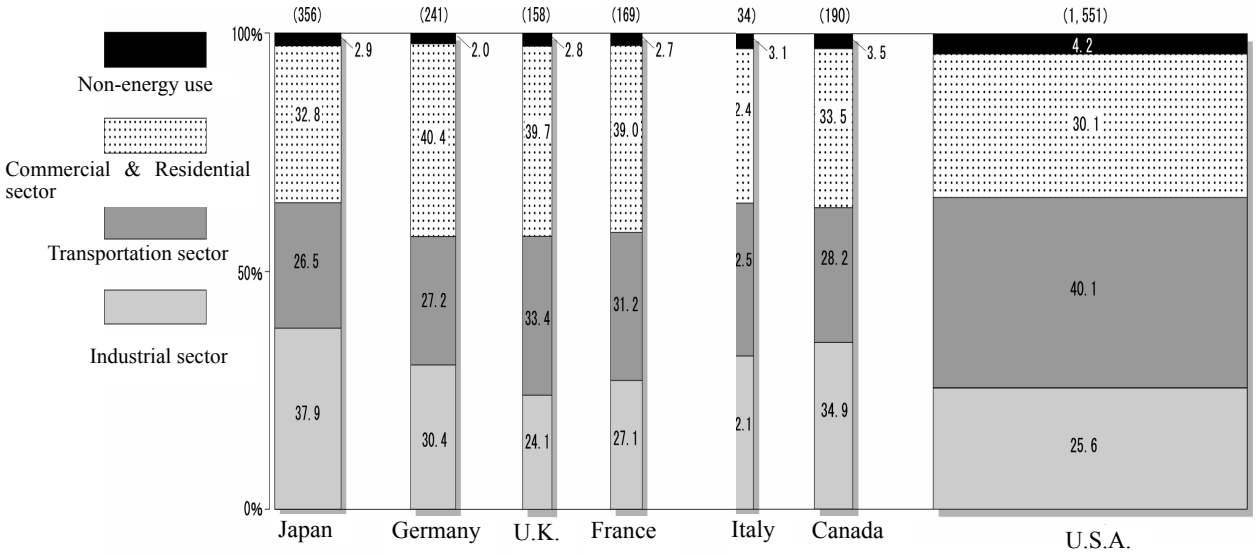
(2) Import dependence (2002)

	Japan	Germany	U.K	France	Italy	Canada	U.S.A
Dependence on Energy import (%)	81.0	61.1	-13.8	49.4	84.6	-54.1	27.2
Dependence on Oil import (%)	99.7	96.7	-53.8	98.3	93.7	-58.2	60.1

Source) IEA/Energy Balances of OECD Countries (2001-2002)

(3) Percentage sector shares in final energy consumption (2002)

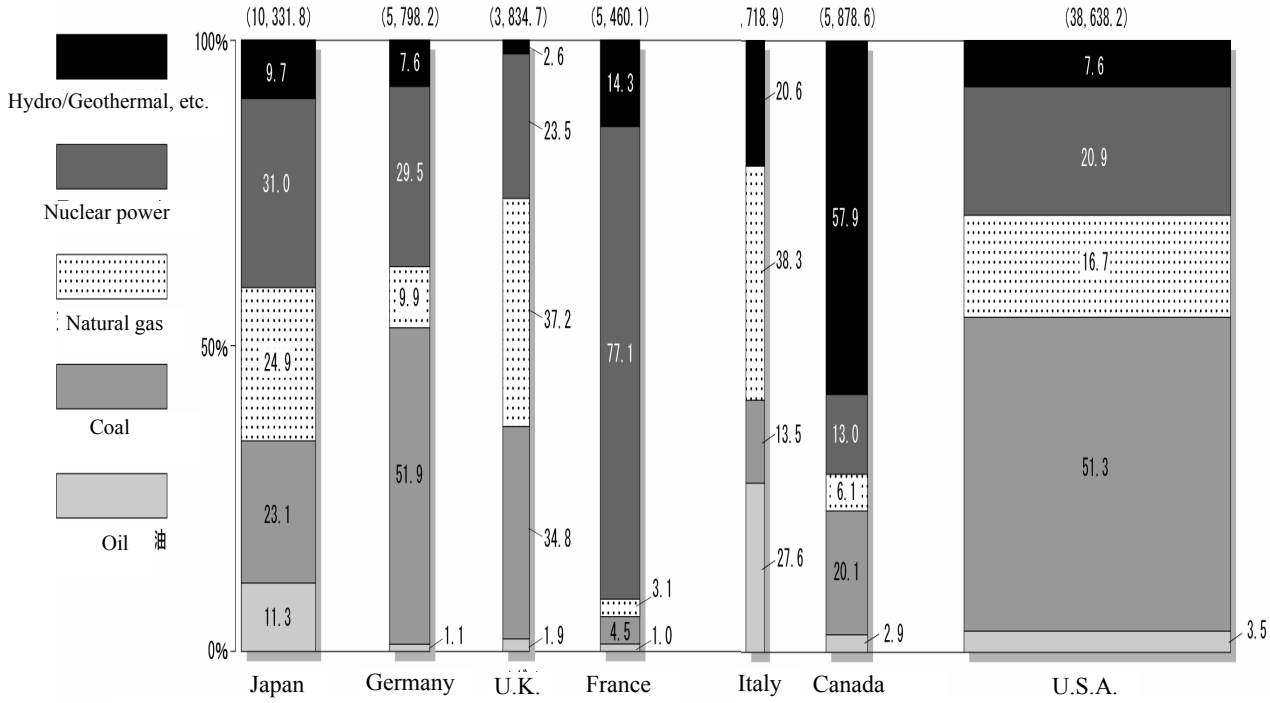
Unit: % **Figures in parenthesis represent 1 Mtoe.**



Source) IEA/Energy Balances of OECD Countries (2001-2002)

(4) Total electricity generated and percentage shares of power sources (2002)

Unit: % **Figures in parenthesis represent 100 million kWh.**



Source) IEA/Energy Balances of OECD Countries (2001-2002)

1.6 Energy consumption in major countries

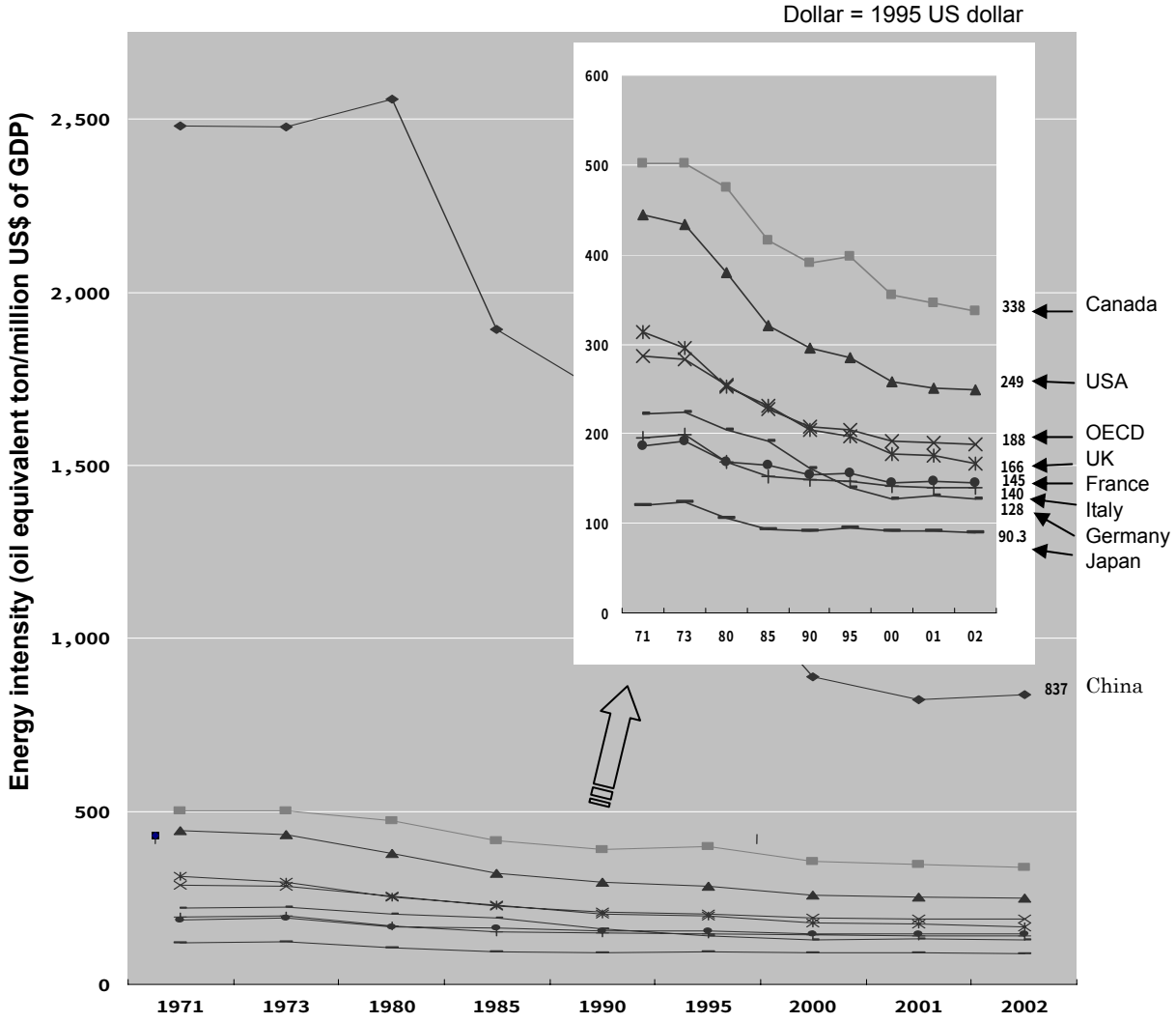
(1) Trend of energy consumption

(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	
	2001	2002	2001	2002	2001	2002	2001	2002
U.S.A.	0.3	2.4	-2.1	1.6	1.4	-0.4	40.1	39.3
Japan	0.4	0.3	-1.0	0.0	-3.8	1.1	48.9	49.4
Germany	0.6	0.2	2.6	-2.0	2.1	-4.2	38.1	37.2
U.K.	2.1	1.8	1.3	-3.0	-2.5	-3.6	34.9	34.6
France	2.1	1.2	3.1	0.0	7.6	-2.8	35.3	23.9
China	7.5	8.0	-0.4	9.7	2.6	6.2	24.7	49.4

Source) IEA/Energy Balances of OECD Countries and IEA/Energy Balances of Non-OECD Countries (2001-2002)

(2) Comparison of energy intensities



Source) IEA/Energy Balances of OECD Countries and IEA/Energy Balances of Non-OECD Countries (2001-2002)

1.7 World Energy Outlook

(1) World Oil Demand

Unit : million barrels per day

		2002	2010	2020	2030	Average annual growth rate 2002-2030(%)
OECD	OECD North America	22.6	25.5	28.7	31.0	1.1
	US and Canada	*20.7*	*23.2*	*25.8*	*27.6*	*1.0*
	Mexico	*2.0*	*2.3*	*2.9*	*3.4*	*2.0*
	OECD Europe	14.5	15.3	16.3	16.6	0.5
	OECD Pacific	8.4	8.9	9.4	9.5	0.5
	OECD Asia	*7.5*	*7.9*	*8.3*	*8.3*	*0.4*
	OECD Oceania	*0.9*	*1.0*	*1.1*	*1.2*	*1.2*
	OECD Total	**45.4**	**49.7**	**54.4**	**57.1**	**0.8**
Non-OECD	Transition economies	4.7	5.5	6.5	7.6	1.8
	Russia	*2.7*	*3.1*	*3.6*	*4.2*	*1.6*
	Other	*2.0*	*2.4*	*3.0*	*3.4*	*2.0*
	China	5.2	7.9	10.6	13.3	3.4
	Indonesia	1.2	1.6	2.1	2.6	2.9
	India	2.5	3.4	4.5	5.6	2.9
	Other Asian Countries	3.9	5.1	7.0	8.8	3.0
	Latin America	4.5	5.4	6.8	8.4	2.3
	Brazil	*1.8*	*2.3*	*2.9*	*3.6*	*2.4*
	Other Latin America	*2.7*	*3.2*	*3.9*	*4.8*	*2.1*
	Africa	2.4	3.1	4.4	6.1	3.4
	Middle East	4.3	5.4	6.8	7.8	2.1
	Non-OECD total	**28.6**	**37.5**	**48.8**	**60.4**	**2.7**
	Miscellaneous	3.0	3.2	3.5	3.8	0.9
	World	**77.0**	**90.4**	**106.7**	**121.3**	**1.6**

Source) IEA / World Energy Outlook (2004)

(2) World Oil Supply

(million barrels per day)

		2002	2010	2020	2030	Average annual growth rate 2002-2030(%)
Non-OPEC	OECD North America	13.7	14.8	12.6	10.0	-1.1
	US and Canada	*10.1*	*10.6*	*8.7*	*7.2*	*-1.2*
	Mexica	*3.6*	*4.2*	*4.0*	*2.8*	*-0.9*
	OECD Europe	6.6	4.8	3.1	2.2	-3.9
	OECD Pacific	0.8	0.5	0.5	0.5	-2.0
	OECD Total	**21.1**	**20.1**	**16.3**	**12.7**	**-1.8**
	Russia	7.7	10.4	10.6	10.8	1.2
	Other transition economies	1.9	4.2	4.7	5.2	3.7
	Transition economies Total	**9.5**	**14.6**	**15.4**	**15.9**	**1.8**
	China	3.4	3.3	2.7	2.2	-1.5
	India	0.8	0.7	0.6	0.5	-1.6
	Other Asia	1.7	1.6	1.2	0.6	-3.4
	Latin America	3.7	4.7	5.5	6.1	1.8
	Brazil	*1.5*	*2.5*	*3.3*	*4.0*	*3.6*
	Other Latin America	*2.2*	*2.2*	*2.2*	*2.1*	*-0.2*
	Africa	3.0	4.6	4.9	4.4	1.4
	Middle East	2.1	1.8	1.4	1.0	-2.7
	Developing Countries Total	**14.6**	**16.6**	**16.2**	**14.8**	**-1.8**
	Non-OPEC Total	**45.3**	**51.3**	**47.9**	**43.4**	**-0.2**
OPEC	OPEC Middle East	19.0	22.5	37.4	51.8	3.6
	Other OPEC	9.2	10.7	12.4	13.0	1.2
	OPEC Total	**28.2**	**33.3**	**49.8**	**64.8**	**3.0**
	Non-conventional oil	**1.6**	**3.8**	**6.5**	**10.1**	**6.7**
	of which GTL	*0.0*	*0.4*	*1.5*	*2.4*	*16.0*
	Processing gains	**1.8**	**2.0**	**2.5**	**3.0**	**1.9**
	World	**77.0**	**90.4**	**106.7**	**121.3**	**1.6**

Source) IEA / World Energy Outlook (2004)

1.8 Projections of Energy Demand and Growth Rates

(1) World

	Energy Demand (Mtoe)				Growth Rate (%)		
	2002	2010	2020	2030	2002-2010	2002-2020	2002-2030
Total Primary Energy Supply	10,345	12,194	14,404	16,487	2.1	1.9	1.7
Coal	2,389	2,763	3,193	3,601	1.8	1.6	1.5
Oil	3,676	4,308	5,074	5,766	2.0	1.8	1.6
of which international bunkers	146	148	152	162	0.2	0.2	0.4
Gas	2,190	2,703	3,451	4,130	2.7	2.6	2.3
Nuclear	692	778	776	764	1.5	0.6	0.4
Hydro	224	276	321	365	2.6	2	1.8
Biomass & Waste	1,119	1,264	1,428	1,605	1.5	1.4	1.3
Other Renewables	55	101	162	256	8.0	6.2	5.7

(2) OECD

	Energy Demand (Mtoe)				Growth Rate (%)		
	2002	2010	2020	2030	2002-2010	2002-2020	2002-2030
Total Primary Energy Supply	5,346	5,970	6,550	6,593	1.5	1.1	0.9
Coal	1,095	1,170	1,213	1,192	1.0	0.6	0.3
Oil	2,167	2,372	2,594	2,725	0.7	1	0.8
Gas	1,171	1,379	1,635	1,830	1.9	1.9	1.6
Nuclear	593	642	599	557	10.5	0.1	-0.2
Hydro	106	121	125	131	1.1	0.9	0.8
Biomass & Waste	181	223	282	359	2.5	2.5	2.5
Other Renewables	33	63	103	159	6.8	6.5	5.8

(3) Transition Economies

	Energy Demand (Mtoe)				Growth Rate (%)		
	2002	2010	2020	2030	2002-2010	2002-2020	2002-2030
Total Primary Energy Supply	1,030	1,186	1,358	1,499	1.8	1.6	1.3
Coal	194	219	227	217	1.5	0.9	0.4
Oil	222	265	312	362	2.2	1.9	1.8
Gas	504	578	685	782	1.7	1.7	1.6
Nuclear	69	77	80	71	1.2	0.8	0.1
Hydro	24	29	31	32	2.3	1.3	1
Biomass & Waste	16	17	19	25	0.8	1.1	1.7
Other Renewables	0	3	4	8	36.7	17.3	13.6

Source) IEA / World Energy Outlook (2004)

(4) Developing Countries

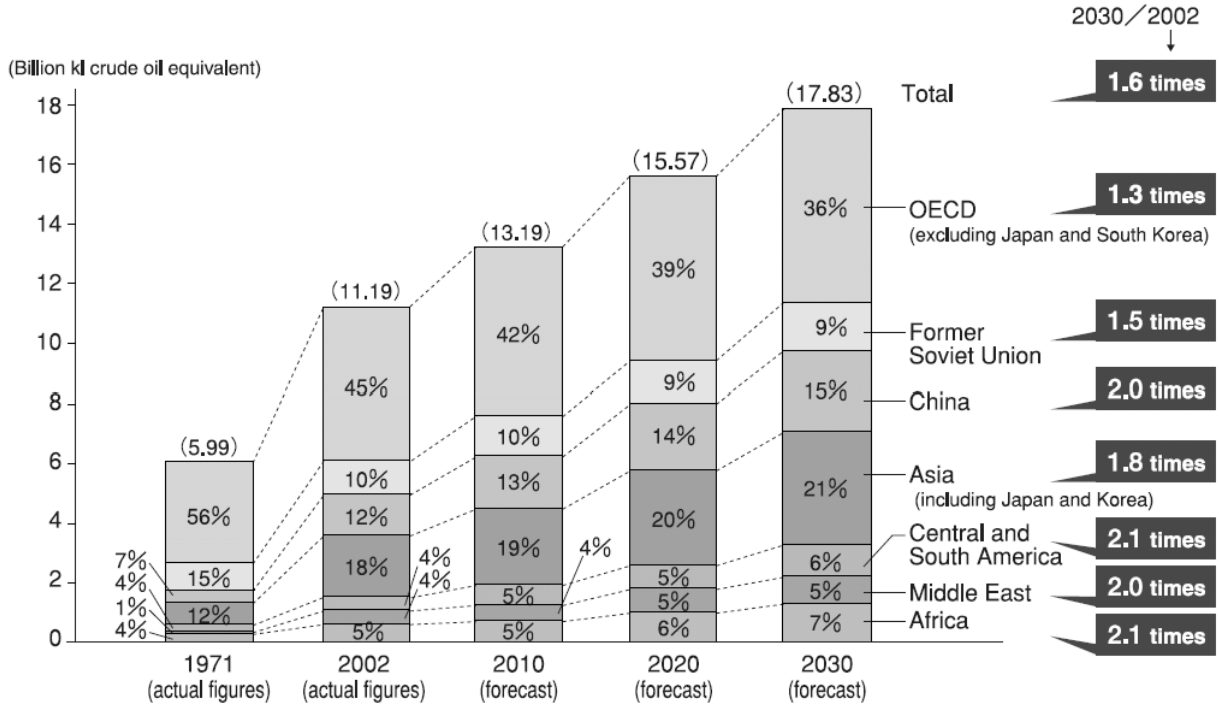
	Energy Demand (Mtoe)				Growth Rate		
	2002	2010	2020	2030	2002-2010	2002-2020	2002-2030
Total Primary Energy Supply	3,824	4,890	6,344	7,873	3.1	2.9	2.6
Coal	1,099	1,374	1,754	2,192	2.8	2.6	2.5
Oil	1,142	1,523	2,016	2,517	3.7	3.2	2.9
Gas	515	746	1,131	1,528	4.7	4.5	3.9
Nuclear	30	60	96	135	9.2	6.7	5.6
Hydro	94	127	166	202	3.7	3.2	2.7
Biomass & Waste	922	1,024	1,127	1,221	1.3	1.1	1
Other Renewables	21	35	54	89	6.4	5.3	5.2

(5) China (which is included in Developing Countries)

	Energy Demand (Mtoe)				Growth Rate		
	2002	2010	2020	2030	2002-2010	2002-2020	2002-2030
Total Primary Energy Supply	1,242	1,622	2,072	2,539	3.4	2.9	2.6
Coal	713	904	1,119	1,354	3.0	2.5	2.3
Oil	247	375	503	636	5.4	4	3.4
Gas	36	59	107	158	6.4	6.3	5.4
Nuclear	7	21	47	73	15.9	11.6	9
Hydro	25	33	50	63	3.6	3.9	3.4
Biomass & Waste	216	227	236	236	0.6	0.5	0.3
Other Renewables	0	5	10	20	–	–	–

Source) IEA / World Energy Outlook (2004)

(6) Increase of World Energy Demand centering on China and the Rest of Asia

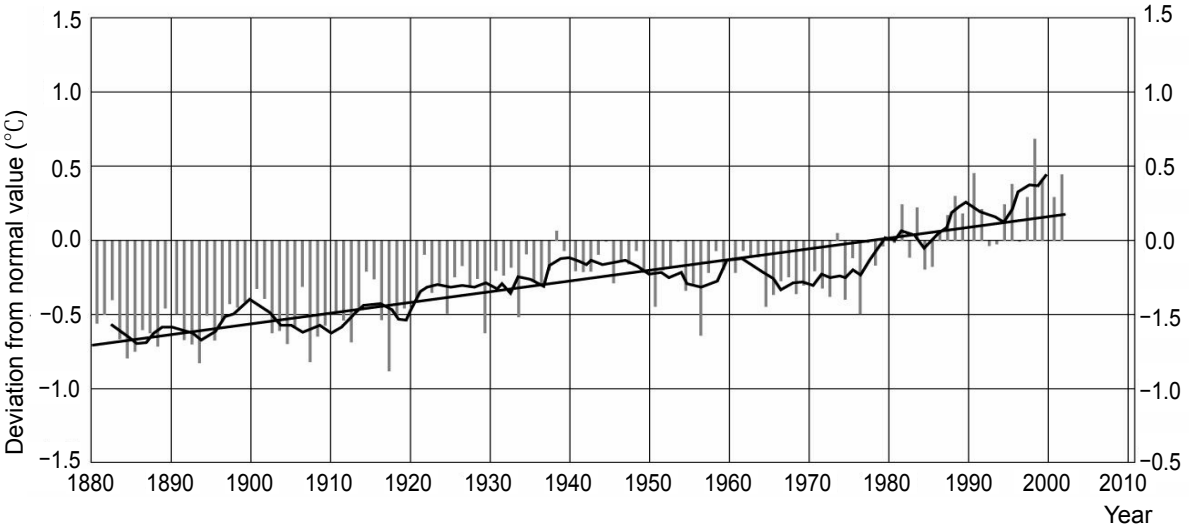


Source : Figure has been converted on the basis of the IEA, “World Energy Outlook 2004”

2. Global Environmental Trends

2.1 Climate change and energy consumption

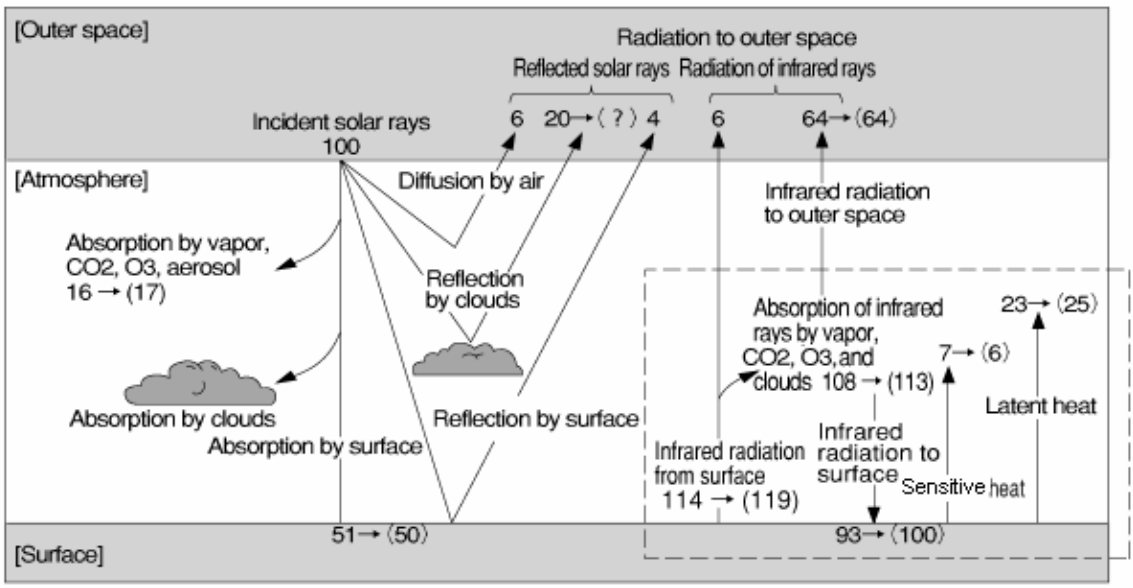
(1) Transition of deviation from normal surface temperature



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) White Paper on the Environment 2002 (Ministry of Environment)

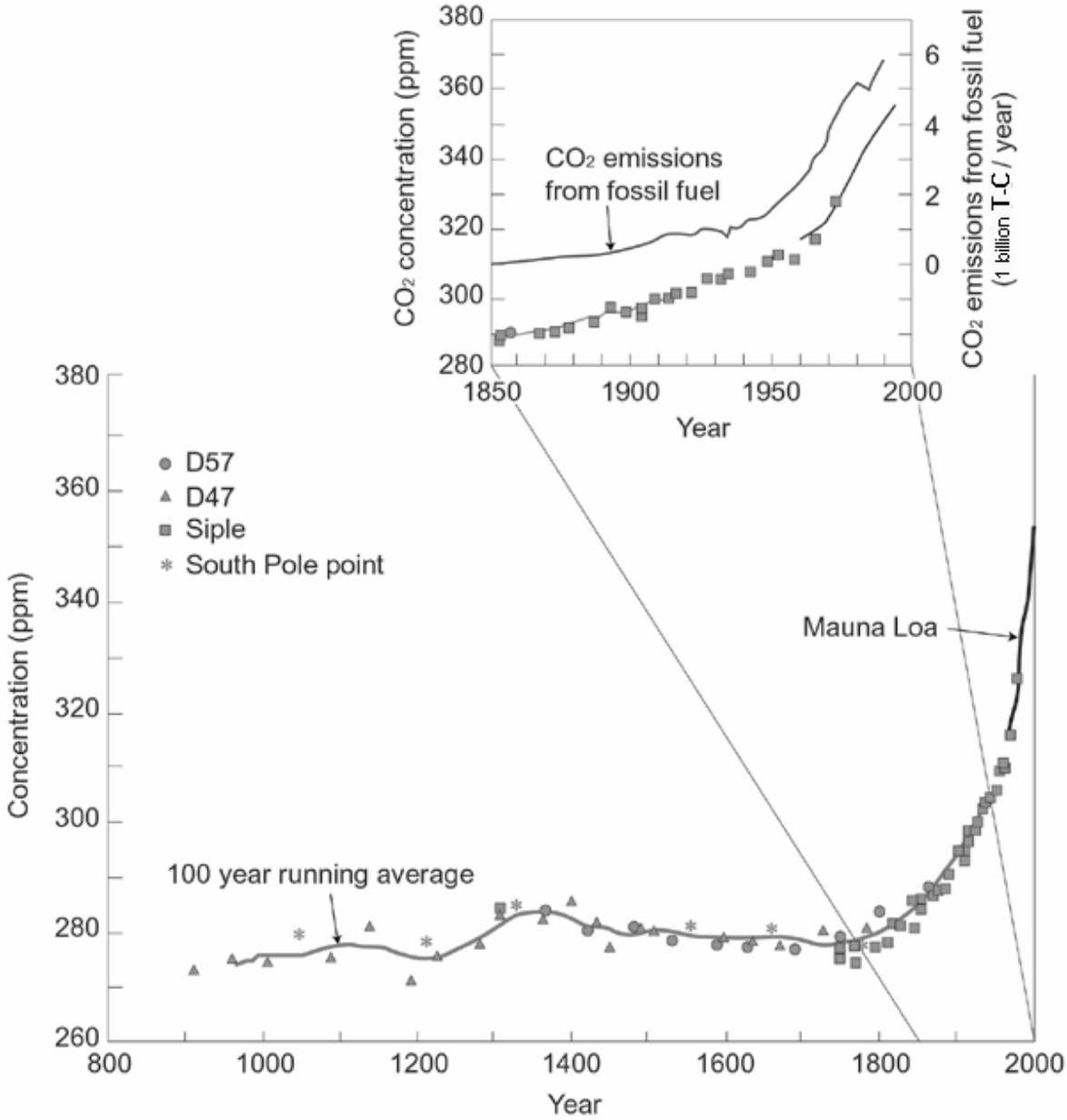
(2) Global energy balance (Index incident solar rays = 100)



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

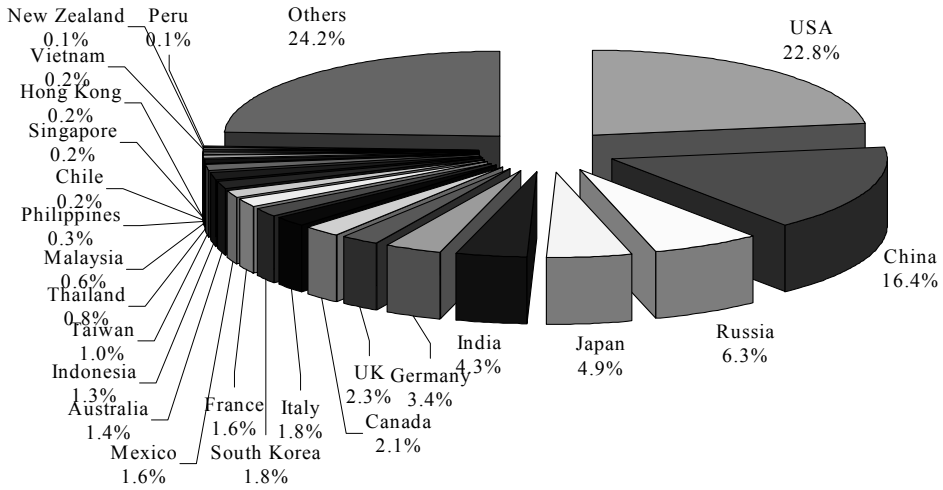
(3) Increase of the carbon dioxide level and changes in fossil energy consumption



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).

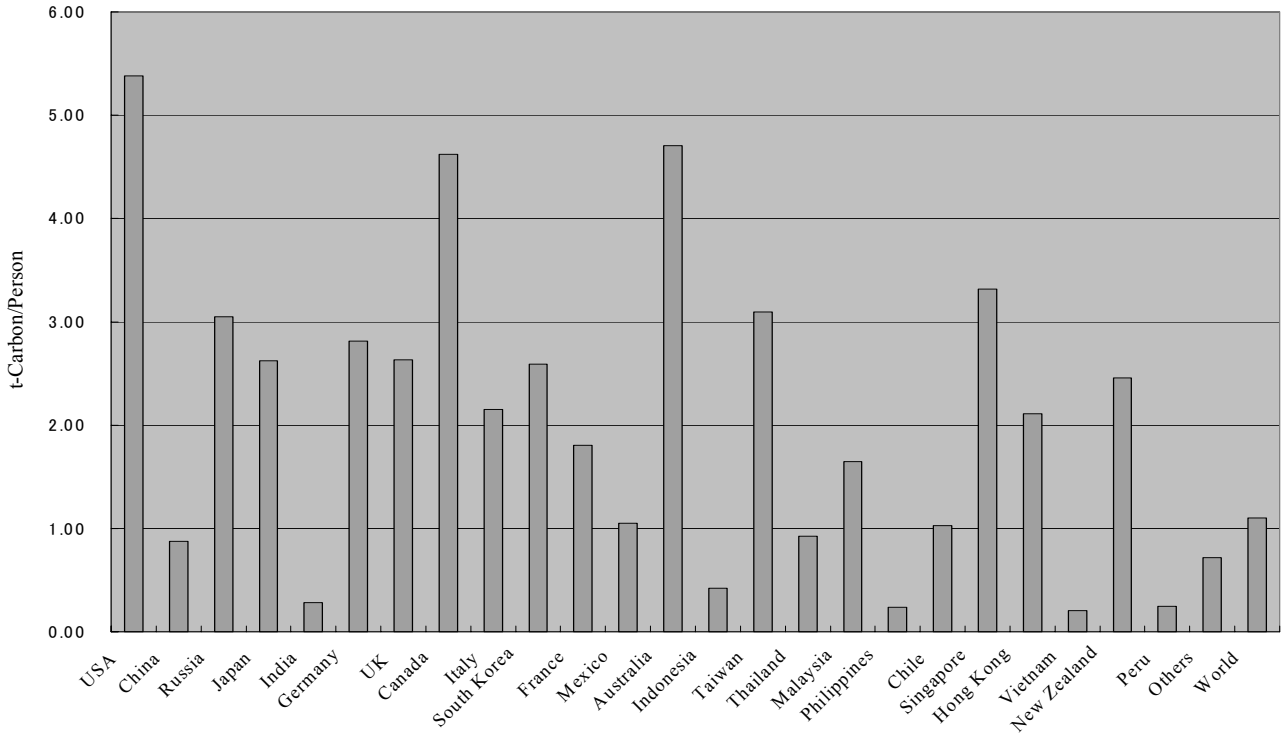
Source) IPCC (1995), translated by the Meteorological Agency. (IPCC : Intergovernmental Panel on Climate Change) White Paper on the Environment 2000 (Ministry of Environment)

(4) CO_2 emissions by country (2003)



Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2004)"

(5) Per-capita CO_2 emissions (2003)



Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2004)"

2.2 International efforts to counter global warming

In this chapter we will focus on the two mechanisms that are dealing with global warming issues: **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

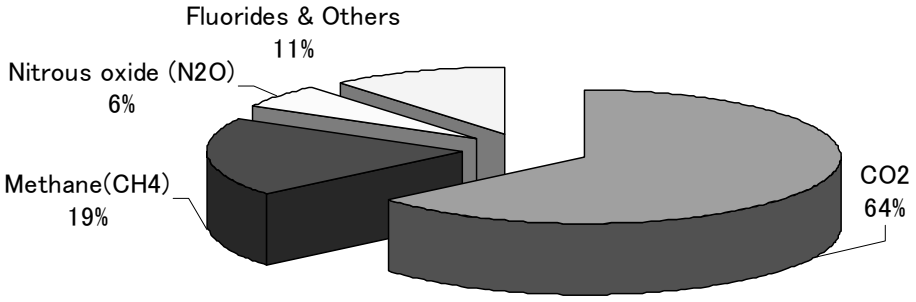
UNFCCC discusses and performs international countermeasures to the climate change while IPCC is a place to accumulate scientific knowledge. In UNCED (United Nations Conference on Environment and Development: commonly named “Earth Summit”) which was held in Rio de Janeiro in Brazil in June, 1992, a large 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

Increase of Atmospheric CO_2	**Rise of Sea Level**	**Rise of Average World Temperature**
★ 265 - 285 ppm before the Industrial Revolution (1750 - 1800) ★ 365 ppm in 1996 ★ 540-970 ppm estimated by the end of 2100	★ 10 - 20 cm rise in 20 century ★ Estimated 9 - 88 cm rise between 1990 - 2100	★ 0.6±0.2 ℃ rise after 1861 ★ Estimated rise of 1.4 - 5.8 ℃ between 1990 – 2100

Source) Third Assessment Report of Climate Change 2001 (IPCC)

(4) Influences of Green House Gases on Global Warming (1850-1990)



Source） 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) COP6 results and progresses

The COP6 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.

Major issues	Financial & technical assistance from developed countries to developing countries to help them manage the emission and adapt to the climate change. Implementation of the Kyoto Mechanism : - International Emission Trading (ET) - Joint Implementation (JI) - Clean Development Mechanism (CDM) Utilization of carbon sequestration techniques “Sinks” Compliance, with its related issues of Reporting, international governance and penalties
Results / Progresses	No consensus was reached on the major issues at the Hague Conference, but the Bonn conference succeeded in making the Kyoto Protocol agreeable for the ratification, expecting to accelerate the transition phase to the implementation phase at COP7.

3) COP7 results and consensus

The COP7 was held in Marrakech, Morocco on Oct. 29 - Nov. 9, 2001.

Results	Essential points of Bonn Agreement have been maintained. The demand urged by Japan, Canada, Australia and Russia to implement flexibly the Kyoto Mechanism and its rule have been confirmed. The U.S. was not substantially involved with the conference although it attended the conference.
Consensus	Establish the two funds for technology transfer and financial support to developing countries. Implementation of the Kyoto Mechanism : - ET, JI and CDM shall be supplementary measures to domestic ones. - Emission constraint by Nuclear Power is not counted in. - Purchase of emission shall be less than 10% of total emission pledged by country. Carbon sequestration techniques “Sinks” : - Conditions by country shall be taken into consideration. Penalty to carry over 1.3 times of the Non-achieved target. CDM Executive Board is set up for Smooth promotion.

4) COP8 results and progresses

The COP8 was held in New Delhi, India on Oct. 23 - Nov. 1, 2002.

Results	The Delhi Ministerial Declaration on Climate Change and Sustainable Development adopted at COP8. 1) Strong encouragement of the Protocol ratification to Parties that have not yet. 2) Recognition with the concern of the findings of the IPCC Third Assessment Report (TAR) which confirms the necessity of significant cuts in global emissions for the ultimate objective of the Convention. 3) Note to current mitigation actions by both Annex I and non-Annex I countries and emphasis on mitigation of GHG emissions to combat climate change as continuing high priority under the provisions of the Convention. 4) Promotion of informal exchange of information on actions relating to mitigation and adaptation among Parties for more effective and appropriate responses to climate change. 5) Take urgent actions at all levels to substantially increase the global share of renewable energy sources.
Progresses	Issues suspended in the COP7 were discussed and agreed. 1) Activity report from CDM Executive Board . 2) Report and assessment based on the Protocol . 3) Report from each parties

5) COP9 results and progresses

The COP9 was held in Milan, Italy on 1-12 December 2003.

Results	The conference concluded as ministers' call for urgent and coordinate action on climate change. 1) Ministers agreed that climate change remains the most important global challenge to humanity. 2) Participants emphasized that the Kyoto Protocol represents a significant first step towards realizing the Convention's goal of stabilizing atmospheric levels of greenhouse gases at safe levels and called for its immediate entry into force.
Progresses	The formal decisions adopted by the conference will strengthen the institutional framework of both the Convention and the Kyoto Protocol. 1) New emission reporting guidelines based on the good-practice guidance provided by the IPCC will provide a sound and reliable foundation for reporting on changes in carbon concentrations resulting from land-use changes and forestry. These reports are due in 2005. 2) Another major advance is the agreement on the modalities and scope for carbon-absorbing forest-management projects in the CDM. This agreement completes the package adopted in COP7 and expands the CDM to an additional area of activity.

6) COP10 results and progresses

The COP10 was held in Buenos Aires, Argentina on 6-17 December 2004

Results	The conference marked the 10th anniversary of the entry into force of the Framework Convention on Climate Change, which served as a central theme for the meeting. In addition to the accomplishments of the past ten years and future challenges, discussions at COP 10 highlighted a range of climate-related issues including the impacts of climate change and adaptation measures, mitigation policies and their impacts, and technology.
Progresses	It was reconfirmed at the conference to be very important that all the countries keep on cooperating for realizing more effectual measures from now on as well as aiming at the further advance under the treaty and the Kyoto Protocol. 1) Each Annex I party welcomed the protocol effectuation on 16 February 2006 as the important first step in promotion of international countermeasures against global warming. It was identified that the intention of further efforts of each country to have their respective targets for emission reduction achieved certainly must be sustained. 2) Based on the working plan that studies for the post Kyoto Protocol after 2013 would start by the end of 2005, It determined to begin operations through information exchange towards future activities in mid and long-term under participation of all countries.
Next step	The COP 11 will be held in Montreal, Canada from 28 November to 9 December 2005.

7) COP11 & COP/MOP1 results and progresses

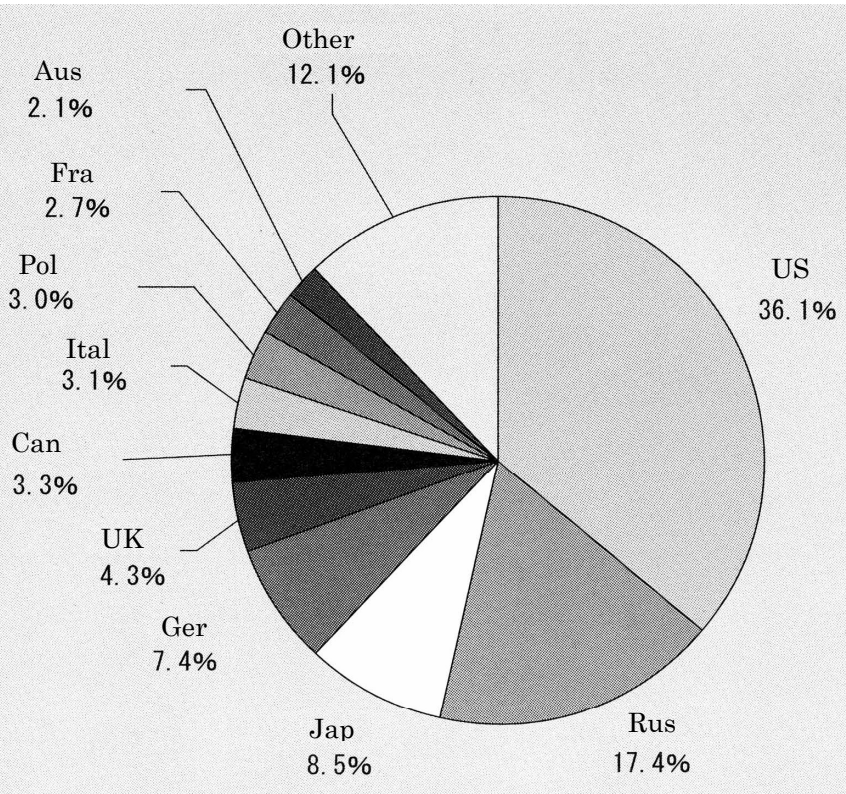
The COP11 & MOP1 was held in Montreal, Canada between 28 November and 9 December in 2005.

The Eleventh Session of the Conference of the Parties (COP 11) was held in parallel with the First Conference of the Parties to the Kyoto Protocol (COP/MOP1) of the United Nations Framework Convention on Climate Change (UNFCCC). Being the first conference being held since the Kyoto Protocol coming into force in February that year and for the Parties to the Kyoto Protocol, the conferences attracted a lot of attention from various fields. Canada's Environment Minister Dion, the chairman of the conference, at the opening, declared the three “I” as the objectives for the conference: the “Implementation” of the Kyoto Protocol, the “Improvement” of the Kyoto Protocol, and the “Innovation” towards the framework of the Post-Kyoto strategy after the end of the first commitment period. In conjunction with the declaration, decisions were made for each of these three categories. For the scope of the “Implementation”, the Marrakech accords were adopted, establishing the operational rule of the Kyoto Mechanism. This adoption meant the establishment of the operational rule of the Kyoto Protocol, including Kyoto Mechanism (Clean Development Mechanism (CDM), Joint Implementation (JI), and Emissions Trading). To further create CDM’s certified emission reductions (CERs), within the scope of the “Improvement”, decisions were made to discuss issues on strengthening the functioning and funding of the Projects Reviewing Council, mitigating the certifying standards for CDM, and reviewing small-scale CDM projects. As being the most major issue, within the scope of the “Innovation” towards the framework of the Post-Kyoto strategy after the end of the first commitment period, the conference entered into a heated debate and finally reached agreements to establish a new working group, starting in May 2006, to discuss the reduction commitments after the end of the first commitment period (until 2012), and open up a “Dialogue for actions for long-term cooperation”, in which all Parties to UNFCCC, including the US and developing countries will participate.

2.3 Kyoto Protocol coming into effect

The requirements for the Kyoto Protocol coming into effect included that (1) not less than 55 parties to the convention ratify the protocol, and (2) parties included in Annex I which accounted in total for at least 55% of the total CO_2 emissions in 1990 of the parties included in Annex I ratify the protocol (Figure below). The requirement (1) was met before some time, and the requirement (2) was met by the ratification of Russia in November 2004, and thus the Kyoto Protocol came into effect on February 16, 2005. Consequently, Japan is obliged to reduce the volume of greenhouse gas emissions by 6% from the standard year level during the first commitment period from 2008 to 2012.

With regard to the commitment of the next period starting in 2013, the protocol stipulates that international examination begin by the end of 2005. At the COP10 held in Buenos Aires, Argentina in December 2004, the holding of a seminar for governmental experts was agreed, which will serve as the foothold of discussion concerning the framework after 2013.



Proportions of CO_2 emissions of Annex I parties in 1990

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

2.4 G8 Summit

The 31st Summit (meeting of leaders of major countries) was held in Gleneagles, Scotland, the United Kingdom from July 6 to 8, 2005.

(1) Major issues

By the initiative of Prime Minister Blair, the chair, Africa and climate change were taken up as main agenda items of the Summit. Japan developed its argument from its original position for the Africa question, based on its successful experiences of economic development cooperation with Asia, and for the climate change question, based on its experiences of overcoming pollution problems during the period of high economic growth and of achieving energy conservation and higher energy efficiency triggered by the oil crises.

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.

(2) An outline of the Gleneagles Plan of Action

--- Climate change, clean energy, sustainable development---

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

2.5 Energy conservation activities of the foreign countries

(1) Approach to prevention of global warming by the major advanced countries

Item	Japan	U.S.	Canada	Australia
Government's plan and development of 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)	National Energy Policy 2001	Implementation Plan for measure against Global Warming 2002 (Climate Change Plan for Canada 2002)	Stable Energy Supply Plan 2004 (Securing Australia's Energy Future 2004)
		Energy Policy Act 2005	Implementation Plan for measure against Global Warming 2005 (Project Green-A Plan for Honouring our Kyoto Commitment 2005)	National Framework for Energy Efficiency NFEE 2004
		Energy Policy Act 1992	Energy Efficiency Act (Establishment in '92; revision in '95; revision in '97; revision in '98)	
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	Various tax incentive/assistance measures	Various tax incentive/assistance measures
		Tax incentive measures based on the Energy Policy Act of 1992		
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		Department of Transport and Regional Services-DOTARS
		Department of Housing and Urban Development–HUD		Department of the Environment and Heritage-DEH Australian Greenhouse Office-AGO
	Ministry of the Environment	Environmental Protection Agency-EPA		
Organizations promoting Energy conservation	New Energy and Industrial Technology Development Organization	Alliance to Save Energy	Energy Technology Center (In Natural Resources Canada-NRCan)	National Appliance and Equipment Energy Efficiency Committee-NAEEEC
	The Energy Conservation Center, Japan	American Council for an Energy-Efficient Economy-ACEEE		
Ratification of Kyoto Protocol	Ratification (June 2002)	Non-ratification (as of September 2005)	Ratification (December 2002)	Non-ratification (As of September 2005)
Greenhouse gas reduction target set by Kyoto Protocol (1990-basis)	−6%	−7%	−6%	+8%
Major domestic measures for promotion of energy conservation	Drastic reinforcement of Law concerning Rational Use of Energy (Industry, transportation, and consumers)	Measures for industry, transportation, and consumers based on the Energy Policy Act of 2005	Improvement of the standard for energy saving devices	Extension of equipment subject to the MEPS standard
	Pursuit of the objectives of the voluntary technical action plan in the industrial sector	Reinforcement of measures by the departments of the Federal Government	Improvement of recognition of energy-saving technology by provision of information	Promotion of the efficiency of equipment and buildings and improvement of information service to consumers
	Extension and review of the standards for top-runner equipment	Improvement of domestic infrastructure	Assistance to energy-saving construction and energy-saving repair	Implementation of steady report on utilization of energy by enterprises
Other domestic measures for reduction in greenhouse gas emissions	Improvement of nuclear power generation efficiency	Measures based on the development of technologies for carbon sequestration, hydrogen utilization, nuclear energy, new energy, etc.	Measures for petroleum, gas, thermal power generation, and mining industry	Extension of the use of recyclable energy
	Extension of the use of new energy	Extension of equipment subject to the Energy Star Program	Extension of the use of recyclable energy	Measures based on R&D and technical development
	Further reduction in Chlorofluorocarbon-Replacing Material emissions	Reinforcement of measures by introduction of tax incentives	Improvement/promotion of efficiency of domestic infrastructure	

Item	EU	Germany	France	U.K.
Government's plan and development of laws concerning energy conservation	Implementation of energy conservation program based on the EU Parliament/Board decision (No.1230/2003/EC)	Energy Conservation Ordinance 2002	Law on Air and Rational Energy Use 1996	Energy Act 2004
	EU Energy Conservation Plan, SAVE Program, etc. (Intelligent Energy Europe 2003-2006)		Energy White Paper 2003 (Livre blanc sur les energies 2003)	Energy Conservation Implementation Plan 2004 (Energy Efficiency: The Government's Plan for Action 2004)
				Energy White Paper 2003 (Our Energy Future-Creating a Low Carbon Economy 2003)
Financial support system concerning energy conservation	National energy conservation guidelines by European Commission	Tax incentive/assistance measures based on the Cogeneration-Act	Tax incentive measures based on the Finance Law for 2003	Various tax incentive/assistance measures
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 of Ecology and Sustainable Development	Department for Transport-DfT
				Office of the Deputy Prime Minister-ODPM
	Directorate-General for Environment (In the European Commission)	Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety-BMU		Department of the Environment, Food and Rural Affairs-DEFRA
Energy conservation related propulsion institution		Deutsche Energie Agentur-DENA	Agency for Environment and Energy Management-ADEME	Energy Saving Trust-EST
				Carbon Trust
Ratification of Kyoto Protocol	Ratification (May 2002)	Ratification (May 2002)	Ratification (May 2002)	Ratification (May 2002)
Greenhouse gas reduction target set by Kyoto Protocol (1990-basis)	−8%	−21%	0%	−12.5%
Major domestic measures for promotion of energy conservation	Extension and reinforcement of equipment efficiency standards	Utilization of environment tax	Utilization of environment tax	Implementation of stricter construction standard
	Increase in efficient buildings	Approach by voluntary agreement	Promotion of development of energy-saving technology	Extension of EEC scheme/expansion of subjects
	Promotion of procurement/introduction of efficient equipment by the government	Utilization of spontaneous labeling	Implementation of stricter construction standards	Promotion of the diffusion of CHP
Other domestic measures for reduction in greenhouse gas emissions	Utilization of emissions trading system	Extension of the use of recyclable energy	Extension of the use of recyclable energy	Extension of the use of recyclable energy
	Extension of the use of recyclable energy	Promotion of the diffusion of CHP	Improvement of domestic infrastructure	Utilization of Climate Change Levy (CCL)

(2) Overview of energy conservation measures in the foreign countries

Date	Country	Summary
Aug.23, 2005	U.S.	U.S. revises light truck fuel efficiency standard
Aug.8, 2005	U.S.	U.S. Energy Policy Act of 2005 (HR.6) enacted
Jul.11, 2005	U.S.	U.S. HUD, EPA and DOE announce "Partnership for Home Energy Efficiency"
Jul.1, 2005	Australia	Australia commences water efficiency labeling system on a voluntary basis
Jun.30, 2005	U.S.	U.S. announces CO_2 emissions in 2004
Jun.27, 2005	Korea	Korea announces CO_2 reduction measures
Jun.22, 2005	EU	EU announces draft energy conservation target of total 20% reduction by 2020
Jun.9, 2005	EU	EU begins media campaign for sustainable society
Jun.9, 2005	UK	UK considers nationwide introduction of road pricing
Jun.2, 2005	Thailand	Thailand begins media campaign for energy conservation
Jun.1, 2005	U.S.	U.S. considers revising fuel efficiency measuring method
Jun., 2005	Taiwan	Taiwan considers introducing stand-by electricity standard into MEPS standard
May 27, 2005	U.S.	Major freight train operators newly join the U.S. Smartway Transport System
Apr. 10, 2005	U.S.	Twelve U.S. states file lawsuit against EPA in relation to greenhouse gas emission regulations
Apr. 5, 2005	Canada	Canadian automotive industry signs a memorandum with the national government concerning greenhouse gas emission reduction
Feb.24, 2005	U.S.	64% of U.S. respondents are familiar with Energy Star System and approximately 10% of the houses pass the standards under the System
Feb. 10, 2005	UK	UK moves to begin automobile labeling system
Feb. 7, 2005	U.S.	U.S. budget proposal for the next fiscal year shows 2% reduction in energy conservation budget
Nov. 7, 2004	Canada	Canada proposes introducing regulations on emission of CO_2 and other gasses from automobiles
Oct. 28, 2004	U.S.	U.S. begins commendation program for energy conservation activities of federal agencies and government employees
Oct.18, 2004	EU	EU begins campaign to promote Eco-Label
Oct. 14, 2004	EU	European Commission proposes tighter CFC regulations (HFCs, PFCs and SF_6) for global warming prevention
Oct. 13, 2004	UK	British Telecom, UK's largest communications company, announces a plan to cover all its power requirements by renewable energy
Oct. 7, 2004	U.S.	U.S. oil major Exxon does not set CO_2 reduction target and records approximately 50% more CO_2 reduction than its UK counterpart British Petroleum
Oct. 6, 2004	UK	UK sets new procurement policy for the national government and other bodies with regard to green products
Oct. 4, 2004	China	Chinese Environment Minister makes a comment that energy conservation and resources efficiency will be emphasized

2.6 Japan's policy 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 green house effect 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, it 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 Outline for Promotion Effects to Prevent Global Warming (2002). 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 Outline for Promotion of Efforts 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 energy supply-demand structure of Japan to a structure of a CO_2 reduction type.

Source : Materials 3-1 for the 27th Meeting of the Global Environment Subcommittee of the Industrial Structure Council

Creation of a CO_2 reduction type society

Spatial or network measures

Creation of regional/urban structures and socio-economic systems of CO_2 reduction type

CO_2 reduction type of urban design

- Promotion of Spatial utilization of energy (District heating and cooling, etc.)
- Joint efforts between different entities (Joint energy management of integrated facilities or several buildings by utilizing IT)
- CO_2 reduction through improvement of the environment deterioration by heat by implementing measures against heat island effects, including the planting of trees

Designing of a CO_2 reduction type of transportation system

- Utilization of public transportation systems (Improvement in public transportation systems and convenience, and commuting transportation management, etc.)
- Use of eco-friendly automobiles (Dissemination of idling stop and eco-friendly driving, etc.)
- Establishment of a system to ensure smooth road traffic (Regulation of the demand for automobile traffic and the introduction of intelligent transportation systems)
- Realization of environmentally sustainable transportation (EST) (Trial in leading areas)

Formation of a CO_2 reduction type logistics system

- CO_2 reduction by joint efforts of cargo owners and transportation companies (Revision of the Energy Conservation Law, Green Transportation Partnership Conference)
- Furthering of more efficient transportation (Modal shift, more efficient truck transportation)

Spatial utilization of new energy and the accommodation of energy

- Establishment of networks for distributed new energy system
- Utilization of biomass
- Effective use of unused energy sources (Energy generated from temperature differences, energy of snow and ice, heat from waste incineration)
- Accommodation of energy between entities (Accommodation of waste heat generated in factories in an industrial complex)

Individual measures

Measures taken by a company or other individual entities

Efforts by manufacturers

- Steady implementation of individual action plans
- Thorough energy management in factories
- Efforts in the residential and transportation divisions in the industrial sector

Efforts by transportation

- Use of eco-friendly automobiles (described above)
- CO_2 reduction by joint efforts between cargo owners and transportation companies (described above)
- Furthering of more efficient transportation (described above)

CO_2 reduction in offices and stores

- Steady implementation of individual action plans
- Thorough energy management based on the Energy Conservation Law
- Improvement in the energy conservation performance of buildings
- Dissemination of BEMS (building energy management systems)

CO_2 reduction in households

- Improvement in the energy conservation performance of housing
- Dissemination of HEMS (Home energy management systems)

CO_2 reduction in the energy supply sectors

- Steady promotion of nuclear power generation
- Promotion of efficient use of oil and LP gas
- Lowering of CO_2 emissions intensity in the electric power field
- Shift to natural gas
- Promotion of introduction of new energy
- Realization of society using hydrogen

Measures for machinery

Measures by equipment in the industrial sector

- Introduction of machinery and equipment with high energy conservation performance
- Highly efficient industrial furnaces
- Next generation coke ovens

Measures for equipment in the transportation sector

- Dissemination of vehicles that meet the top runner standards
- Dissemination of fuel-efficient automobiles
- Dissemination of clean energy automobiles
- Control of the running speed of large trucks
- Introduction of equipment for idling stop
- Introduction of sulfur-free fuel
- Improvement in energy efficiency in the railroad, vessel and aircraft sections

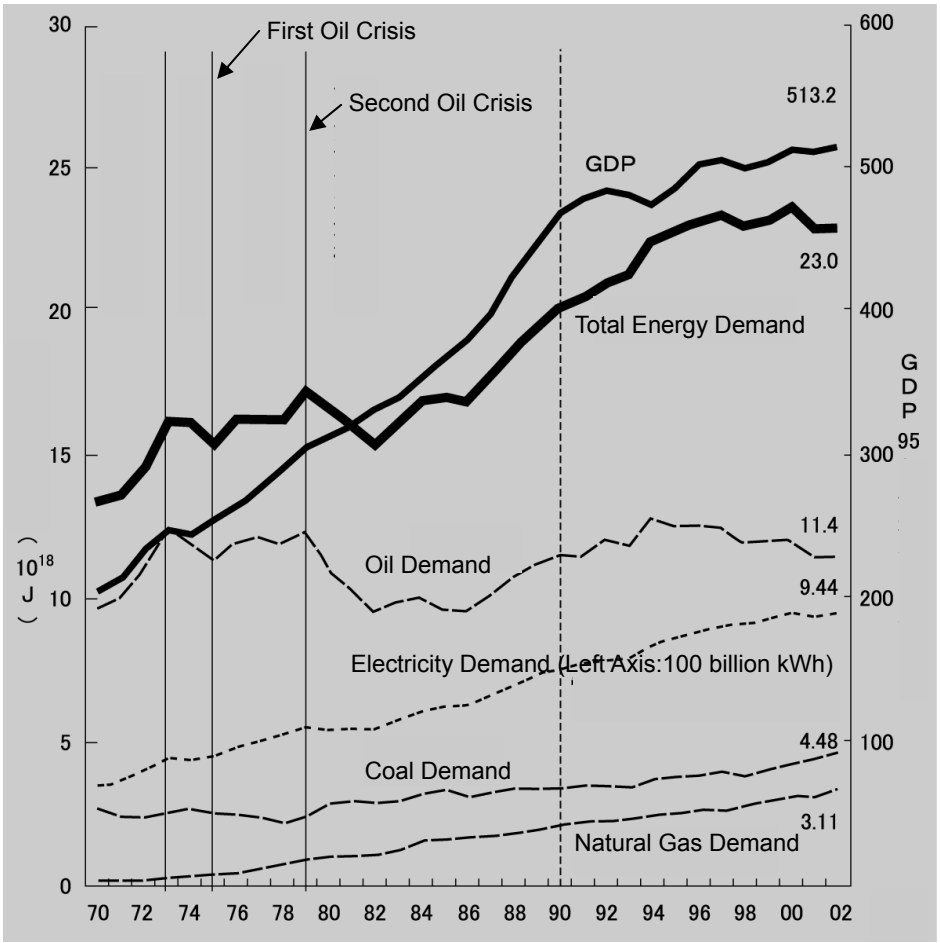
Measures for equipment in offices, stores and households

- Improvement in the efficiency of equipment based on the top runner standards
- Provision of information on energy conservation type equipment
- Support for dissemination and technological development of energy conservation type machinery, including highly efficient water heaters
- Reduction of standby energy

3. Energy Situation in Japan

3.1 Demand of energy sources and GDP

(1) Trend of energy sources and GDP

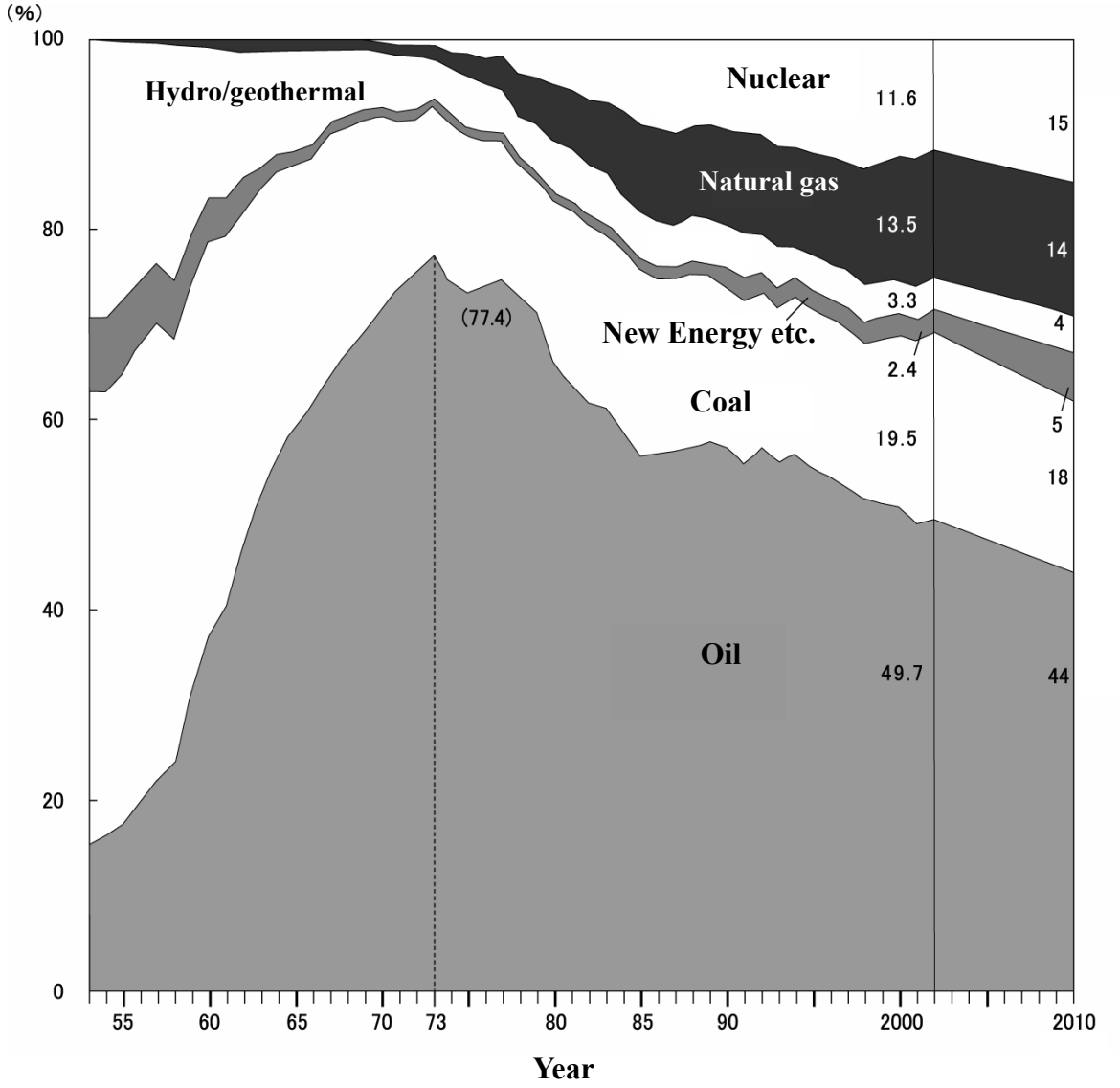


(2) Changes in Energy / GDP elasticity

Fiscal Year	1965～73	1973～80	1980～90	1990～2000	2000～02
GDP Growth Rate	9.05%	3.45%	4.17%	0.96%	-0.16%
Annual Average Growth Rate of Energy Demand	10.86%	0.43%	2.04%	1.58%	-1.07%
Energy/GDP Elasticity	1.2	0.13	0.49	1.65	-

Source) "Energy Production, Supply and Demand Statistics", "Annual Report on National Account", "Outline of Electric Power Supply and Demand"

3.2 Transition of percent distribution of primary energy supply (1955- 2010)

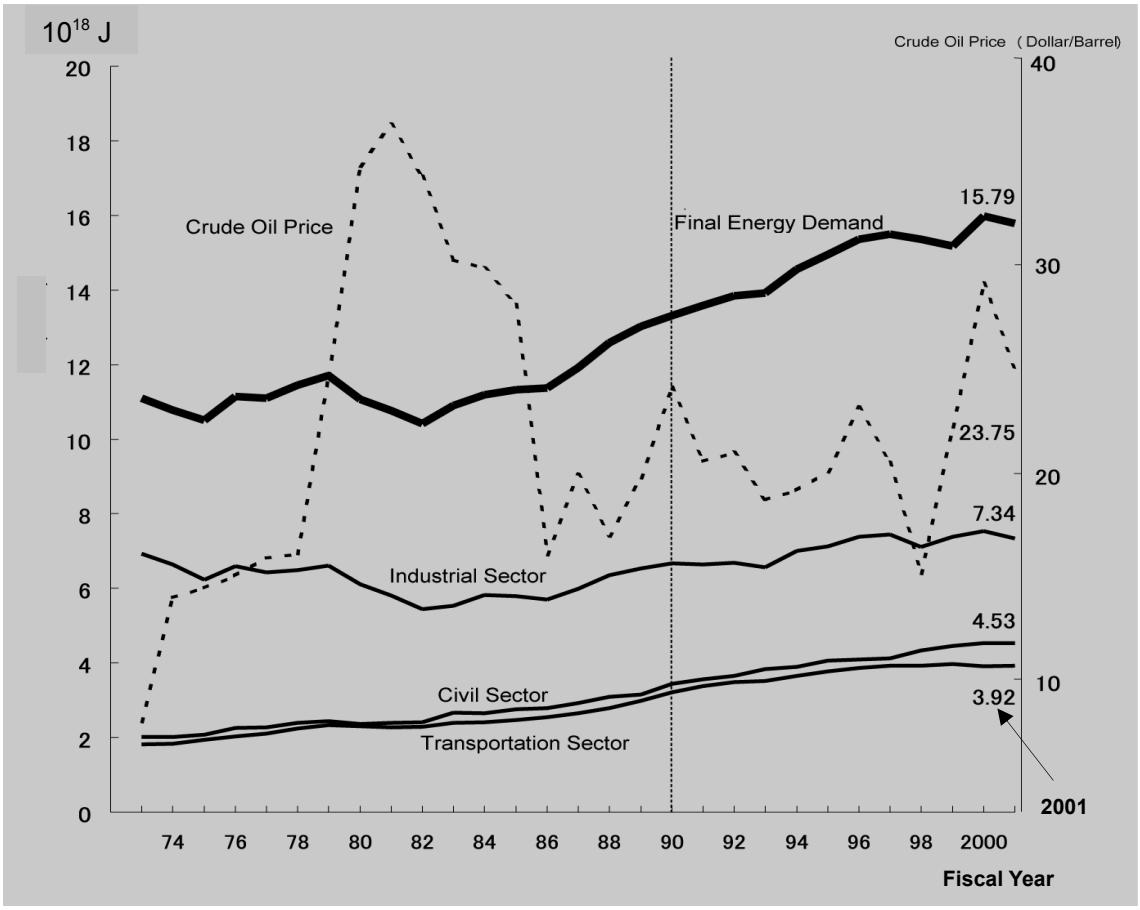


Note) The estimated figures of FY 2010 are based on the long-term energy supply and demand outlook published by General Resource Energy Investigation Committee (2004).

The figure of "New Energy etc." after the fiscal year of 1990 includes amount of "waste heat and others."

Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2006)"

3.3 Final energy consumption by sector



Fiscal Year	73	79	82	85	90	92	94	96	97	98	99	2000	2001
Final Energy Consumption	11.10	11.70	10.42	11.33	13.32	13.85	14.56	15.36	15.50	15.36	15.81	15.98	15.79
		2.3	-3.2	1.2	2.3	2.0	4.6	2.7	0.9	-0.9	2.9	1.1	-1.2
Industrial Sector	6.94	6.61	5.45	5.80	6.67	6.69	7.00	7.39	7.44	7.11	7.38	7.53	7.34
		1.8	-6.2	-0.4	-3.1	0.7	6.8	3.8	0.7	-4.4	3.8	1.9	-2.4
Civil Sector	2.01	2.45	2.41	2.76	3.44	3.66	3.89	4.10	4.12	4.33	4.46	4.54	4.53
		2.3	0.5	3.7	8.6	2.8	1.5	0.8	0.5	5.1	2.9	1.8	-0.1
Transportation Sector	1.82	2.33	2.29	2.47	3.21	3.49	3.65	3.87	3.92	3.92	3.97	3.91	3.92
		3.8	0.6	2.5	7.6	3.2	3.7	2.7	1.3	-0.1	1.3	-1.4	0.1

Note) The values at the lower column are the growth rate.
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2004)"

3.4 Outlook of final energy consumption

(Unit : million kL of crude oil equivalents)

Fiscal Year / Items	1990		2000		2010					
					Reference		Current Measures		Additional Measures	
		%		%		%		%		%
Final Consumption Total	344	100%	413	100%	420	100%	411	100%	Approx. 402	100%
Industrial Sector	172	50%	195	47%	188	45%	187	46%	Approx.187	Approx.46%
Civil Sector	89	26%	117	28%	127	30%	123	30%	Approx.118	Approx.29%
Household Sector	43	12%	55	13%	60	14%	58	14%	Approx.55	Approx.14%
Commercial Sector	46	13%	63	15%	67	16%	65	16%	Approx.63	Approx.16%
Transportation Sector	83	24%	101	24%	106	25%	101	25%	Approx.97	Approx.24%
Passenger	43	13%	61	15%	64	15%	62	15%	Approx.60	Approx.15%
Truck	39	11%	40	10%	42	10%	39	10%	Approx.37	Approx.9%

Source) Midterm report of "Outlook of Energy Demand and Supply in 2030" issued by Demand &Supply Subcommittee of Advisory Committee for Natural Resources and Energy in October 2004

3.5 Outlook of primary energy supply

(Unit : million kL of crude oil equivalents)

Fiscal Year / Items	1990		2000		2010					
					Rreference		Cuurent Measures		Additional Measures	
Primary Energy Supply	512		588		602		585		569	
Fuel	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Oil	271	53%	274	47%	258	43%	247	42%	Approx.236	Approx.41%
L P G	19	4%	19	3%	19	3%	19	3%	Approx.17	Approx.3%
Coal	86	17%	107	18%	111	18%	105	18%	Approx.101	Approx.18%
Natural Gas	53	10%	79	13%	91	15%	86	15%	Approx.81	Approx.14%
Nuclear power	49	10%	75	13%	85	14%	85	14%	Approx.87	Approx.15%
Hydro power	22	4%	20	3%	21	3%	21	4%	Approx.21	Approx.4%
Geothermal	0	0%	1	0%	1	0%	1	0%	Approx.1	Approx.0%
New Energy,etc	12	2%	14	2%	16	3%	22	4%	Approx.27	Approx.5%

Source) Midterm report of "Outlook of Energy Demand and Supply in 2030" issued by Demand &Supply Subcommittee of Advisory Committee for Natural Resources and Energy in October 2004

3.6 Outlook of CO_2 emissions originating from energy use

(Unit: 1 million t-CO_2)

Items \ Fiscal Year	1990	2000		2010				
				Reference			Additional Measures	
			Growth rate compared to FY90		Growth rate compared to FY90			Growth rate compared to FY90
Total of CO_2 emmission	1,048	1,161	+ 10.7%	1,115	+ 6.4%		1056	.+ 0.8%
Increasing and decreasing comapred to FY1990	—	113	—	67	—		8	—
Industrial Sector	476	470	▲ 1.3%	450	▲ 5.6%		435	▲ 8.6%
Civil Sector	273	344	+ 26.0%	333	+ 22.2		302	+ 10.8%
Household	129	158	+ 22.5%	155	+ 20.0%		137	+ 6.0%
Commercial	144	186	+ 29.2%	178	+ 24.1%		165	+ 15.0%
Transportation	217	264	+ 21.7%	260	+ 19.6%		250	+ 15.1%
Conversion	82	83	+0.7%	73	▲ 11.8%		69	▲ 16.4%
Rate of emmission compared with base year	–		+9.1%		+ 5.4%			+ 0.6%

Source) Material-2 in the 11th meeting of Demand &Supply Subcommittee of Advisory Committee for Natural Resources and Energy

4. Energy Conservation Policy in Japan

4.1 Outline of energy conservation policies

(1) Brief history of energy conservation policy in Japan

Japan has made impressive achievements in the energy conservation. It is mostly because of the combined efforts made by the both public and private sectors since the first oil crisis. As of the year 1973, when the first oil crisis occurred, Japan's dependence on oil resources was as high as 80% of its total primary energy demand.

Although the oil crisis revealed Japan's fragile supply- demand structure of energy, the government took advantage of it as a precious lesson and has since been making full efforts to build a robust supply-demand structure.

Specifically, on the supply level, the diversification of energy sources has been pushed forward with by switching to alternative energies such as natural gas or nuclear power. On the demand level, on the other hand, the industrial sector is playing a central role in terms of energy conservation.

As the result of those tireless efforts, the dependence on oil has declined to 52%, which enables Japan to realize an *energy-conservation-oriented* society while staying in an economic power at the same time. And in terms of energy consumption per GDP, our country has been successful in curbing increasing the consumption, even compared with that of other major developed nations.

In the meantime, the member nations reached an agreement with the target that required developed nation to cut their GHG emissions at the 3rd Session of the Conference of the Parties (COP3) in Kyoto 1997. Therefore, in order to reach the goal and conserve the environment on a global level, further efforts of energy conservation have since been perceived.

More than 90 % of GHG consists of carbon dioxide and approximately 90% of carbon dioxide is emitted from combusting fossil fuels. That means nearly 80 % of GHG emissions originates from energy use. For that reason potent and effective energy policies are thought to be *the* key player in resolving environmental problems.

In order to achieve the goal of 6% GHG emission reduction set by the Kyoto protocol, the Japanese government decided to design measures covering the both supply and demand of energy. In terms of the demand level, for example, it will urge the industrial, the commercial and residential and the transportation sector to promote more energy conservation, 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 the year of 2010, which is almost equivalent to the annual energy consumption in all of the households in Japan. This tells us how ambitious the goal of the energy conservation measures will be.

However, the energy consumption in the commercial sector and the transportation sector has kept rising partly due to the changing the lifestyles of the Japanese people. Based on this recent trend, the Advisory Committee for Energy put forward additional measures aimed at the promotion of energy conservation in the commercial sector and the transportation sector in 2001.

(2) Promotion of energy conservation measures

1) Introduction and promotion of energy conservation equipment and systems

For promoting energy conservation equipment, investment in industry and commerce, loan programs and tax reduction 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 Fuel consumption standards for trucks.

(c) Commercial and residential sector:

Guidelines for buildings

Guidelines for residential housing

Addition of designated appliances and formulation of energy efficiency guidelines

4) Enhancing 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.

5) Active promotion of an energy conservation labeling system

In June 1995, Japan and the U.S.A. agreed to unify the standard and the indicating system of the International Energy Star Program which is an energy conservation standard for office automation equipment from personal computers and the program was enforced on October 1, 1995. Each of the industrial, residential and commercial, and transportation sectors is endeavoring to promote energy conservation through careful measures such as the above.

(3) Promotion of international energy conservation measures

Under the policy and support of the Japanese Government, ECCJ has been conducting energy conservation training programs for developing countries mainly in the Asian region for the purpose of promoting energy efficiency and conservation of those countries as well as enhancing the stable supply of energy of Japan. The programs include lectures, practical trainings at trial plants, factory tours, etc. aiming at transferring Japanese successful experiences and information (energy conservation policy, energy management, highly energy-efficient technology, etc.) for energy efficiency and conservation to those countries which could serve as useful reference for their planning/implementation/spread of energy efficiency and conservation. .

1) For bilateral cooperation

- Dispatch of experts
- Acceptance of trainees
- Implementations of model projects of energy conservation, for example, waste heat recovery in plants where large amounts of energy are consumed, such as iron and steel works and power stations.

2) For multilateral cooperation

Make full use of the opportunities to exchange information and opinions through international organizations, such as IEA and APEC, and to establish international cooperation as much as possible.

4.2 The Basic Energy Plan

The Agency for Natural Resources and Energy (ANRE) reported 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 of the Fundamental Law on Energy Policy Measures. Here are the details of the three principles.

(1) Securing the stable energy supply

In order to deal with the future growth of energy demand in the Asian region and Japan's dependence on the Middle East oil, 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. And 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) Environmental sustainability

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) Utilizing the 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

4.3 Law concerning the Rational Use of Energy

(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, 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

"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 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. Therefore, 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 factory / business premises (hereafter referred to as Factory) and are purposed that the rational utilization of energy in Factory would be implemented appropriately and effectively. (Refer to the item 4.4 "Evaluation Criteria" and the item 4.5 "Standards and Target Values".)

This is to show a guideline of the individual and concrete measures about the basic matters stated in the basic policy and to guide business operator to judge and conduct appropriate and effective

implementation of the rational energy utilization in Factory. (The revised criteria was announced on 10 January, 2003.)

2) Guidance and advice

The competent minister (METI and other minister(s) who are responsible for the programs of the relevant Factory), 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

The 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 equivalents) 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 for reinforcement in April, 2006.

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 the status of their energy utilization to the competent minister every year.

However, 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 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 Factory is judged to be in egregious breach of the evaluation criteria for energy rationalization, the competent minister may instruct Type 1 Designated Energy Management Factory to prepare a rationalization plan, and if the operator does not obey the instructions, they can announce to that effect or give an order for taking any action to respond to the instructions, after hearing the opinion of the council concerned.

4) Type 2 Designated Energy Management Factories

The factories 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 equivalents) 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 Factory shall appoint an energy management officer, who takes an energy conservation course, 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 Factory is 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

Annual Energy Consumption	Industrial Category	
Total of Fuel and Electricity	Following 5 industries: Manufacturing Mining Electricity supply Gas supply Heat supply	• All industries other than those listed at left e.g. office buildings, department stores, hotels, schools, hospitals, government offices, and amusement parks) • Head office / office bldg. of the left listed industries.
3,000 kL	Type 1 Designated Energy Management Factory	Type 1 Designated Energy Management Factory
1,500 kL	Type 2 Designated Energy Management Factory	

Regulatory obligations

* Appointment of qualified Energy Manager
* Submission of medium- to- long- term plan
* Periodical report

Regulatory obligations

* Appointment of Energy Management Officer
* Periodical training of Energy Management Officer
* Periodical report

Regulatory obligations

* Appointment of Energy Management Officer
* Submission of medium- to- long- term plan
  (Participation of qualified Energy Manager for preparing medium- to- long- term plan)
* Periodical report

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

In Japan, factories belonging to any of the five designated industries with a total of fuel and electricity consumption of at least 3000 kL of crude equivalent are designated as Type 1 designated energy management factories under the Law concerning Rational Use of Energy, and are subject to the obligation to appoint one or more energy managers according to the level of their energy consumption. Such energy managers must be selected from the holders of a license of qualified person for energy management.

A license of qualified person for energy management is awarded to any person who has passed an 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. The process works in the following manner:

(a) Examination of Qualified Person for Energy Management

a) Category

i) Examination of qualified person for heat management
ii) Examination of qualified person for electricity management Heat

b) Prerequisites

None

c) Examination subjects

i) Examination of qualified person for heat management

Introduction to heat management and regulations, basics of flows of heat and heat fluid, fuel and combustion, and heat-utilizing equipment and its management

ii) Examination of qualified person for electricity management

Introduction to electricity management and regulations, basics of electricity, electrical facilities and equipment, and electric power applications

d) Application destination

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

e) Examination date and sites

The examination is held in August in every year and at 10 locations - Sapporo, Sendai, Tokyo, Nagoya, Toyama, Osaka, Hiroshima, Takamatsu, Fukuoka and Naha.

f) Announcement of successful applicants

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

g) 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) Category

i) Heat management course

ii) Electricity management course

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 - Sendai, Tokyo, Nagoya, Osaka, Hiroshima and Fukuoka.

d) Application destination

Training Department, Japan Energy Management Examination and Training Center, The Energy Conservation Center of 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. Thus, the Law provides the following rules for rational energy use in buildings.

1) Obligations of building owners

Those who intend to construct a building 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 was announced on 24 February, 2003. (Refer to the item 4.6 ”Evaluation Criteria for Buildings”.) And the standard for houses was announced on 30 March, 1999.

2) Guidance and advice

The Minister of Land, Infrastructure and Transport may, whenever necessary, give necessary guidance and advice on building design and construction to the owners of buildings other than private dwellings 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 the building owners should refer to in making decisions. In addition to these rules, the Minister of Economy, Trade and Industry may give insulation and other construction material manufacturers necessary guidance and advice for improving the insulation properties of their construction materials in order 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

Furthermore, if the Minister of Land, Infrastructure and Transport deems that any building (not for dwelling) of 2,000 m^2 or more in total floor area is notably insufficient in the measures taken for rationalization of energy use in terms of the standards to be referred to, he can give necessary instructions to the buildings owner on the matters concerning design and construction work, and if the building owner does not comply, the minister can announce to that effect.

(6) Measures for equipment

Another energy-consuming area consists of automobiles, air-conditioners and other equipment that require large amounts of energy. These machines and appliances are mostly purchased by general consumers after being produced systematically in large quantities. For rational energy use relating to such equipment, it is important to call for the consumers energy conservation effort in their use, but a more drastic way is to improve their energy efficiency itself at the production stage. Based on this idea, the Law provides for various rules to follow in using 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 consumption efficiency of the equipment which they produce or import. Concerning 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 consumption efficiency improvement which manufacturers should refer to in making decisions. Further, 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 where he considers a considerable improvement is needed in the energy consumption efficiency of 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).

The target value of the standard is set up on the basis of the product having the highest energy efficiency of all the products of the same group sold on the market. (“Top Runner Program”)

The year when the specific equipments were designated is as following;

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 Oven, Electric Rice Cooker, DVD Recorder

2) Labeling

Equipment described above shall be marked to show its energy consumption efficiency so that general consumers can selectively purchase equipment of high energy consumption efficiency based on the marked correct information of the energy consumption efficiency. 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.

Furthermore, 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) 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.

(8) Supporting measures and penalties

In addition to the above provisions, the Law 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.

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

The Law enacted in 1979 was amended for reinforcement in 1983, 1993, 1998, 2002 and 2005. Especially, the amended version promulgated in August 2005 and enforced in April 2006 included big issues; such as the integration of heat and electricity, which were separated in the past, for control purposes in view of today's actual circumstances at factories and business establishments, and the addition of .measures for the transportation sector.

The Chronicles of revisions of the law are shown in the table on the page. 43.

The outline of the latest version of the law is shown in the table on the page 44.

Chronicles of Revisions of Energy Conservation Laws

	Promulgation Date	Effective Date	Summary of Legislation and 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 1st class designated energy management factories to submit a medium- to long-term plan. 3. Creates a new category as to the 2nd class 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 Revisions	Note
Revision (4)	June 2002	April 2003	1. The category of the 1st class designated energy management factory that had targeted five manufacturing industries was expanded to all industries. 2. Obliges the 2nd class 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. New obligations imposed on consigners and carriers (cargoes and passengers) for the transportation sector. 4. 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.

The outline of the amended version in 2006 of the law concerning the rational use of energy

Factories and Business

Publication of responsibilities and criteria for enterprises

Type 1 Designated Energy Management Factory
(Annual energy use: 3,000 kl)
- Appointment of Energy Manager
- Submission of mid- and long-term plans
- Submission of periodical reports on energy use

←When the Ministry finds the rational use of energy to be significantly insufficient in consideration of the criteria, it shall instruct, announce to the public, or order (penalize) the particular factory

Type 2 Designated Energy Management Factory
(Annual energy use: 1,500 kl)
- Appointment of a qualified person for energy management of type 2 designated factory
- Submission of periodical reports on energy use
- The divisions of heat and electricity, which were separated in the past, shall be integrated for control purposes (represented in crude-oil equivalent).

←When the Ministry finds the rational use of energy to be significantly insufficient in consideration of the criteria, it shall advise the factory in question

[Modified points of the law]
- ○ The divisions of heat and electricity, which were separated in the past, shall be integrated for control purposes in view of today's actual circumstances at factories and business establishments.
- ○ Consequently, the level of energy use as the standard to designate factories was lowered to increase the number of factories and business establishments subject to designation. (From approximately 10,000 to 13,000)
- ○ Establishment of registered examination body system. (If a factory or business establishment is examined and verified by a registered examination body, the factory or the like shall be excused from the submission of periodical reports.)

Transportation

1. Carriers (Freight, passenger)
Publication of responsibilities and criteria for enterprises

Designated carriers
(Vehicle ownership: More than 200 trucks
or more than 300 items of rolling stock or
the like)
- Submission of mid- and long-term plans
- Submission of periodical reports on energy use

←When the Ministry finds the rational use of energy to be significantly insufficient in consideration of the criteria, it shall advise, announce to the public, or order (penalize) the operator in question.

2. Consigners
Publication of responsibilities and criteria for enterprises

Designated consigners
(Annual cargo: 30 million ton kilometers)
- Submission of plans
- Submission of periodical reports on energy use required for consignment transportation

←When the Ministry finds the rational use of energy to be significantly insufficient in consideration of the criteria, it shall advise, announce to the public, or order (penalize) the consigner in question.

[Modified points of the law]
- ○ Measures for the transportation sector are newly added. (Periodical reports shall be prepared from April 2007.)

Residences and Buildings

Publication of responsibilities and criteria for owners of residences or buildings and clients for construction

- The clients, those who will modify buildings, and the owners of specified buildings shall be instructed or advised in connection with the design, construction, and maintenance of the buildings.
- The Ministry of Land, Infrastructure and Transport announces guidelines for the design and construction of residences.

Designated buildings
(Buildings including residences having a total floor area of 2,000 m^2 or larger)
- Submission of notification of energy-saving measures to the competent authorities* by the clients and owners (specified clients etc.) who will construct or extensively modify designated buildings.

←When the competent authority finds the energy-saving measures to be significantly insufficient in consideration of the criteria, the authority shall advise or announce to the public the name of the owner in question.

(* Competent authorities: Prefectural authorities, with district construction surveyors, governing construction authorization procedures)

- Periodical reports on maintenance of buildings with respect to measures by the designated clients etc. of buildings who have submitted notification to the competent authorities

←When the competent authority finds energy-saving measures to be significantly insufficient in consideration of the criteria, the authority shall advise the client etc. in question.

[Modified points of the law]
- ○ Owners of buildings are newly designated as those subject to the measures (maintenance, repair, and modification)
- ○ Notifications in the case of extensive modifications are also designated compulsory.
- ○ Residences having a total area of 2,000 m^2 or larger are included in the category of designated buildings, with requirements for notification newly designated.

Measures for Machinery and Equipment

Responsibilities for manufacturers or importers of energy-consuming equipment

Designated equipment
Publication of criteria
(Top Runner standard)
- Energy conservation standards of passenger vehicles, air conditioners, television, etc., which are required to be higher than the performance of the respective top-running brands of commercialized products.
- LCD and plasma televisions, DVD recorders, and heavyweight vehicles are newly listed as products subject to the measures.

←When the Ministry finds it necessary to improve performance significantly, it shall advise or announce to the public.

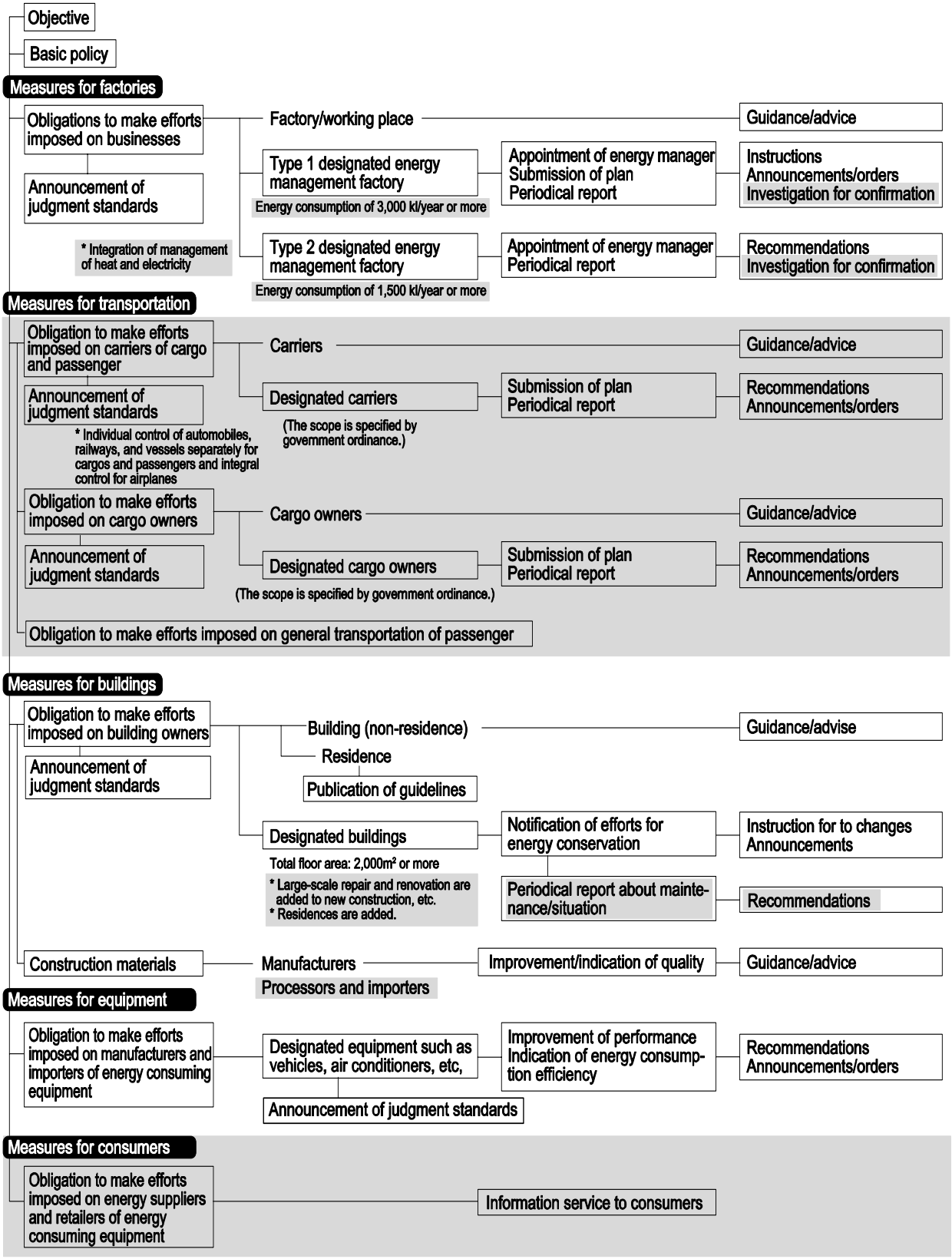
Provision of information

Information for general consumers
- Promotion of distribution of energy-saving devices as well as provision of energy-saving information to users by power/gas companies and publication of achievements
- Promotion of presentation of easy-to-understand energy-saving information over the counter at home appliance shops (annual power consumption values, fuel economy, etc.)

[Modified points of the law]
- ○ Responsibility for provision of information is newly specified.

(10) Structure of the "Law Concerning the Rational Use of Energy"

Enforced on 1st Oct. 1979, Revised on 10th August 2006 (is the revised part)



Source: The First Meeting of Factory Judgment Criteria Group, Energy Efficiency Standards Subcommittee (April 28, 2005)

4.4 Evaluation Criteria for Factory on rational use of energy

(1) Standards

(Based on "Judgment Standards for business owners on the rational use of energy at factories" revised on March 18, 2003)

Category <equipment>	Standards			
	Management	Measurement and recording	Maintenance and inspections	Measures at installation of new equipment
1. Rationalization of fuel combustion <Furnaces>	- Management Standard shall be set up with a view to lowering the air ratio to the prescribed standard value ("Standard Value") for proper control of combustion process. - Management Standard shall be set up to manage the combustion load (calorific capacity) of multiple furnaces to improve the thermal efficiency of them as a whole. - Control of particle size, moisture content, viscosity, etc. must be done as required according to the properties of the fuel in use.	- Management Standard shall be established to perform periodical measurements and recording of supplied amounts of fuel, exhaust temperatures, residual oxygen present in exhaust emissions, and so on.	- Control Standard shall be established to carry out periodical maintenance and inspections of furnaces	- Combustion equipment fit to the furnaces and the type of fuel in use, which is capable of regulating fuel supply amount and air ratio shall be introduced. - A ventilation system capable of regulating airflow rate and combustion chamber pressure shall be introduced.
2. Rationalization of heating, cooling, heat transfer, etc. <Heating equipment>	- Management Standard shall be established to control temperature/pressure values and the amount of the heating medium in use for heaters in order to prevent heat oversupply. - Improvement in heat patterns of industrial furnaces - Prevention of overload and underload - Improvement in thermal efficiency of multiple heaters as a whole - Achievement of shorter waiting time between processes - Achievement of operation concentrated on heaters that can be run intermittently - Boiler water quality control to prevent scale buildup and sludge sedimentation - Shutoff of steam feed valves when unnecessary - Keeping steam dryness at an appropriate level	- Management Standard shall be established to perform periodical measurements and recording of temperatures of the heated/cooled objects, the temperature, pressure and flow rate values of the heating medium (such as steam) in use for heaters, and other necessary items.	- Control Standard shall be established to carry out periodical maintenance and checkup of all elements related to heat transmission, such as boilers, industrial furnaces and heat exchangers, in an effort to prevent potential reduction of heat transmission performance.	- Materials having high thermal conductivity shall be used for elements related to heat exchange. - Heat exchangers shall be arranged in such a way that allows an appropriate improvement in thermal efficiency of the heating equipment as a whole.
3. Rationalization of heating, cooling, heat transfer, etc. <Air-conditioning equipment and hot water supply systems >	- Management Standard shall be set up for each air-conditioning block to be demarcated within a plant or office building so that air-conditioning temperature, ventilation frequency, humidity values, etc. can be appropriately controlled in the respective blocks. - Management Standard shall be established with a view to improving the efficiency of air-conditioning equipment each individually and as a whole so that heat source and air-conditioning equipment can be controlled in conjunction. - Management Standard shall be established to control supply water temperature, pressure, etc. on the hot water supply system.	- Management Standard shall be established per air-conditioning block to perform periodical measurements and recording of temperature and humidity values. - Management Standard shall be established to perform periodical measurements of items required for improvement of the efficiency of air-conditioning equipment each individually and as a whole. - Management Standard shall be established to perform periodical measurements and recording of supplied water quantity and temperature values, etc. of the hot water supply system.	- Control Standard shall be established to carry out periodical maintenance and checkup of air-conditioning equipment with regard to items required for improvement of the efficiency of the equipment each individually and as a whole, such as removal of filter blinding and descaling. - Control Standard shall be established to carry out periodical maintenance and checkup of heat exchangers for descaled state, etc.	- Air-conditioning equipment shall meet the following requirements: (1) Equipment shall be capable of controlling each air-conditioning block individually and separately and have a capacity to meet the heat demand. (2) Heat source equipment in high thermal efficiency such as heat pumps shall be used. (3) If thermal load fluctuations are anticipated, a regenerative system which is capable of enhancing thermal efficiency, or equipment that allows split control/operation of various units, which is high in thermal efficiency, shall be used. .

Category <equipment>	Standards			
	Management	Measurement and recording	Maintenance and inspections	Measures at installation of new equipment
			- Control Standard shall be established to carry out periodical maintenance and checkup of the automatic controller for items required for its control.	(4) If air blowers or pumps are to be used in significantly varying load conditions, a variable airflow or fluid flow system shall be used, respectively (5) Installation of measuring instruments and sensors is required for measurement of temperature and humidity values and other necessary air conditions block by block and for improvement of air-conditioning efficiency. BEMS shall also be introduced as well. - For hot water supply systems, all possible measures for efficient use of energy shall be implemented.
4. Prevention of heat loss due to radiation, conduction, etc. <Heat utilizing equipment>	- Heat insulation of heat utilizing equipment shall be worked in conformity with applicable JIS. - Measures shall be taken to improve the heat insulation of industrial furnaces to Standard Values.	- Management Standard shall be established to perform periodical measurements of the status of heat loss and recording of the analytical results of heat balance.	- Management Standard shall be established to carry out periodical maintenance and checkup of heat utilizing equipment for prevention of heat loss. - Control Standard shall be established to carry out periodical maintenance and checkup of steam traps for prevention of steam leak.	- Generally, improvement of heat insulation shall be ensured. Fireproof insulation materials in conformity with applicable JIS shall be used. - Measures to prevent heat loss due to heat dissipation and air out-/inflows from openings shall be taken. - Heat radiation area shall be reduced through streamlining of heat medium pipe routing.
5. Recovery and utilization of waste heat <Waste heat recovery equipment>	- Management Standard shall be set up to meet the off gas temperature and the waste heat recovery rate to Standard Value and lower the off gas temperature. - Management Standard shall be established to control the temperature range, quantity and permissible properties of steam drain for recovery and utilization of the waste heat from the drain. - Management Standard shall be established to allow recovery and utilization of the sensible and latent heat, pressure and combustible components of the heated solid or fluid. - Waste heat from exhaust gas shall be properly utilized for preheating of raw materials.	- Management Standard shall be established to perform periodical measurements and recording of the status of waste heat.	- Control Standard shall be established to carry out periodical maintenance and checkup of waste heat recovery equipment.	- Prevention of air penetration into the waste heat flue and pipeline, reinforced heat insulation, and other necessary measures shall be considered. - The surface area of the waste heat recovery equipment shall be such that enhances heat recovery rate.

Category <equipment>	Standard			
	Management	Measurement and recording	Maintenance and inspections	Measures at installation of new equipment
6. Rationalization in the conversion of heat to power, etc. <Power generation equipment>	- Management Standard shall be established to maintain high-efficiency operation or to improve total efficiency in case of parallel running of various units of dedicated power generation equipment. - In thermal electric power plants, Management Standard shall be established to operate the steam turbine at low pressure in case partially loaded.	- Management Standard shall be established to perform periodical measurements and recording of thermal efficiency.	- Control Standard shall be established to carry out periodical maintenance and checkup of equipment to keep thermal efficiency high	- Equipment capacity shall be on a proper level meeting the actual and future demand for electric power. - Equipment shall provide a yearly power generating efficiency not significantly lower than the average efficiency level at the receiving end of the thermal power generation equipment available in Japan.
7. Rationalization in the conversion of heat to power, etc. <Cogeneration equipment>	- For the cogeneration equipment consisting of various boilers, gas turbines, steam turbines, and so on, Management Standard shall be established for operation control to enhance total efficiency through full management of cogenerated heat and power. - Management Standard shall be established for operation control to ensure the minimum value of extraction pressure for bleeding turbine or backpressure for backpressure turbine.	- Management Standard shall be established to perform periodical measurements and recording of thermal efficiency according to the load level. - When a bleeding or backpressure turbine is run at a nearly minimum level of extraction pressure or backpressure, Management Standard shall be established to perform periodical measurements and recording of inlet pressure values, etc.	- Control Standard shall be established to carry out periodical maintenance and checkup of equipment to keep thermal efficiency high.	-Equipment capacity shall be on a proper level meeting the actual and future demand for electric power after verification of full possibility of utilization of waste heat and power.
8. Prevention of electricity loss due to resistance, etc. <Electricity receiving and distributing equipment>	- Management Standard shall be established for transformers to keep power demand rate at an adequate level. - Management Standard shall be established to minimize distribution loss. - The power factor at the receiving end shall be 90% or more. - Management Standard shall be established for run-stop operation of the phase advancing condenser. - Management Standard shall be established to prevent voltage imbalance. - Management Standard shall be established for operation of power receiving equipment to level power usage. - Management Standard shall be established for control of supply to power receiving equipment to minimize power loss.	- Management Standard shall be established to perform periodical measurements and recording of items necessary for saving power and minimizing power loss.	- Control Standard shall be established to carry out periodical maintenance and checkup of power receiving transformers and distribution equipment.	- Equipment capacity, receiving transformer arrangement and distribution voltage shall be determined after full study of the actual and future demand for electric power.

Category <equipment>	Standards			
	Management	Measurement and recording	Maintenance and inspections	Measures on new construction
9. Rationalization of conversion from electricity to mechanical power, heat, etc. < Motor applied equipment and electric heaters, etc. >	- Management Standard shall be established for motor equipment to shut off the motor when not required. - Management Standard shall be established to keep an appropriate demand rate for the motor. - Management Standard shall be established for fluid machines to reduce the load on the motor. - Management Standard shall be established for induction, arc and resistance furnaces to improve their thermal efficiency. - Management Standard shall be established for electrolytic equipment to improve its thermal efficiency. - Management Standard shall be established for each unit of electricity utilizing equipment to minimize electricity loss.	- Management Standard shall be established to perform periodical measurements and recording of items necessary for minimizing electric power loss such as voltage or current loss.	- Control Standard shall be established for periodical maintenance and checkup of motor applied equipment. - Control Standard shall be established for periodical maintenance and checkup of fluid machines. - Control Standard shall be established for periodical maintenance and checkup of electric heaters and electrolytic equipment.	- When motor applied equipment is newly installed, its configuration shall be such that readily allows adjustments of operating conditions in relation to load variations.
10. Rationalization in the conversion from electricity to motive power, heat, etc. < Lighting systems, elevators and office equipment>	- Management Standard shall be established for lighting equipment in conformity with applicable JIS. All excessive and/or unnecessary lighting equipment shall be removed. - The number of working elevators shall be controlled. - Office equipment power shall be turned off when unnecessary.	- Management Standard shall be established to perform periodical measurements and recording of intensity of illumination.	- Control Standard shall be established for periodical maintenance and checkup of lighting equipment. - Control Standard shall be established for periodical maintenance and checkup of elevators. - Control Standard shall be established for periodical maintenance and checkup of office equipment as necessary.	- Select appropriate lighting equipment considering the following: (1) Energy-saving type such as Hf fluorescent lamps (2)High efficiency type such as HID lamps (3) Easy maintenance lighting equipment (4) Lighting equipment that considers total efficiency of illumination (5) Use of a separate circuit where daylight can be made use
11. BEMS (Building Energy management System)				
12. Efficient use of thermal energy				
13. Utilization of surplus steam, etc.				
14. Utilization of unused energy				
15. Utilization of service providers				

(2) Targets

Category <equipment>	Targets	
	Improvement of equipment	Installation of energy conservation equipment
1. Rationalization of fuel combustion <Furnaces>	- Efforts are required to lower the air ratio to the prescribed target value ("Target Value") - Examination shall be made to select a burner or combustion equipment capable of regulating fuel supply amount and air ratio. - Examination shall be made to select a ventilation system capable of regulating airflow rate and combustion chamber pressure.	- It shall be examined to install a combustion controller capable of controlling air ratio. - It shall be examined to introduce a regenerative burner when installing a new burner or at renewal of the existing one. - Accurate, computerized combustion control is required through installation of appropriate measuring equipment to each boiler.
2. Rationalization of heating, cooling, heat transfer, etc. <Heating equipment>	Examination shall be made into; - increasing steam dryness - improved emissivity of industrial furnace wall - improved heat transfer rate across the heating surface - use of materials having high thermal conductivity for elements related to heat exchange - direct heating of objects requiring heating - increasing the number of stages of the multi-effect evaporator - obtaining a higher efficiency in distillation columns - improved thermal efficiency of the heat exchangers as a whole - an appropriate combination of various types of industrial furnaces - improved control method for the heating equipment (Target for exerting efforts) - achievement of uninterrupted operation, integration, cutback and/or partial leave-out of the heating process - pretreatment of materials to be heated - use of vacuum vapor for heating	- It shall be examined to adopt dispersion layout and employ regenerative equipment when installing a new boiler or similar equipment that utilizes heat. - It shall be examined to introduce a type with high thermal efficiency when installing new heating equipment.
3. Rationalization of heating, cooling, heat transfer, etc. < Air-conditioning equipment and hot water supply systems >	Examination shall be made into - improved heat insulation of the parts requiring air-conditioning in conjunction with measures for shielding sunshine - reducing load involved in outside air processing of the air-conditioning equipment, taking the use of an open air cooling or free cooling system into consideration - introduction of a large temperature difference system that allows reduction of required airflows and circulating water volume - improved heat insulation of pipes and ducts - utilization of an airflow controller for ventilation power system.	- It shall be examined to use a regenerative type heat pump system or gas-cooled system for air conditioning. When cooling and heating are required simultaneously, examination shall be made into installation of a heat recovery system, together with heat source equipment operated by waste heat. - For hot water supply, use of a heat pump system or condensation heat recovery system shall be examined.
4. Prevention of heat loss due to radiation, conduction, etc. <Heat utilizing equipment>	Examination shall be made into: - minimizing heat capacity required for loading trucks into industrial furnaces - improving the furnace heat insulation to the prescribed target value ("Target Value") - improved heat insulation of the heat utilizing equipment - preventing heat loss through openings of the heat utilizing equipment - taking measures to prevent heat medium leak - reducing the heat radiation area of the heat medium feed pipeline - placing appropriate covers for open type units	
5. Recovery and utilization of waste heat <Waste heat recovery equipment>	- Efforts shall be made towards efficient heat recovery by reducing the temperature at the inlet of the cooler or condenser. - Efforts shall be made to improve heat recovery rate by decreasing the waste gas temperature to the prescribed target value ("Target Value"). - It shall be examined to install a device that allows keeping waste heat temperature high to the waste heat flue. - It shall be examined to take measures for enhancing waste heat recovery rate of the equipment. - Methods for efficient use of waste heat shall be researched and examined.	- It shall be examined to install regenerative type equipment for waste heat.

Category <equipment>	Targets	
	Improvement of equipment	Installation of energy conservation equipment
	- Methods for effective utilization of the sensible and latent heat, pressure, etc. of the heated solid or fluid shall be examined.	
6. Rationalization in the conversion of heat to power, etc. <Power generation equipment>		
7. Rationalization in the conversion of heat to power, etc. <Cogeneration equipment>	- Remodeling of the existing bleeding or backpressure turbine shall be studied if there is possibility of enhancing its efficiency.	- The possibility of installing cogeneration equipment shall be studied if there is a great demand for steam or hot water.
8. Prevention of electricity loss due to resistance, etc. <Electricity receiving and distributing equipment>	- It shall be examined to keep the power factor at 95% or more at the receiving end.	- A transformer with efficiency equal to or higher than the standard energy consumption efficiency shall be used.
9. Rationalization of conversion from electricity to mechanical power, heat, etc. < Motor applied equipment and electric heaters >	- It shall be examined to install a motor having a capacity fit to the required output. - The most efficient possible operation of escalators shall be examined, considering use of human motion sensors.	- It shall be examined to use a motor having efficiency higher than the Target Value - For motor applied equipment, it shall be examined to install a rotational speed controller. - Electric heaters shall be introduced only after comparative study with other heat sources is performed. In addition, the heating system that best suit the required temperature level shall be selected. - Examination shall be made into distributed layout of small air compressors.
10. Rationalization in the conversion from electricity to motive power, heat, etc. < Lighting systems, elevators and office equipment>	- It shall be examined to make use of human motion sensors, timers, etc. - The most efficient possible operation of escalators shall be examined, considering use of human motion sensors.	- Examination shall be made into selection of dipping type lighting equipment or installation of an automatic light controller.
11. BEMS	- Time series energy management shall be implemented for comparative analysis with the past practice data so that the present consumption trend can be assessed. - Energy-saving control shall be examined for air-conditioning equipment and electricity equipment. - Examination shall be made into introduction of a system to allow easy check and verification of machinery and equipment deterioration and proper maintenance time as well.	
12. Efficient use of thermal energy	- Examination shall be made into preparation of a comprehensive data system on energy management situation along with improvement of consistency in heat utilization in terms of temperature.	
13. Utilization of surplus steam, etc.	- Effective applications of useable combustion gases or steam, if any, shall be examined. Additional examination shall be made to improve the conversion rate from heat to motive power. - Effective utilization of surplus heat and/or steam at other plants or for household applications shall be examined.	
14. Utilization of unused energy	- Examination shall be made into recovery and utilization of energy from combustible waste. - Examination shall be made into recovery and utilization of temperature difference energy from sewage, river water and/or seawater around the plant.	
15. Utilization of service providers	- It shall be examined to make effective use of diagnostics and advice from ESCO project participants.	

4.5 Standard and target values for operating equipment

(1) Air ratios and waste gas temperatures for boilers

Classification				Air ratio				Waste gas temperature					
Item			Load factor(%)	Solid fuel		Liquid fuel	Gas fuel	By-product gas such as blast furnace gas	Solid fuel		Liquid fuel	Gas fuel	By-product gas such as blast furnace gas
				Fixed bed	Fluidized bed				Fixed bed	Fludized bed			
Standard	For electric utility		75-100			1.05-1.20	1.05-1.10	1.2	-	-	145	110	200
	Other (quantity of evaporation)	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	200	200	200	170	200
		10 to less than 30t/h	50-100	1.3-1.45	1.2-1.45	1.15-1.30	1.15-1.30	-	250	200	200	170	-
		5 to less than 10t/h	50-100	-	-	1.20-1.30	1.20-1.30	-	-	-	220	200	-
		Less than 5t/h	50-100	-	-	1.20-1.30	1.20-1.30	-	-	-	250	220	-
Target	For electric utility		75-100	-	-	1.05-1.10	1.05-1.10	1.05-1.10	-	-	135	110	190
	Other (quantity of evaporation)	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	180	170	160	140	190
		10 to less than 30t/h	50-100	1.2-1.3	1.2-1.25	1.15-1.25	1.15-1.25	-	180	170	160	140	-
		5 to less than 10t/n	50-100	-	-	1.15-1.30	1.15-1.25	-	-	300	180	160	-
		Less than 5t/h	50-100	-	-	1.15-1.30	1.15-1.25	-	-	320	200	180	-

<Standard for air ratio>

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

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

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

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

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

<Target for air ratio>

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%.

<Standards for waste gas temperature>

* 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 for waste gas temperature>

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.

(2) Air ratios for industrial furnace

	Item	Gas fuel		Liquid fuel		Remarks
		Continuous type	Intermittent type	Continuous type	Intermittent type	
Standard	Melting furnace for metal forging	1.25	1.35	1.3	1.4	
	Continious billet reheating furnace	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 furr	1.20	-	1.25	-	
	Cement kiln	1.30	-	1.3	-	Value of liquid fuel in case pulverized coal firing
	Calcining kiln	1.30	1.35	1.3	1.35	Value of liquid fuel in case pulverized coal firing
	Drying furnace	1.25	1.45	1.3	1.5	Burner portion only
Target	Melting furnace for metal forging	1.05-1.20	1.05-1.25	1.05-1.25	1.05-1.30	
	Continious billet reheating furnace	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 furr	1.05-1.20	-	1.05-1.25	-	
	Cement kiln	1.05-1.25	-	1.05-1.25	-	Value of liquid fuel in case pulverized coal firing
	Calcining kiln	1.05-1.25	1.05-1.35	1.05-1.25	1.05-1.35	Value of liquid fuel in case pulverized coal firing
	Drying furnace	1.05-1.25	1.05-1.45	1.05-1.30	1.05-1.50	Burner portion only

<Standards for air ratio>

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 for air ratio >

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.

(3) 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

(4) 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.

(5) Equipment to be improved in power factor

Category of equipment	Capacity: (kW)
Cage-type induction motor	75
Coil-type induction motor	100
Induction furnace	50
Vacuum melting furnace	50
Induction heater	50
Arc furnace	-
Flash butt welder (excluding portable type)	10
Arc welder (excluding portable type)	10
Rectifier	10,000

(6) 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	—

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."

4.6 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 February 24, 2003)

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

(a) Proper measures shall be taken to prevent possible heat loss through outer walls, windows, etc. of the buildings with due considerations to the following approaches.

i) Developing plot and ground plans of the buildings based on the directions of the outer walls, layouts of the rooms, etc.

ii) Using highly efficient thermal insulation materials for outer walls, roofs, windows and openings

iii) Reducing heat load by adopting a system capable of properly controlling solar radiation coming through windows, promoting greening, etc.

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken regarding outer walls, windows, etc. of the buildings (except factories, etc.) shall be determined in accordance with (c). However, the assessment on the walls, windows, etc. of the buildings of less than 5,000 square meters in gross area may follow (d) as well as (c).

(c) "Conventional PAL standard values" (Appendix)

(d) Important ones in terms of energy use among the outer walls, windows, etc. of the buildings of the category cited in the conditional clause of (b) shall be assessed based on the values that are obtained by adding a total of marks of the following i) to iv) and the specific values determined according to the use of the building concerned and the area classification, which are respectively calculated so as to become numbers over 100.

i) Marks regarding plot and ground plans of the building

Points shall be determined depending on the measures regarding the main direction, the shape, the air location and the average floor height.

ii) Marks regarding heat insulation efficiency of the outer walls and roofs

In the general region (other than the cold region (Hokkaido, Aomori, Iwate and Akita prefectures) and the hot region) and the cold region, points shall be added up according to the area classification and the measures taken respectively for the outer walls and roofs of the building concerned, while the point for the hot region shall be zero. However, when the measures taken for one assessment item serve for more than two items, the area-weighted average of the thickness of the insulation material shall be used for assessment.

iii) Marks regarding insulation efficiency of the windows

In the general region and the cold region, points determined according to the area classification and the measures taken shall be used and that for the hot region shall be regarded as zero.

iv) Marks regarding sunray-shielding efficiency of the windows

Points determined according to the area classification and the measures taken shall be used.

(2) Efficient use of energy regarding air conditioning equipment

(a) Efficient use of energy for air conditioning equipment shall be ensured with due considerations to the following approaches.

i) Designing air conditioning systems by taking into account characteristics of air conditioning loads of the rooms and other fact

ii) Developing heat transfer equipment plans designed for little energy loss in air ducts, piping, etc.

iii) Adopting appropriate control systems of the air conditioning equipment

iv) Adopting heat source systems with highly efficient energy use

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken regarding the air conditioning equipment installed in the buildings (except factories, etc.) shall be determined in accordance with (c). However, the assessment on the air conditioning equipment of the buildings of less than 5,000 square meters in gross area (package air-conditioners (limited to air-cooling system) specified under JIS B8616-1999 (package air-conditioner) and gas heat pump heating/cooling equipment specified under JIS 8627-2000 (gas heat pump heating/cooling equipment) may follow (d) as well as (c).

(c) "Conventional CEC/AC standards" (Appendix)

(d) Important ones in terms of energy use among the air conditioning equipment cited in the conditional clause of (b) shall be assessed based on the values drawn from the addition of a total of marks of the following (i) to (iii) and specific values determined depending on the use of the building concerned and the area classification, which are calculated so as to become numbers over 100.

i) Marks regarding reduction of outside air load

Points determined depending on the measure taken shall be summed up.

ii) Marks regarding places for installation of outdoor machines and lengths of piping from the outdoor machines to indoor machines

Points shall be determined depending on the condition.

iii) Marks regarding heat source equipment efficiency

Points shall be determined depending on the measures taken.

(3) Efficient use of energy by mechanical ventilation equipment

(other than air conditioning equipment)

(a) Efficient use of energy shall be ensured by mechanical ventilation equipment other than air conditioning equipment with due considerations to the following approaches

i) Developing plans designed for little energy loss in air ducts, etc.

ii) Adopting appropriate control systems for the mechanical ventilation equipment other than air conditioning equipment

ii) Adopting energy-efficient equipment that has proper capacity for necessary amount of ventilation

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken regarding the mechanical ventilation equipment (except air conditioning equipment, hereinafter the same in (3)) installed in the buildings (except factories, etc.) shall be determined in accordance with (c). However, the assessment of the mechanical ventilation equipment of the buildings of less than 5,000 square meters in gross area may follow (d) as well as (c).

(c) "Conventional CEC/V standards" (Appendix)

(d) Those that are installed in rooms not air-conditioned and are important in terms of energy use out of the mechanical ventilation equipment cited in the conditional clause of (b) shall be assessed based on the values drawn from the addition of 80 points to a total of marks respectively determined depending on the condition of the relevant items, which shall be calculated so as to become numbers over 100 respectively.

(4) Efficient use of energy regarding lighting equipment

(a) Efficient use of energy for lighting equipment shall be ensured with due considerations to the following approaches

i) Using high efficiency lighting fitting

ii) Employing proper lighting equipment control methods

iii) Using installation methods that facilitate easy maintenance and management

iv) Properly arranging lighting equipment, setting illumination intensity, selecting shapes and interior finish of rooms, etc.

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken regarding the lighting equipment of the building concerned shall be determined in accordance with (c). However, the assessment of the lighting fixture of the buildings of less than 5,000 square meters in gross area may follow (d) as well as (c).

(c) "Conventional CEC/L standards" (Appendix)

(d) The lighting equipment cited in the conditional clause of (b) shall be assessed by lighting zone that is important in energy use, based on the values respectively drawn from the addition of 80 points to a total of marks of the following i) to iii), which are calculated so as to become numbers over 100.

i) Marks regarding illumination efficiency of lighting equipment

Points determined depending on the measures taken regarding each given item shall be aggregated.

ii) Marks regarding control systems of lighting equipment

Points shall be determined depending on the measures taken.

iii) Marks regarding layout of lighting equipment, setting of illumination intensity and decision on forms and interior finish of rooms, etc.

Points determined depending on the measures taken regarding each given item shall be aggregated.

(5) Efficient use of energy regarding hot water supply system

(a) Efficient use of energy for hot water supply system shall be ensured with due considerations to the following approaches.

i) Developing proper piping system plans taking into account shortening of supply lines, insulation of piping, etc.

ii) Adopting proper control systems of the hot water supply systems

iii) Adopting highly energy-efficient heat source systems

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken regarding the hot water supply systems of the building concerned shall be determined in accordance with (c). However, the assessment of the hot water supply systems of the buildings of less than 5,000 square meters in gross area may follow (d) as well as (c).

(c) "Conventional HW standards" (Appendix)

(d) Out of the hot water supply systems in the conditional clause of (b), those that are important in terms of energy use shall be assessed based on the values respectively drawn from the addition of 70 points to a total of marks of the following i) to v), which are calculated so as to become numbers over 100.

i) Marks regarding piping system plans

Points determined depending on the measures taken regarding each given item shall be aggregated.

ii) Marks regarding control systems of hot water supply facilities

Points determined depending on the measures taken regarding each given item shall be aggregated.

iii) Marks regarding heat source equipment

Points determined depending on the measures taken shall be used.

iv) Marks in the case of utilizing solar heat as heat source

Heat quantity from use of solar heat (in kilojoules/year) divided by hot water supply load (in kilojoules/year) shall be multiplied by 100.

v) Marks in the case of preheating supply water

Yearly average increase in water temperature from preheating (unit: Celsius degree(°C)) divided by the difference between the temperature of hot water used (°C)and yearly average supply water temperature (°C) by region shall be multiplied by 100.

(6) Efficient use of energy regarding lifting equipment

(a) Efficient use of energy for lifting equipment shall be ensured with due considerations to the following approaches.

i) Adopting proper elevator control systems

ii) Using highly energy-efficient drive systems

iii) Adopting appropriate installation plans depending on the required transport capacity

(b) Whether or not specific measures for the approaches mentioned in (a) above are properly taken particularly regarding elevators out of the elevating machine installed in the buildings (limited to those for use of office, etc. and hotels, etc.) shall be determined in accordance with (c). However, the assessment of the elevators out of the elevating machines installed in the buildings of less than 5,000 square meters in gross area may follow (d) as well as (c).

(c) "Conventional CEC/EV standards" (Appendix)

(d) Out of the elevators cited in the conditional clause of (b), those that are important in terms of energy use shall be assessed based on the values drawn from the addition of 80 points to a total of marks of the following i) and ii), which are calculated so as to become numbers over 100.

i) Marks regarding elevator control systems

Points shall be determined depending on the measures taken.

ii) Marks regarding the number of elevators installed

10 points for up to 2 elevators installed and 0 point for 3 and more elevators installed.

For details of the standard values and marks, please see the statute book of "Law concerning the Rational Use of Energy" revised in 2003. (May, 2003 The Energy Conservation Center, Japan)

Appendix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hotels, etc.	Hospitals, etc.	Stores for merchan-dising business, etc.	Business offices, etc	Schools, etc.	Restau-rants, etc.	Assembly halls, etc.	Factories, etc.
①PAL	420	340	380	300	320	550	550	–
②CEC/AC	2.5	2.5	1.7	1.5	1.5	2.2	2.2	–
③CEC/V	1.0	1.0	0.9	1.0	0.8	1.5	1.0	–
④CEC/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
⑤HW	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							
⑥CEC/EV	1.0	–	–	1.0	–	–	–	–

Note:

1) "Hotels, etc." include hotels, inns, and other facilities having energy use statuses similar to those.
2) "Hospitals, etc." include hospitals, nursing homes for elderly people, welfare homes for physically disabled people and other facilities having energy use statuses similar to those.
3) "Stores for merchandising business, etc." include department stores, supermarkets and other facilities having energy use statuses similar to those.
4) "Business offices, etc." include business offices, tax offices, police offices, fire stations, offices of local public organizations, libraries, museums, post offices and other facilities having energy use statuses similar to those.
5) "Schools, etc." include elementary schools, junior high schools, high schools, universities, technical colleges, higher vocational schools, "miscellaneous" schools and other facilities having energy use statuses similar to those.
6) "Restaurants, etc." include eating and drinking places, restaurants, coffee houses, cabarets and other facilities having energy use statuses similar to those.
7) "Assembly halls, etc." include public halls, assembly halls, bowling allays, gymnastic halls, theaters, movie houses, pachinko parlors and other facilities having energy use statuses similar to those.
8) "Factories, etc." include factories, livestock barns, garages, bicycle-parking houses, warehouses, pavilions, wholesale markets, crematoriums and other facilities having energy use statuses similar to those.
9) In this table, $l\,x$ means a total of the lengths of circulation pipeline for hot water supply and primary pipeline (both in meters) divided by the daily average of a total volume of hot water consumed (in cubic meters).

4.7 Top Runner Program

(1) Background

In order to diffuse appliances and vehicles that are highly energy efficient, the revised Energy Conservation Law makes it obligatory for manufacturers and importers to ensure their products to meet energy-saving target standards.

The Japanese government launched the Top Runner Program based on the amended Law in 1999, under which the standards are set based on the efficiency level of the most 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.

(2) What is the Top Runner Program?

1) Target 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.

2) Target Standard Value:

As for the designated products, manufacturers and importers etc. are obliged to meet the target standard values concerning “energy consumption efficiency” of those products. Target standard values are set on the basis of the value of the most energy efficient products of the same in the market.

3) Classification of Target Standard Value:

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

4) Target Fiscal Year:

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.

5) Judgment Method of Achievement:

In the target fiscal year, achievement of the target is judged based on energy conservation figures 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.

6) Measurement Method:

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

7) Indications:

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

(3) List of target designated products in the Top Runner Program

Passenger vehicles Air conditioners Fluorescent lights TV sets Video Casset Recorders Copying machines Computers Magnetic disk units Freight vehicles Electric refrigerators Electric freezers	Space heaters Gas cooking appliances Gas water heaters Oil water heaters Electric toilet seats Vending machines Transformers (molded)
11 products above were designated originally in 1999.	Additional 7 products above were designated in 2002.
	Microwave Oven Electric Rice Cooker DVD Recorder
	Additional 3 products above were designated in 2006.
LPG passengervehicles were added to the category of a passenger vehicle in 2003.	
	Total 21 products are designated as of July 2006.

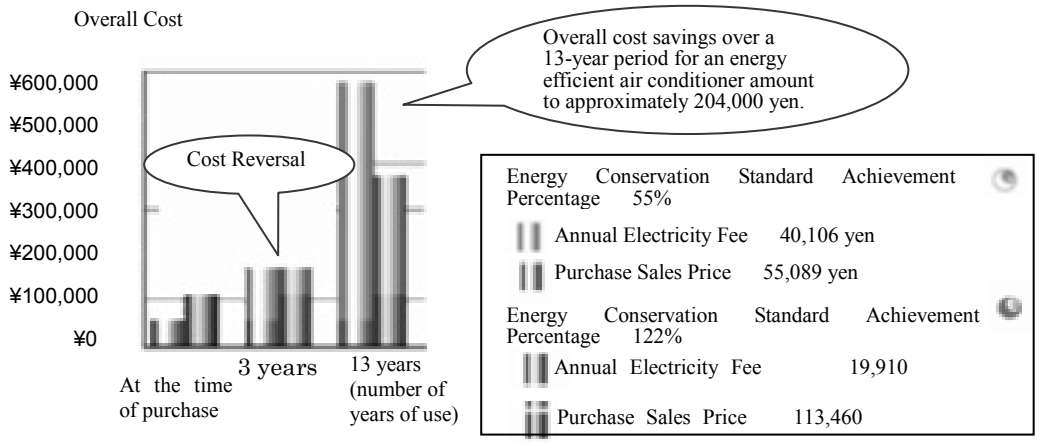
(4) Expected energy conservation by the target fiscal year

	Equipment	Target Fiscal Year	Expected energy conservation effects as of the previous fiscal year of the target
1	Gasoline passenger vehicles	FY2010	Approx. 23% compared to FY1995
	Diesel passenger vehicles	FY2005	Approx. 15% compared to FY1995
	LPG passenger vehicles	FY2010	Approx. 11.4% compared to FY2001
2	Air conditioners	Frozen at FY2007 Frozen at FY2004: Frozen at FY2004 for blower/wall type items for cooling/heating under 4kW	Approx. 63% compared to FY1997 for coolers/heaters; approx. 14% for dedicated cooler
3	Fluorescent lights	FY2005	Approx. 16.6% compared to FY1997
4	TV sets	FY2003	Approx. 16.4% compared to FY1997
5	Video cassette recorders	FY2003	Approx. 58.7% compared to FY1997
6	Copying machines	FY2006	Approx. 30% compared to FY1997
7	Computers	FY2005	Approx. 83% compared to FY1997
8	Magnetic disk units	FY2005	Approx. 78% compared to FY1997
9	Diesel freight vehicles	FY2005	Approx. 7% compared to FY1995
	Gasoline freight vehicles	FY2010	Approx. 13% compared to FY1995
10	Electric refrigerators and freezers	FY2004	Approx. 30% compared to FY1998
11		FY2004	
12	Space heaters	FY2006	Approx. 1.4% compared to FY2000 for gas space heaters; approx 3.8% for oil space heaters
13	Gas cooking appliances	FY2006	Approx. 13.9% compared to FY2000
14	Gas water heaters	FY2006	Approx. 4.1% compared to FY2000
15	Oil water heaters	FY2006	Approx. 3.5% compared to FY2000
16	Electric toilet seats	FY2006	Approx. 10% compared to FY2000
17	Vending machines	FY2005	Approx. 33.9% compared to FY2000
18	Transformers	FY2006: oil-filled transformers FY2007: mold transformers	Approx. 30.3% compared to FY1999
19	Microwave oven	FY2008	Approx. 8.5% compared to FY2004
20	Electric rice cooker	FY2008	Approx. 11.1% compared to FY2003
21	DVD Recorder	FY2008	Approx. 22.4% compared to FY2004

(5) Merits of Purchasing Top Runner Machinery and Equipment

Prices of Top Runner machinery and equipment are generally higher compared with conventional popular machinery and equipment due to the latest energy conservation technological features. To encourage purchases of these machinery and equipment that appear expensive at first glance, to raise consumer awareness of concept of overall costs, which are acquired by adding running costs (annual costs of electricity or fuel) to the purchase price is necessary. One example is shown below.

[Air Conditioners]
Comparison of Overall Costs over the Annual Operational Costs of an Energy Efficient Model and a Popular Model (Cooling Capacity 2.8kW)



Comparison:
Comparing air conditioners that energy conservation standard achievement percentage of 55% ( ) and 122% ( ), the difference in the volume of electricity consumed is 918kWh per year after subtracting 905kWh per year from 1,823kWh per year. If a consumer selects the more energy-efficient air conditioner model, he will save approximately 20,200 yen on his electric bill over a one-year period.

*To calculate electricity consumption volume, periodic electricity consumption volume (as of end of October 2003) specified in manufacturer's catalogue was used.
*Purchase price derived from July 2003 aggregate sales data.
*Air conditioners are used for an average of 12.8 years according to a September 2003 cabinet office consumer operation survey.

(6) 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 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.

(7) Measures to be taken in case 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. Also, 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 government decree.

Moreover, 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.

(8) 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)

4.8 Law for Energy Conservation and Recycling Support

The law is designed to support business operators who will voluntarily implement projects to promote the rationalization of the use of energy and natural resources. The description concerning the rational use of energy of the law will be summarized below. In this law, the concept of "the rational use of energy" included the use of substitute energy sources for oil

(1) Guidelines for efforts

The competent minister shall establish guidelines for business operators and building owners who will voluntarily implement projects for the rational use of energy.

(2) The definition of specified projects

There are three categories of projects which will be defined as "specified". Business operators etc. who are going to take 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 will be supported 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 (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).

4.9 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 (2005)

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 (financing percentage is 40% for projects identified in (5) below): (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 Act. (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%
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 II *2 *3	
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 II *4	40%

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	Preferential rate II *5	40%
Projects for improvement of wind power generation plants (Output of 1200 kW or higher)	DBJ	Preferential rate II *6	
Projects for improvement of solar power generation plants (Output of 150 kW or higher)		Preferential rate I	
Fuel cell introduction projects (Output of 100 kW or higher, use of waste heat, and 60% or higher primary energy use efficiency are required.)			
Biomass energy plant introduction projects		Preferential rate I *6	
Projects for introduction of plants that use the heat generated by the snow/ice melting system		Preferential rate I	

*1: Projects described in (1), (2) and (3) are provided with interest subsidies from Oil Special Account. The preferential rate II is applied to these projects if the benefit of interest subsidy is selected.
*2: These projects are provided with interest subsidies from Oil Special Account, applicable exclusively to ESCO/ESP projects in Category (a). The preferential rate III is applied to the projects in Category (b) if the benefit of interest subsidy is selected.
*3: The preferential rate III is applied to ESCO/ESP projects.
*4: These projects are provided with interest subsidies from Oil Special Account. The preferential rate III is applied if the benefit of interest subsidy is selected.
*5: City gas air cooler projects are provided with interest subsidies from Oil Special Account. The preferential rate III is applied if the benefit of interest subsidy is selected.
*6: The preferential rate II applies until the end of FY2006.

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

2) For Small and Medium-sized Enterprises

Target Projects	Agency	Interest rate
(Promoting the efficient use of energy) Projects for acquisition of energy conservation facilities, including remodeling and updating of those existing. For the specified facilities and ESCO projects, lease and rental of facilities fall within the scope of this funding.	JASME NFLC ODFC	Special interest rate
(Promoting the introduction of specific high energy performance equipment) Projects for replacement of obsolete industrial furnaces and/or boilers or for introduction of additional equipment which yields performance comparable to those of replacement.	JASME NFLC ODFC	Special interest rate *
(Promoting the use of alternative energy sources) Projects for introduction of the equipment that uses alternative energy sources instead of oil.	JASME NFLC	Special interest rate

* Interests are subsidized from Oil Special Account.

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

Source) Ministry of Economy, Trade and Industry : The financial supporting measures on financial and taxation for introducing energy efficiency and new energy facilities (2005)

(2) Tax incentives to promote investment in the energy supply and demand structure reform (2005)

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:

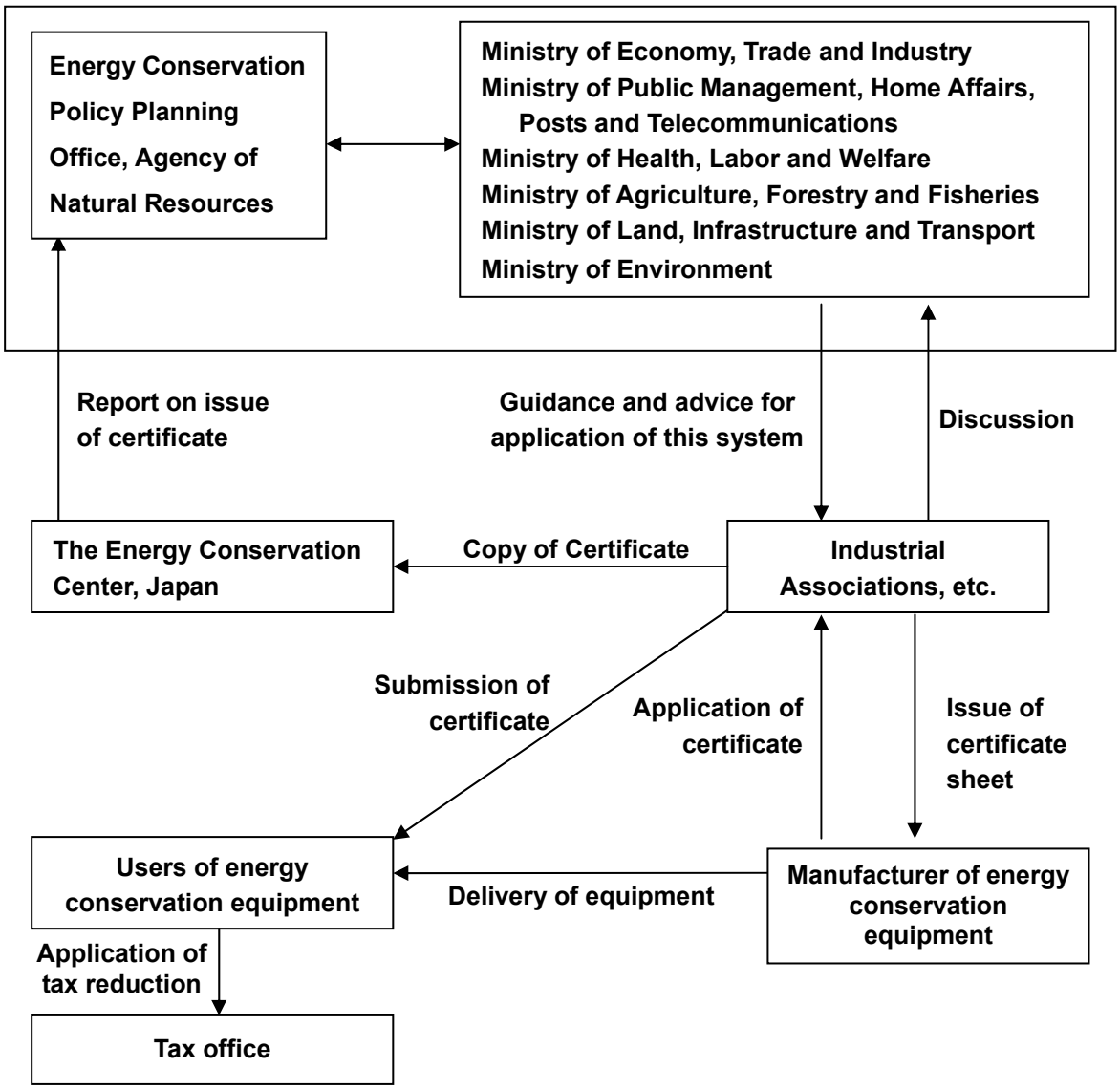
1) Tax exemption equivalent to 7% of the equipment acquisition cost (which should not be more than 20% of the income tax or corporate tax payable.)

2) Special depreciation of 30% of the equipment acquisition cost in the year of acquisition, in addition to ordinary depreciation.

• Energy-conserving equipment:

Equipment for general industries 74 units

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



4.10 Commendation Programs to award Energy Conservation Efforts

The Energy Conservation Center Japan is conducting various commendation programs to promote the awareness of how important the efficient use of energy is. Here are brief lists of those programs.

1) Commendation Program to Excellent Energy Managers: A commendation certificate will be given to individuals who have long been pursuing energy management and made an outstanding contribution to efficient energy management. Sponsored by METI.

2) Commendation Program to Excellent Energy Management Factories: A commendation certificate will be given to factories or business facilities who have long made efforts to rationalize the energy use, have long been pursuing energy management and made an outstanding contribution to energy management as well as are acknowledged to be a paragon of successful energy management . Sponsored by METI.

3) The National Contest of Energy Conservation Successful cases: The winner of the contest will be decided 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 ECCJ.

4) Commendation Program to Meritorious Energy Management Service Performers: A commendation certificate will be given to individuals who have long been playing a central role and made an outstanding contribution to promoting the efficient energy management. Sponsored by ECCJ.

5) Commendation Program to Excellent Energy Management Engineers: A commendation certificate will be given to individuals who have long provided efforts to the energy management service and made an outstanding contribution to promoting the efficient energy management. Sponsored by ECCJ.
The prize awarding ceremony will be held in February and prize certificates will be conferred on the awardees by the Ministry of Economy, Trade and Industry as well as the Director-General of the Agency of Natural Resources and Energy.
On top of those commendation programs, the ECCJ sponsors contests for the school students in order to inspire the younger generation with the importance of energy conservation practices. Here we will give a brief description about the contest.

6) Energy Conservation Poster Contest for elementary and junior high school students. Sponsored by ECCJ.

7) Energy Conservation Essay Contest for elementary and junior high school students. Sponsored by ECCJ.

8) Commendation Program to Excellent Energy Conservation Equipment[1]: A commendation certificate will be given to companies or teams for their strong 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].

9) The Energy Conservation Grand Prize will be awarded to equipment, resources or systems which have already or likely to be launched into markets and have high excellence in energy conservation. The prize has three genres: i) home-use, ii) commercial use, and iii) automobiles. Entries are judged on energy efficiency, originality, marketability and environmentality. Sponsored by ECCJ.

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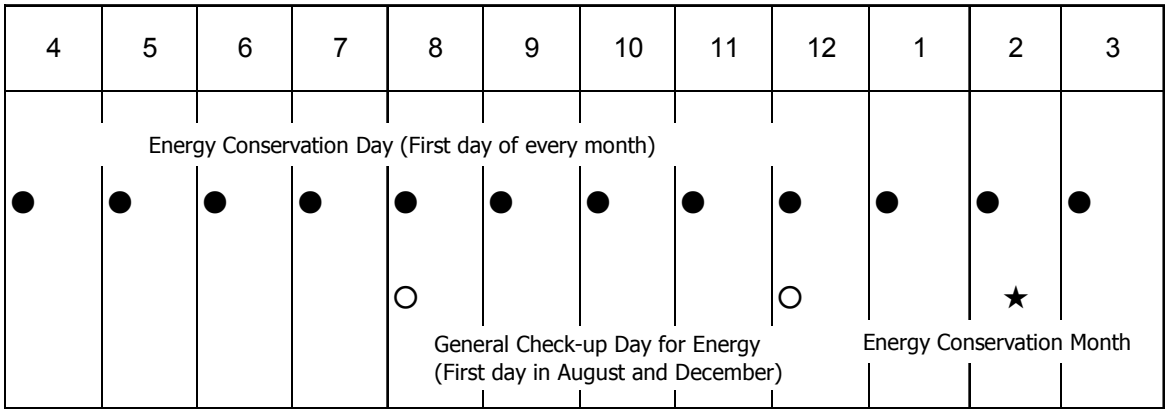
[1] "Energy Conservation Equipment" represents, i) devices, facilities and systems in addition to "equipment" in general sense, ii) measuring instruments remarkably contributing to energy conservation, iii) equipment that exploits unutilized resources such as wastes.
[2] JFM = The Japan Machinery Federation

4.11 Publicity activities

- Energy conservation day, energy conservation month, and general check-up day for energy conservation

In order to promote energy conservation as a nationwide activity, the government has established ”Energy Conservation Day” on **the 1st of every month**, “Energy Conservation Month” in **February** and “General Check-up Day for Energy Conservation” on the **1st of August and December**. Educational and publicity activities are conducted in cooperation with the local governments and private companies.



Description	Objectives and Contents	Commencing from	Governing Body
Energy Conservation Day	1. Creating greater opportunity to review energy conservation activities and ensuring their results 2. Working to promote energy conservation activities	March, 1980	Energy and Resources Conservation Measures Promotion Conference
Energy Conservation Month	1. Nationwide movement involving general consumers and public institutions 2. Implementing energy conservation programs in the industrial sector 3. Holding energy-conservation exhibitions 4. Various campaign events	March, 1976	Energy and Resources Conservation Measures Promotion Conference
General Check-up Day for Energy Conservation	1. Total check-up and review concerning daily energy conservation activities 2. Deepening nationwide understanding of daily energy conservation habits and the importance of energy 3. The Summer General Check-up Day for energy Conservation was determined by the Energy and Resources Conservation Measures Promotion Conference on June 28, 1990	October, 1980	Energy and Resources Conservation Measures Promotion Conference

4.12 Energy Audit Program

(1) Energy audit for small and midsize companies

Energy audit service for small and midsize factories took place in 1955 and approximately 5,600 cases of energy audit service have since been conducted in the factories around Japan.

1) **Target factories:** A firm whose capital is less than 100 million yen or whose total number of employees is less than 300.
2) **Cost**: Free of charge
3) **Number of auditors and auditing period**: Number of experts: 1-2; Period: 1-2 days
4) **Audit**

   (a) Advice on heat energy

   (b) Advice on electric energy
5) **Organization: The Energy Conservation Center, Japan**

(2) Energy Audit for commercial buildings

1) **Target buildings:** Buildings designated as "1st class designated Building" according to the Energy Conservation Law.
2) **Cost**: Free of charge
3) **Details of audit:** Two or three audit experts will make an interview with the persons in charge about the management standards for the building which is going to have an energy audit. Then, they will make an on-the-spot survey how the facilities in the building are operated. After the survey, they will draw up a list of areas which need remedies. And they will give advice for energy saving.
4) **Organization:** The Energy Conservation Center, Japan

4.13 The international ENERGY STAR Program

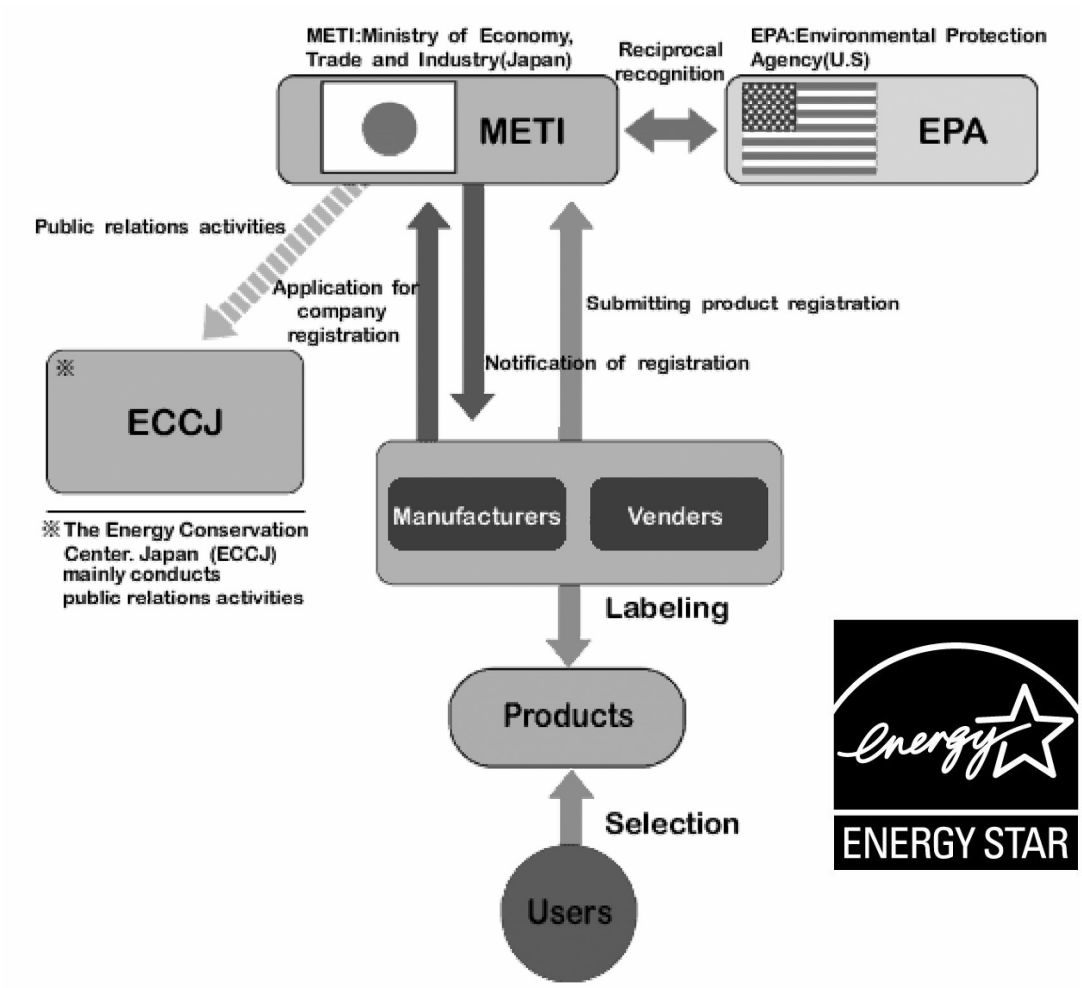
The international Energy Star program is a voluntary energy-efficiency labeling program designed to promote energy-efficient products. It was established in the US in 1992. Japan reached agreements to promote certain ENERGY STAR qualified products in 1995.

To participate in the program, contact an agency in charge, and it will respond with further information. Once it has been approved that the products of a manufacturer or a firm meet the standard, and then the manufacturer or the firm will be eligible to use the ENERGY STAR label.

(1) Product categories

Personal computers, monitors, printers, fax machines, copying machines, scanners and multifunction devices.

(2) Scheme

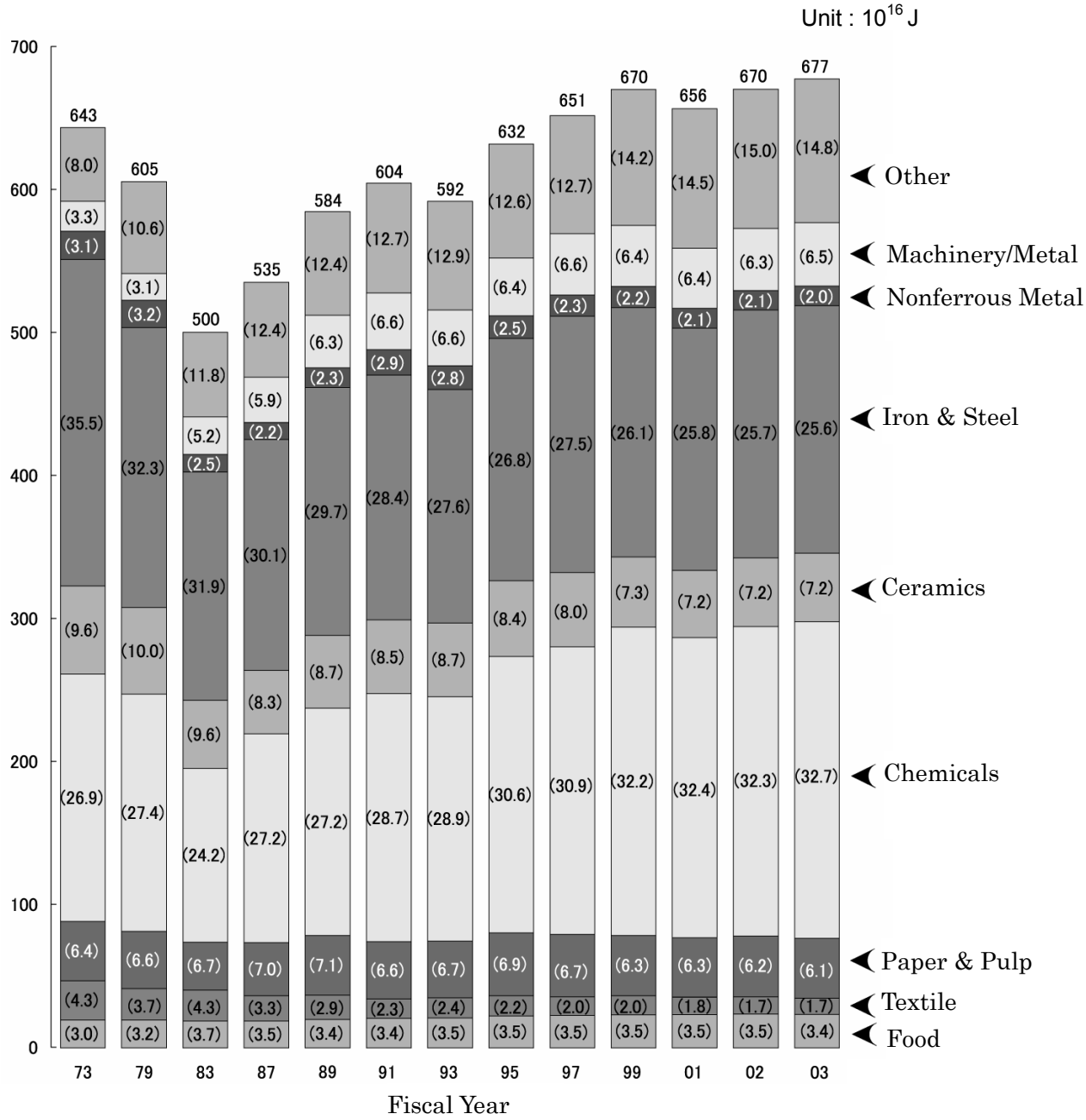


5. Energy Conservation by sector

5.1 Energy conservation in the industrial sector

(1) Situation of energy use in the industrial sector

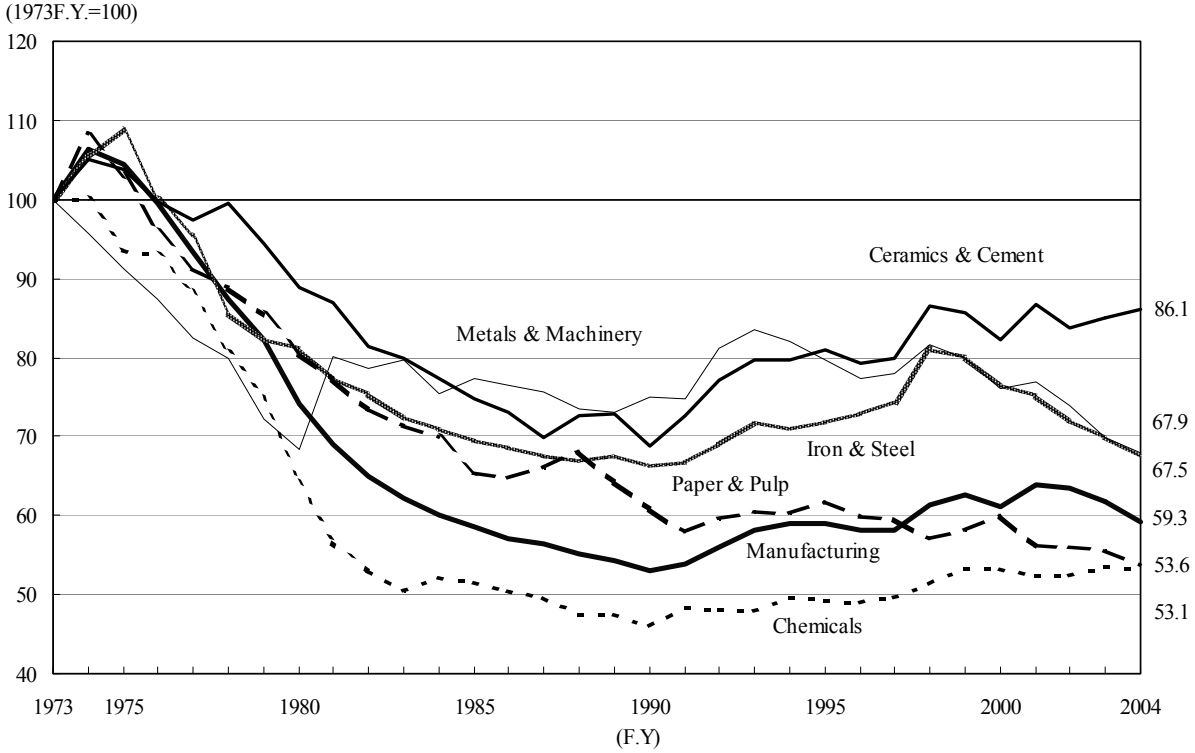
1) Energy consumption by manufacturing industry



Note) The figures in the parentheses are %.
Source) "Energy Production, Supply and Demand Statistics"

2) Energy intensities in major industries (IIP)

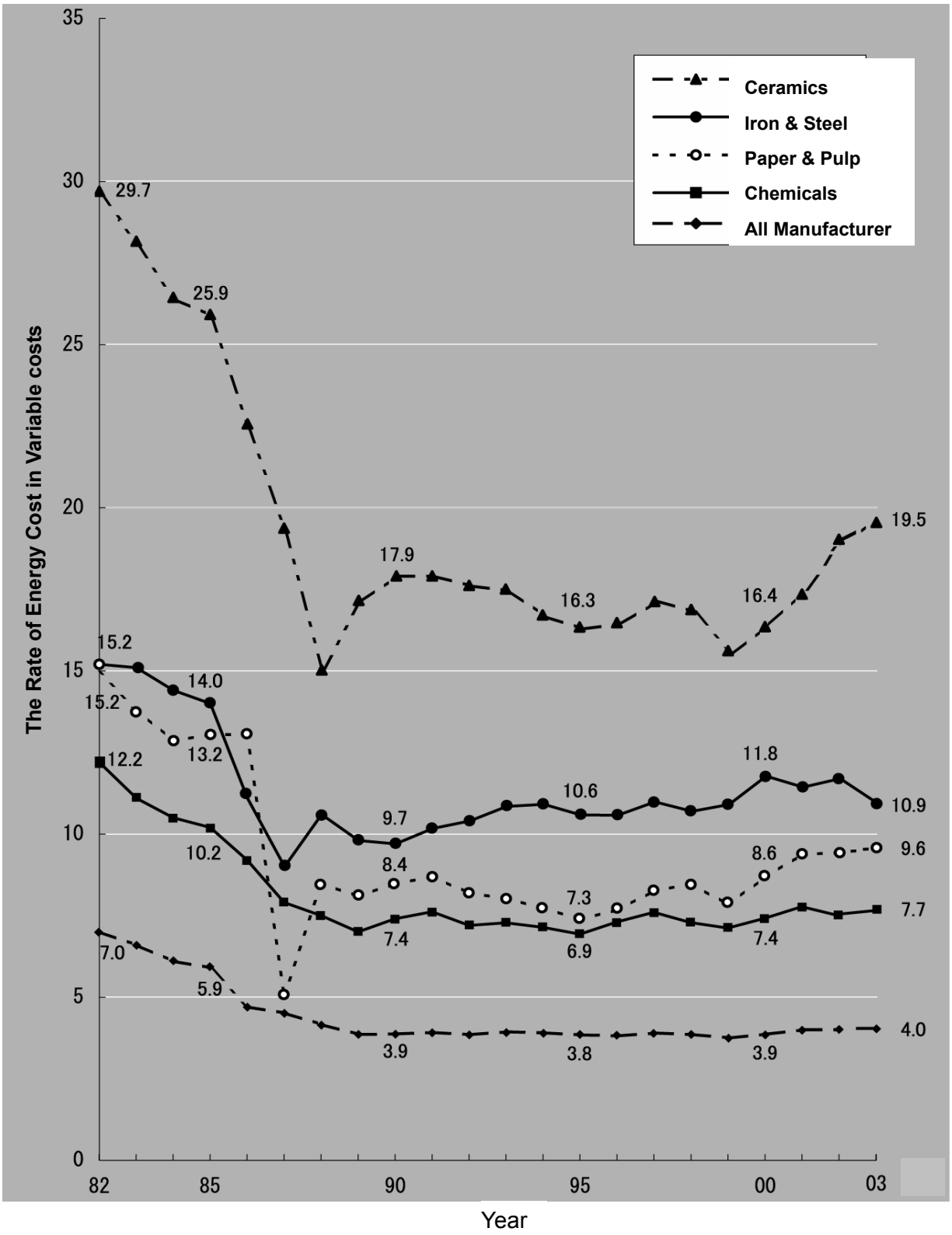
Index : Fiscal 1973 = 100



Note) IIP means Indices of Industrial Production (Energy consumption, calorie / production, yen)

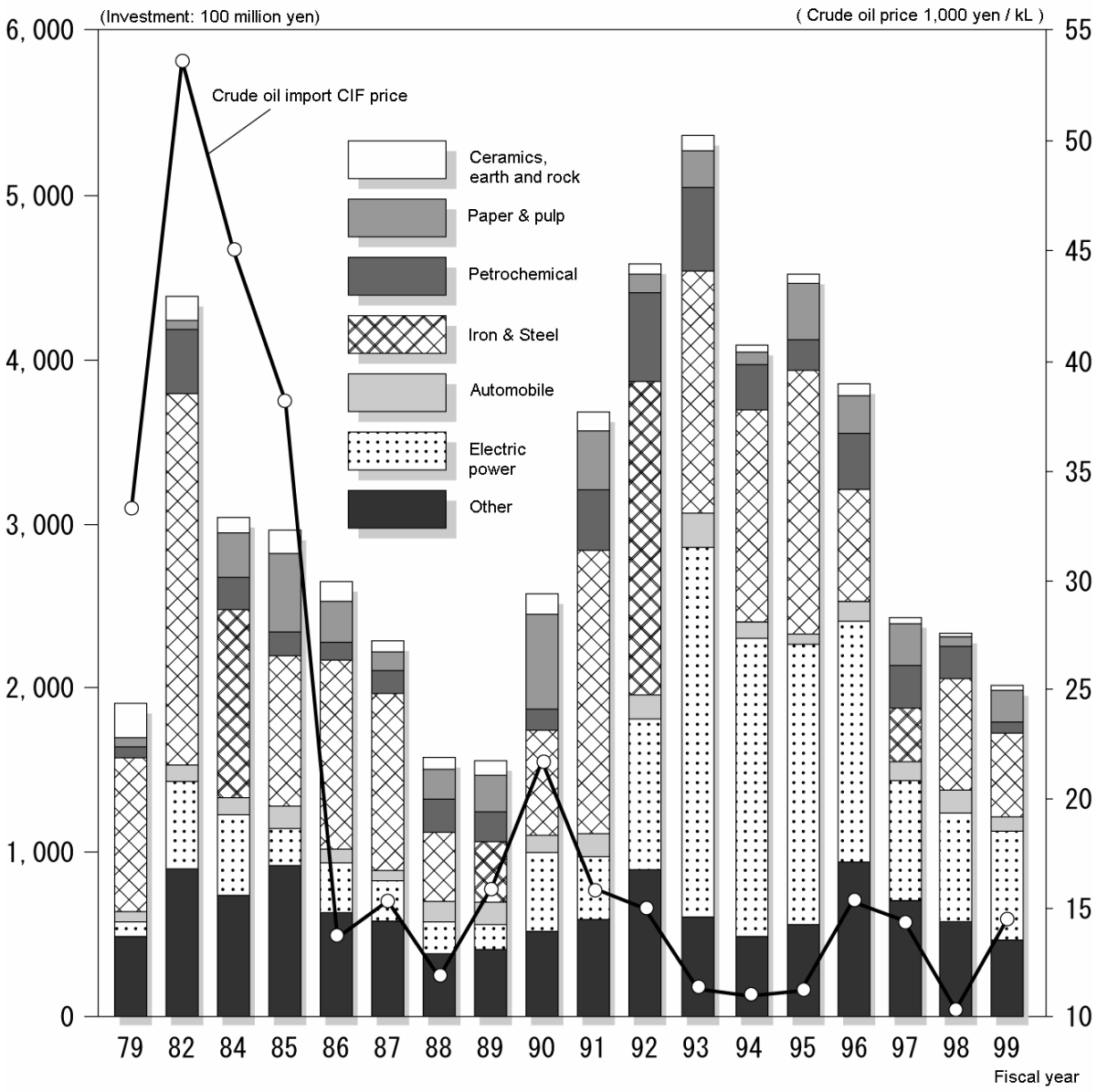
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2004)"

3) The ratio of energy costs to variable costs in major industries



Note) Variable costs = raw materials cost + fuel cost + electric power cost
Energy costs = fuel cost + electric power cost
Source) "Industrial Statistics Table (Industry Section)", Ministry of Economy, Trade and Industry

4) Energy conservation equipment investment and crude oil price



Source: "Equipment Investment Research" (Ministry of Economy, Trade and Industry),
"Monthly Trade" (Ministry of Finance)

5) Effects of energy conservation and investment payback period

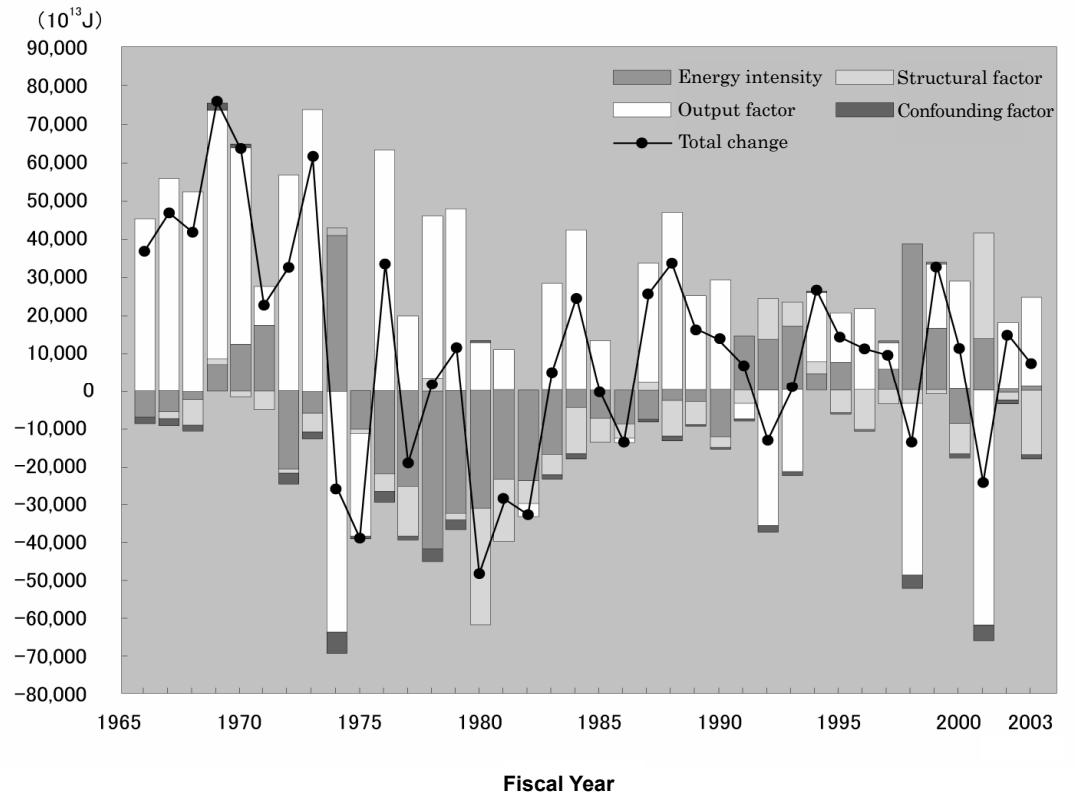
Industries	Trend of Energy use (kl/year)			Investment payback period (year)		
	FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000
Textiles	10,521	7,288	9,592	8.54	6.37	5.80
Paper, pulp	40,097	17,036	27,471	2.93	7.45	12.33
Chemicals	12,261	11,319	39,794	5.29	10.64	6.05
Oil refining	9,982	24,963	24,207	5.14	2.91	4.44
Ceramics, earth and rock	1,431	1,593	3,704	9.08	6.73	7.10
Steel	4,492	27,051	32,571	3.00	5.08	5.41
Nonferrous metals	4,995	2,172	1,058	4.44	12.27	10.75
General machinery	3,916	6,643	4,890	11.20	11.72	8.08
Electronic machinery	10,026	9,695	1,243	6.65	7.13	4.93
Electric machinery	3,092	311	227	4.32	6.47	5.70
Automobiles	32,121	48,914	30,514	4.76	4.15	6.23
Other manufacturing	5,951	6,579	4,587	6.50	8.90	7.93
Electricity	1,365	16,118	11,752	6.00	19.00	5.00
Gas	–	–	954	–	–	16.00
Heat supply	–	1,034	421	–	69.25	10.43
Wholesale, retail	121	324	386	9.25	6.22	2.75
Lease	–	–	–	–	–	–
Service	1	212	0	5.50	5.00	0.00
Manufacturing Total	138,885	163,564	179,858	5.99	7.49	7.06
(Basic materials industry)	(83,779)	(91,422)	(138,397)	(5.49)	(7.35)	(7.41)
(Processing assembly industry)	(55,106)	(72,142)	(41,461)	(6.69)	(7.67)	(6.57)
Non-manufacturing	1,487	17,688	13,513	6.92	24.87	6.84
Total	140,372	181,252	193,371	6.17	11.83	7.00

FY = Fiscal Year

Source) "Equipment Investment Plans in Major Industries," by the Ministry of Economy, Trade, and Industry

6) Energy demand analysis for the industrial sector

a) Factors affecting energy consumption in the manufacturing industry



b) Trend of factors of energy consumption change in the manufacturing sector

(Unit: 10^{16} J)

Fiscal Year		'90	'92	'94	'96	'98	'00	'01	'02	'03
Energy Consumption Changes		13.5	-13.3	26.1	10.7	-13.7	10.7	-24.7	14.3	6.7
Factor	Output Effect	29.0	-35.9	18.2	21.5	-45.2	28.7	-62.0	18.1	23.7
	Structure Effect	-2.7	10.9	3.1	-10.4	-3.9	-7.9	27.7	-2.1	-17.2
	Intensity Effect	-12.3	13.4	4.4	0.1	38.6	-8.8	13.5	-0.7	1.2

Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)"

(2) Energy conservation measures in the industrial sector

1) History of energy conservation measures for factories

Since the oil crisis, Japan's industrial sector has been playing a central role in the efficient use of energy. Thanks to its efforts, the sector has successfully maintained almost the same energy consumption level as in the oil crisis in spite of the growing output. Nonetheless, it is also true that the sector accounts for nearly 40 % 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 Environmental Voluntary Action Plan", aiming to promote the efficient use of energy on a voluntary basis.

On the policy level, the Law Concerning the Rational Use of Energy (Energy Conservation Law) was revised in order 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 all industries. Also through the revision business operators became necessary 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 also financial incentives, such as low interest loan programs, to boost investment in developing energy saving products and technologies under the law concerning energy conservation and recycling assistance, and tax breaks under the tax measures to promote the investment in the restructuring of 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

(The 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) Technological 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 main voluntary technical action plan by Nippon Keidanren [1)]

a) Manufacturing industry

Name of organization	Measures to attain goals
The Federation of Electric Power Companies of Japan	1. Introduction and expansion of LNG thermal power generation and improvement of utilization rate of nuclear power generation 2. Diffusion and expansion of natural energy (water, geothermal, wind, and solar energy) 3. Improvement of efficiency in thermal power generation (combined cycle power generation, high-efficiency coal-fired power generation) 4. Promotion of nuclear power generation based on security and confidence-building 5. Diffusion and expansion of energy conservation appliances and efforts to provide information on energy conservation
The Japan Iron and Steel Federation (JISF)	1. Improvement of efficiency of heating furnaces (introduction of regenerative burner, strengthening of thermal insulation) 2. Improvement of exhaust heat recovery rate in CDQ, TRT, sintering, converter, etc. 3. Improvement of efficiency of privately owned electrical power facilities and oxygen plants 4. Introduction of rotational speed control of dust catcher fan, etc. 5. Integration of facilities 6. Improvement of hot charge rate 7. Improvement of efficiency of coal moisture control system 8. Utilization of waste plastics in blast furnaces and coke ovens, etc.
Japan Chemical Industry Association	1. Efficiency improvement of facilities and equipment 2. Improvement of operation methods 3. Recovery of waste energy 4. Rationalization of process 5. Introduction of cogeneration 6. Fuel switch
Petroleum Association of Japan	1. Revision of operation management 2. Mutual utilization of waste heat among refining facilities 3. Promotion of computer control 4. Introduction of cogeneration 5. Continuation of the conventional measures (waste heat recovery from waste gas/effective utilization of low temperature waste heat, introduction of cogeneration, introduction of high-efficiency turbine, heat integration, switch into high-efficiency heat-exchangers) 6. Efforts among entities (promotion of "combinat renaissance," that is cooperative, efficient, and mutual utilization of heat and energy emitted in neighboring plants of different industrial category)
Japan Paper Association	1. Introduction of energy conservation system (heat recovery equipment, utilization of inverter control) 2. Introduction of high-efficiency equipment (high-temperature high-pressure recovery boiler, high-efficiency cleaning equipment, low-differential pressure cleaner, etc.) 3. Revision of manufacturing process (shortening and integration of processes) 4. Fuel switch to biomass energy (black liquor, waste woods, paper sludge, etc.) and waste energy (waste oil, scrap tires, etc.) 5. Strengthening of management (revision of control values, decrease in fluctuation)
Four major entities relating to electronics and electricity	1. New/unutilized energy 2. Cogeneration, thermal storage 3. Introduction of high-efficiency equipment 4. Strengthening of management 5. Improvement of control methods (automatic control) 6. Utilization of waste heat 7. Improvement of production process and product quality 8. Loss prevention (thermal insulation/heat-retention) 9. Fuel switch 10. Improvement in operation management 11. Construction of production system with high-efficiency in energy consumption rate

1) Materials for the Industrial Structure Council and the Advisory Committee for Natural Resources and Energy (FY2004)
Note) Keidanren : Japan Federation of Economic Organizations

Name of organization	Measures to attain goals
Japan Cement Association	1. Diffusion and promotion of energy conservation equipment 2. Expansion of utilization of waste as alternative energy source 3. Expansion of utilization of waste for the other purposes 4. Improvement of production rate of mixed cement 5. Introduction of energy conservation appliances (high-efficiency clinker cooler, kiln burner, etc.) 6. Utilization of vertical mills for milling raw cement materials, preliminary milling for finishing, and high-efficiency separator) 7. Expansion of utilization of waste as alternative energy (waste plastics, waste wood)
Japan Automobile Manufacturers Association, Inc.	1. Introduction of cogeneration 2. Decrease in supply pressure and leakage prevention of compressed air 3. Improvement of combustion efficiency of boiler, utilization of smaller boiler, and utilization of surplus steam for cogeneration 4. High-efficiency compressor, high-efficiency boiler 5. Improvement of thermal insulation of drying furnace, waste heat recovery 6. Individual control of air conditioning, inverter control of air conditioning 7. Production process (process reduction, line abolishment and integration, reduction of material use) 8. Group control for appliances (boilers, compressors, etc.) 9. Introduction of wind power generation 10.Energy conservation of air-conditioners and lighting fixtures 11.Energy conservation and abolishment/integration of production processes, energy conservation of coolant and cooling water system 12.Operation management (shut-down of unused facility, through control of energy consumption) 13.Fuel switch
Japan Auto Parts Industries Association	1. Energy conservation activities through daily management and improvement propositions 2. Improvement of operation management items/management methods of equipment and appliances 3. Improvement of production process, renewal of related appliances, abolishment/integration of processes/appliances 4. Change in heat source/fuels, introduction of energy conservation system by waste heat recovery, etc. 5. Adoption of smaller and lighter products/parts 6. Introduction of energy conservation system including cogeneration and sharing of energy conservation technology 7. Adoption of energy conservation, high-efficiency, restructured and integrated production processes 8. Acquisition of ISO14001 and spiraling up 9. Obedience to voluntary action plan of the Association 10.Switch to alternative energy, renewal of facility (adoption of LNG energy, adoption of electricity)
Japan Mining Industry Association	1. Optimization of boiler operation (abolishment/integration) 2. Reduction of coke consumption by various improvement activities 3. Heat recovery by construction of new sulfuric acid converter boiler 4. Increase in power generation by additional construction of steam turbine 5. Reduction of coal consumption by furnace operation with low internal temperature 6. Reduction in electric power consumption rate by additional construction of oxygen plant 7. Integration of facilities including waste heat boilers, etc. 8. Strengthening of heat recovery of sulfuric acid converter 9. Additional construction of new waste heat boiler to blast furnace 10.Improvement of combustion efficiency of kiln 11.Utilization of waste plastics as fuels 12.Reduction in electric power consumption rate for electrolyzing by various improvements

b) Service and commercial sector

Name of organization	Measures to attain goals
Scheduled Airlines Association of Japan	1. Replacement by new airplane with improved fuel consumption efficiency and promotion of its introduction 2. Optimization of routes and time by introducing new air traffic control support system, etc. 3. Loading most suitable amount of fuel, adoption of lighter equipment loaded in the body, restraining use of auxiliary power units 4. Reduction of training duration, etc., by use of simulators
The Real Estate Companies Association of Japan	1. Energy conservation of air-conditioning (individualization, total enthalpy heat exchanger, optimal control, VAV) 2. Lighting (adoption of high frequency bulbs, automatic dimmer control) 3. Adoption of inverter control and group control system for elevators 4. Adoption of inverter controlled pumps 5. Energy conservation for the window area (air barrier system, thermal insulation, outdoor air cooling) 6. Rooftop greening 7. Improvement efforts of operation
Japan Department Stores Association	1. Holding environment committee 2. Survey implementation of actual condition on energy consumption in each store 3. Holding seminar on energy conservation study of department stores 4. Demonstration experiment of electric tag system (improvement of efficiency of distribution system, etc.)
Japan Chain Stores Association	1. Appropriate temperature control of air-conditioners and refrigerating/freezing showcases 2. Introduction of night cover after shops closed 3. Application of thermal insulation coatings to window panes 4. Introduction of cogeneration, desiccant-based air-conditioning system, and ice thermal storage system 5. Transition to kitchen system using electromagnetic energy (electrification of all energy sources) 6. Utilization of surplus power at night (from water cooling type freezers/air-conditioners to air-cooling types) 7. Reuse of waste water (for flushing toilet, watering)
Japan Association of Refrigerated Warehouses	1. Introduction of energy conservation appliances (phase advance capacitor, electronic expansion valve, demand control, energy conservation lighting appliances, high-efficiency compressors, high-efficiency heat exchanger, high-efficiency transformer) 2. Improvement of equipment (thermal insulation, prevention of cool air leakage, adoption of closed deck type platform) 3. Dairy operation management (appropriate temperature, enforcement of cleaning, etc.)
NTT group	1. Promotion of energy management 2. Introduction of high-efficiency power supply appliances, air-conditioners 3. Promotion of adopting broadband-related appliances with low electricity consumption 4. Introduction of clean energy (solar power generation, wind power generation)
Japanese Bankers Association	1. Appropriate temperature control and reduction of operation time of air-conditioners 2. Restraint and voluntary restraint of elevator use between close floors 3. Thinning out of lighting 4. Resource conservation (recycled paper, paperless business operation), energy conservation (electricity)
The General Insurance Association of Japan	1. Appropriate temperature control of air-conditioners

Name of organization	Measures to attain goals
Japan Franchise Association	1. High-efficiency lighting appliances, inverter controlled lighting appliances, lighting control (timer, dimmer control) 2. High-efficiency freezer, inverter controlled freezer 3. Utilization of waste heat by integrating air-conditioning/refrigerating systems 4. Introduction of cogeneration 5. Keeping optimal temperature by air-conditioning, reduction of operation hours of air-conditioners 6. Introduction of comprehensive maintenance and management system of stores and appliances 7. Introduction and operation of ISO14001 8. Introduction of soft energy (wind power generation, solar power generation, fuel cells) 9. Introduction of ESCO-method energy conservation system 10. Comprehensive management system of energy for store operation 11. Introduction of energy conservation stabilizer for lighting, inverter controlled lighting, and dimmer control system 12. Research of clean energy (solar power generation, fuel cells)
Japan Broadcasting Corporation (NHK)	1. Regenerative air conditioning system 2. Introduction of total enthalpy heat exchanger 3. Attaching sunshine control film 4. High-efficiency motor 5. High-efficiency inverter controlled lighting 6. Water conservation system (utilization of rainwater, sound effect appliances for toilet) 7. Rooftop greening 8. Air-conditioning (variable air volume system, variable water volume system) 9. Fresh air volume control system

4) Measures taken in factories and buildings based on the Energy Conservation Law[1)]

a) Systematic and voluntary energy management

Based on the Law concerning the Rational Use of Energy (Energy Conservation Law), thorough implementation of systematic and voluntary energy management is demanded for the target factories and buildings by obliging them to appoint energy managers and formulate and submit periodical reports of energy use and medium-/long-term plans for achieving goals as shown below.

Type 1 designated energy management factory which consume a large amount of energy

(Annual energy consumption is 3,000 kL or more in crude oil equivalent.)

○ Factories

Measures

- Appointment of an energy manager (who is required to have a license of qualified person for energy management of type 1 designated factory)
- Formulation and submission of periodical reports
- Formulation and submission of medium-/long-term plan

○ Buildings

Measures

- Appointment of an energy management officer (who is required to take a seminar for qualified person of energy management of type 2 designated factory)
- Formulation and submission of periodical reports
- Formulation and submission of medium-/long-term plan (the appointed energy manager should participate in the plan formulation)

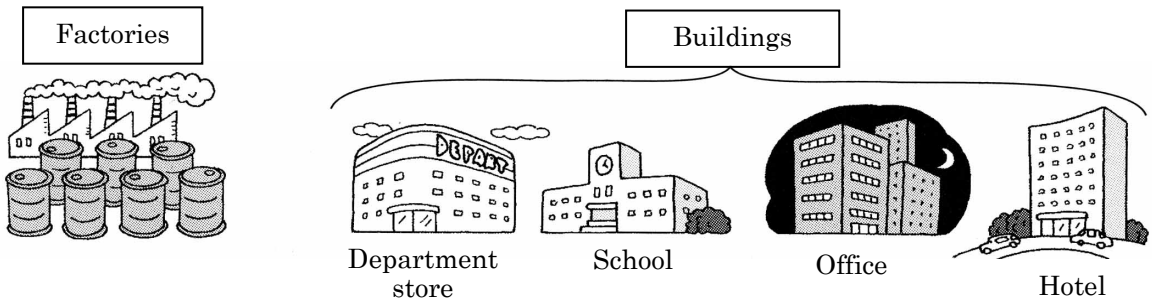
Type 2 designated energy management factory which consume a medium amount of energy

(Annual energy consumption is 1,500 kL or more in crude oil equivalent.)

○ Factories and buildings

Measures

- Appointment of an energy management officer for the type 2 designated management factory
- Formulation and submission of periodical reports



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

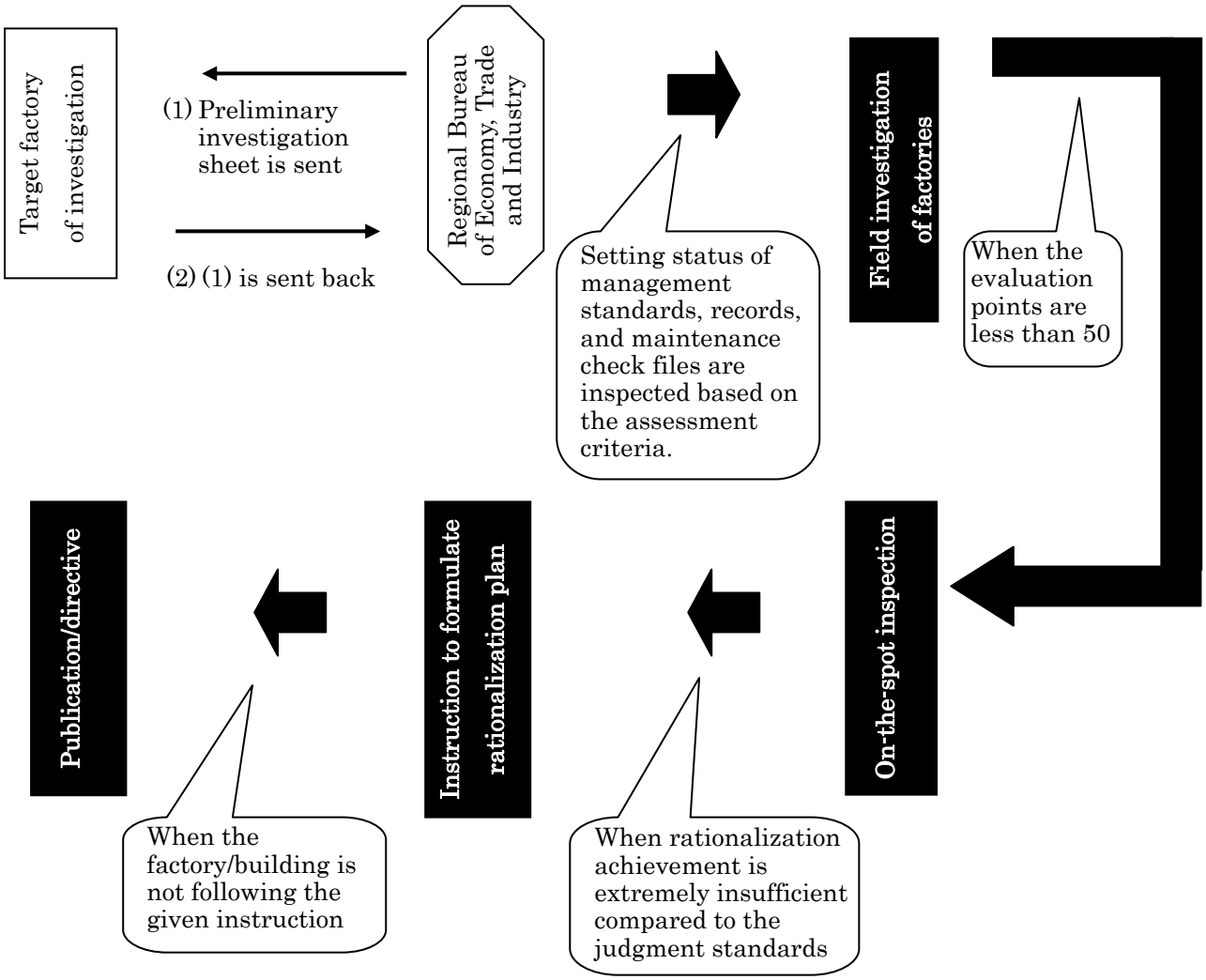
b) Overall factory check

A field investigation targeting 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.



c) Dissemination and promotion of energy conservation technology (Spill-Over)

i) What is Spill-Over?

As energy conservation is an important policy for Japan, the energy conservation technology strategy was formulated in June, 2002 by the Japanese government, the Agency for Natural Resources and Energy. This strategy stressed the importance of promoting "spill-over," to actively spread existing energy conservation technologies to meet technological needs across various sectors and fields.

The technical term "spill-over" is originally used 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 will generate 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.

ii) 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.

1. Understanding of current conditions by an energy management system which makes the conditions visualized
2. Finding an energy conservation theme by abolishing the existing ideas and reviewing designed values and management criteria
3. Use of surplus energy, or effective use of energy that has been left unused
4. Introduction of cogeneration, improvement of operation methods, raising utilization rate
5. Remodeling equipment into or replacing one with high-efficiency equipment
6. Utilization of energy conservation methods introduced by the Energy Service Company (ESCO) projects
7. Reduction of the consumption of the fixed consumption of energy
8. Effective use of heat, and mutual effective use of heat and materials
9. Energy conservation measures for water

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

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

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

In this way, reduction of consumption of the fixed consumption of energy is a cross-sectional theme. Rationalizing the consumption of such energy is advantageous even if the business pattern and main products change. According to the data of past cases, technologies to reduce consumption of the fixed consumption of energy are summarized in the table below.

Excellent energy conservation technologies can be flexibly applied to a wide range of fields, in addition to being able to reduce energy consumption by rationalization. Evaluation of the energy conservation technologies is carried out reviewing the following points: high-efficiency, low-loss, downsizing, weight reduction, adaptability, as well as improvement in user-friendliness including capability to deal with networking and safety of the technology itself.

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

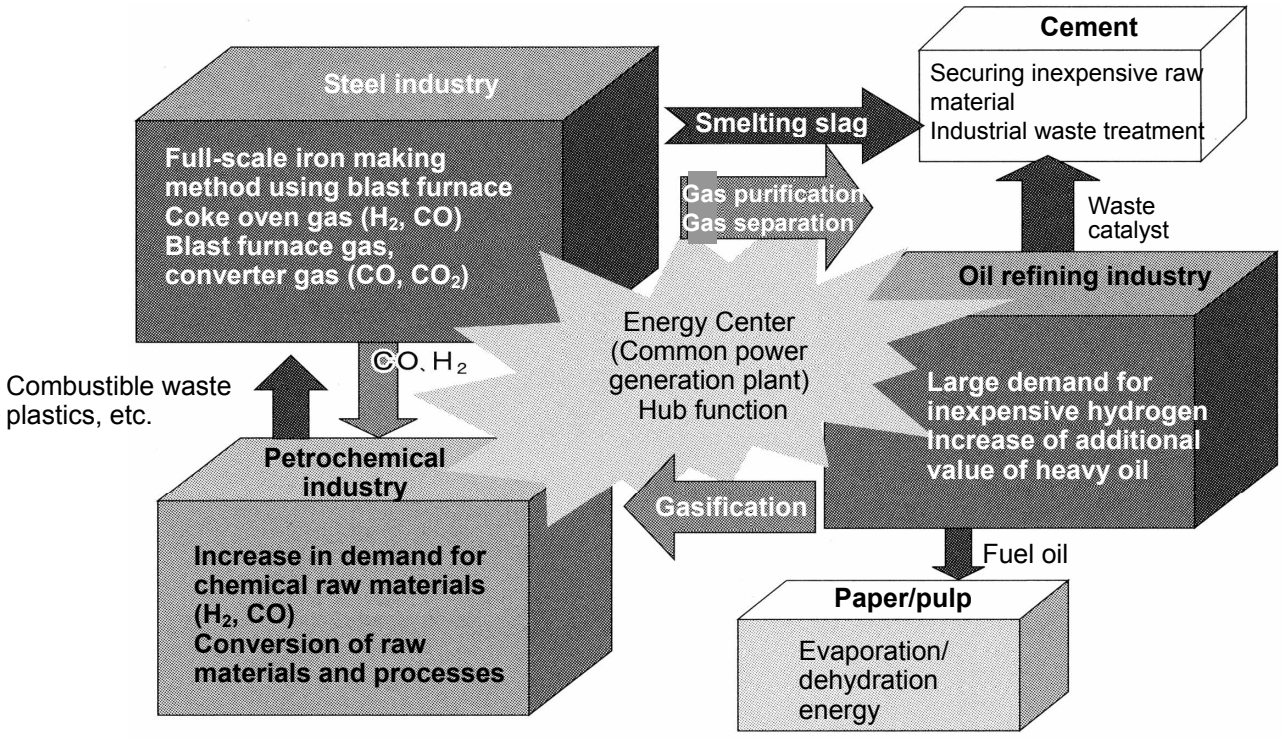
Among the energy conservation measures in the industry sector, technology highly required by the demand side is reduction of the fixed consumption of energy that is not in proportion to production by converting it to a variable energy, which is an energy required in proportion to the production. Generally, points for reducing of the fixed consumption of energy are rationalization of a utility energy supply system, optimization of excess demand, and reduction of consumption of a standby power requirement.
1. Method 1: Reduction of the fixed consumption of energy by raising production efficiency and reducing production duration. 1) Cut-down of processing steps by partial integration of production steps 2) Cut-down of duration by paralleling the processes that can directly influence production efficiency 3) Cut-down of duration by rationalization of preliminary treatment, preliminary processing, preheating, etc., in production processes 4) Cut-down of duration by rationalization of post treatment, energy recovery, etc. in production processes 5) Cut-down or omission of post treatment duration by improvement of production technology (high precision processing and high quality processing) 6) Cut-down of heating/melting duration by improvement and rationalization of energy consumption rate 7) Cut-down of duration by raising production efficiency through raising production technology by basic technology 8) Cut-down of waste time to the utmost limit, including cutting standby time in production processes
2. Method 2: Conversion the consumption of the fixed consumption of energy to the variable energy 1) Replacing hydraulic actuator system with electric actuator system 2) Replacing pneumatic actuator system with electric actuator system 3) Lowering the set pressure for pneumatic line, and converting the fixed consumption of energy to the variable energy by using booster pump and buffer tank 4) Lowering temperature level of the retention furnace, and adopting induction heating at pouring gate and additional heating by DC torch 5) In the heating process, converting the fixed consumption of energy to the variable energy by adopting infrared heating, laser heating, and pulse combustion burner introducing 6) Reduction of heating and cooling sources by applying recovered heat in before and after heating/cooling processes in the same production line to preheating and pre-cooling process 7) Diligently setting control values before rebooting in more detail by stopping equipment to be at standby time by the minute and second
3. Method 3: Reduction of production space and minimization of the fixed consumption of energy amount 1) Level down of clean room, etc., and raising the cleanliness of each appliance, chamber, and container 2) Introduction of zone or spot air-conditioning by dividing air-conditioning area 3) Dividing into smaller lighting areas for the purpose of adaptive control of lighting for each area, and adopting localized lighting and natural light 4) Distributed allocation and adaptive control for boilers, compressors, transformers, power factor improvement equipment, etc. 5) Reduction of energy for lighting/air-conditioning by adopting Just In Time (JIT) production system and dividing spaces for assembly process and parts stockyard into smaller areas
4. Method 4: Rationalization and lowering loss of appliances related to the fixed consumption of energy 1) Adoption of higher efficiency appliances for lighting, air-conditioning, ventilation, water supply, and other appliances that consume the constant amount of energy 2) Rationalization of fluid pump, blower, etc., by introducing inverter control system 3) Reduction of energy for lighting, ventilation, air-conditioning by mitigating work environment conditions under unmanned operation 4) Lowering losses by cascade connection of different types of pumps 5) Reduction of waste power by reducing potential risk of steam leakage, compressed air leakage, water leakage, etc. 6) Reduction of holding energy by improvement of adiathermancy of furnace wall, etc.

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

d) Energy conservation by coordination among factories and work places

Comprehensive energy conservation can be attempted by mutual utilization of exhaust heat and waste in various neighboring factories in an industrial complex, etc.

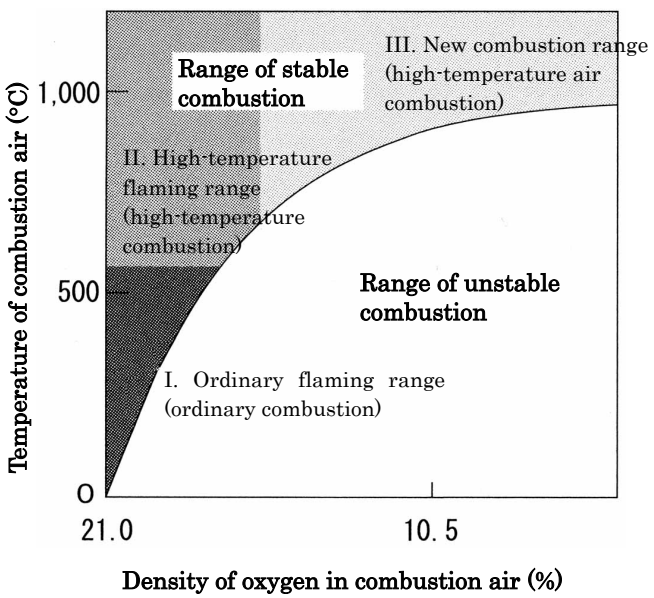
For example, hydrogen, which accounts for 55% of the gas generated in coke ovens of steel plants, can be supplied to oil refineries, where the hydrogen is refined and used for desulfurization, if the oil refinery is close to the steel plant. It is expected that adoption of iron carbide as a raw material 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.



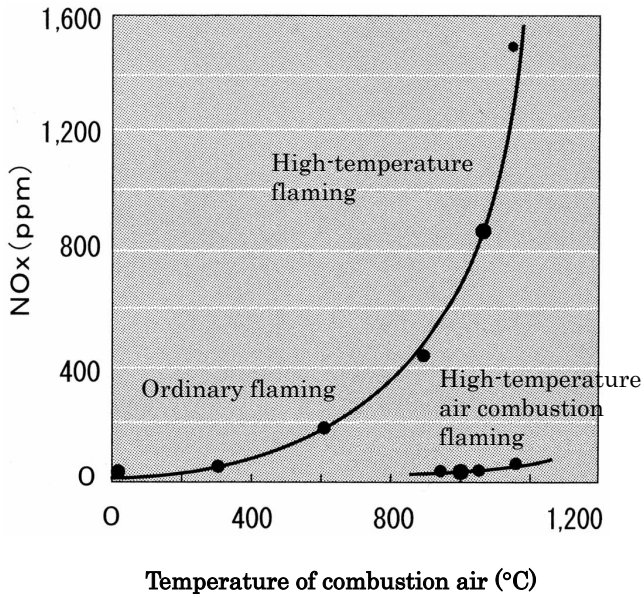
e) Dissemination of high-efficiency industrial furnaces and high-efficiency boilers

i) 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.



Temperature of combustion air and combustion range (conceptual diagram)



Density of NO_x emission in high-temperature air combustion

In the "Field test project on high-efficiency industrial furnace introduction,"[*2] high-temperature air combustion technology was applied to commercial furnaces. The

[*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.

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). 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 in order to practically apply this technology to non-industrial combustion and heating facilities that consume a large amount of energy.

ii) 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. However, 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).

Among the future challenges are 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

[*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).

exhausted gas (economizer using steam's latent heat recovery). 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.

f) Dissemination of cogeneration and fuel cells

i) 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 in stallion	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.

ii) 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.

g) 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 CMC steam control 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		Application 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

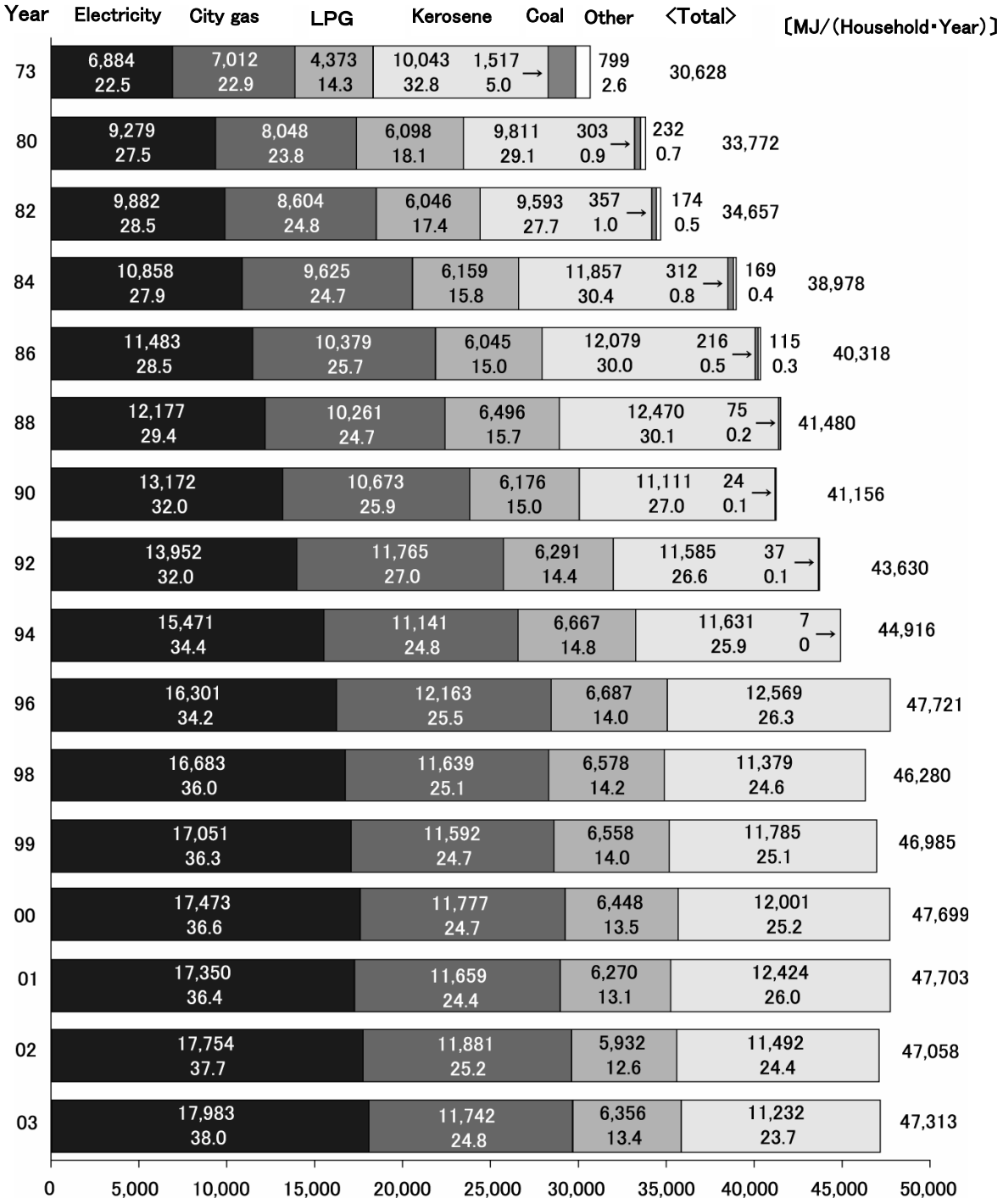
h) Challenges in typical energy conservation technology development

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 cokes production method	Future generation cokes 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
		Development of catalytic cracking process of naphtha	
	Reduction of environmental load	Green chemistry	Analysis and evaluation technology using bio-technology/extremely critical catalyst
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	
	Use of drying heat cascade	Vacuum drying system	Removal of impurities such as lint
			Establishment of decompressing process
	Non-aqueous system processing	Processing technology using plasma	Improvement of treatment capacity, etc.
		Dyeing processing technology under the condition of critical CO_2 density	Development of treatment appliance
	Non-heating processing	Processing equipment using ozone	Improvement of treatment capacity, etc.
	Change in dyeing processing system	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
		Bio-bleaching technology	
	Increase in amount of power generation by high-efficiency use of black liquor	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: survey by the Energy Conservation Center, Japan

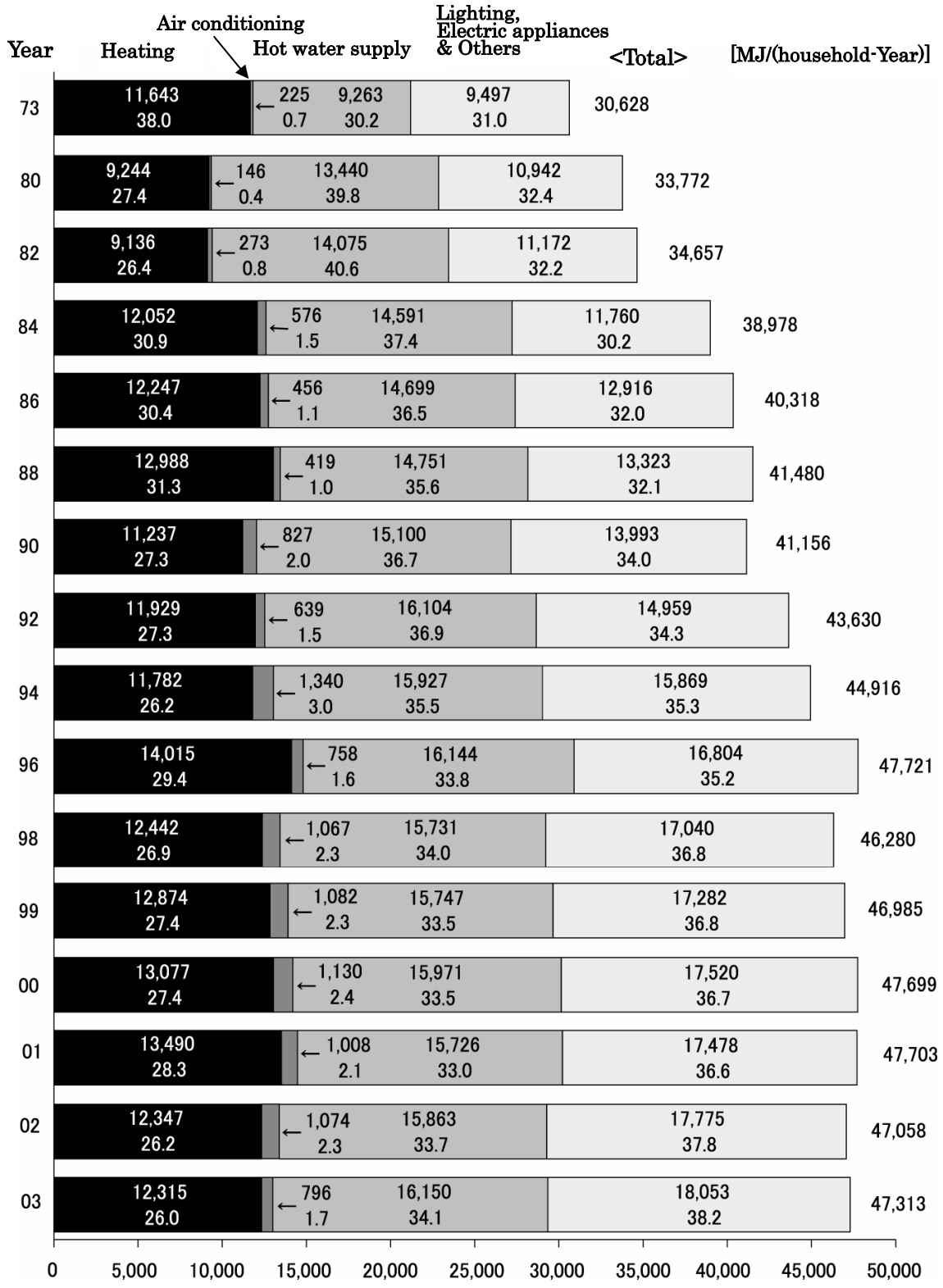
5.2 Energy conservation in the residential sector

(1) Energy consumption per household by energy sources



Note) The lower figures in the bar represent percentage distribution.
Source) "Domestic Energy Statistics Annual Report 2003", Residential Environment Planning & Research Center

(2) Energy consumption per household by usage



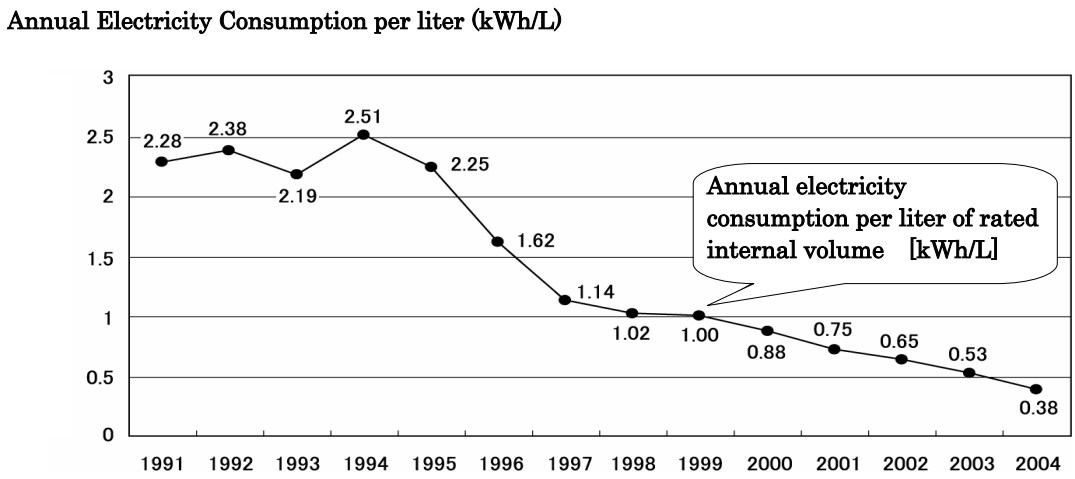
Note) The lower figures in the bar represent percentage distribution.

Source) "Domestic Energy Statistics Annual Report 2003", Residential Environment Planning & Research Center

(3) Improvements in energy efficiency of home electric appliances

- Effects of Top Runner Program -

1) Changes in energy conservation performance of freezers/refrigerators

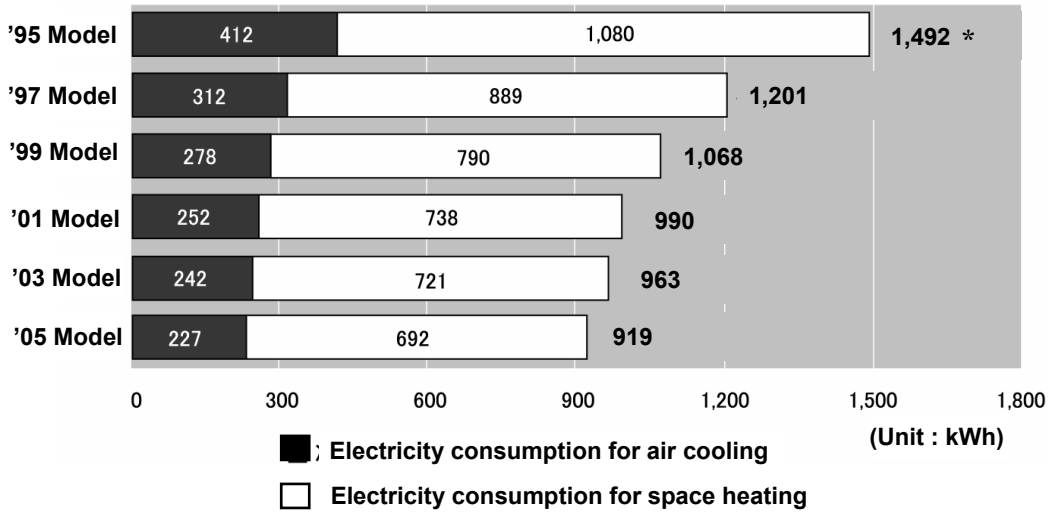


Note) The annual electricity consumption per 1litre of rated internal volume, which is measured by JIS (Japan Industrial Standard), is an average value derived from the value of main refrigerators from each manufacturing company. The increase of figures in 1994 is because of change of medium of refrigerators from Freon to other materials.

Source) The Japan Electrical Manufacturers' Association (JEMA)

2) Changes in energy conservation performance of air conditioners

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



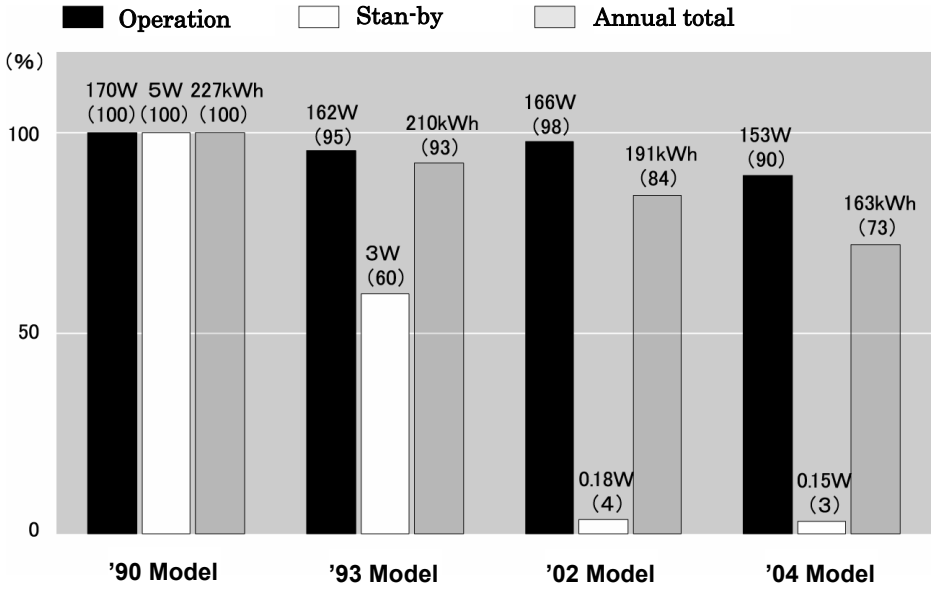
* = total consumption during term

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

Source) Japan Refrigeration and Air Conditioning Industry Association

3) Changes in energy conservation performance of TVs

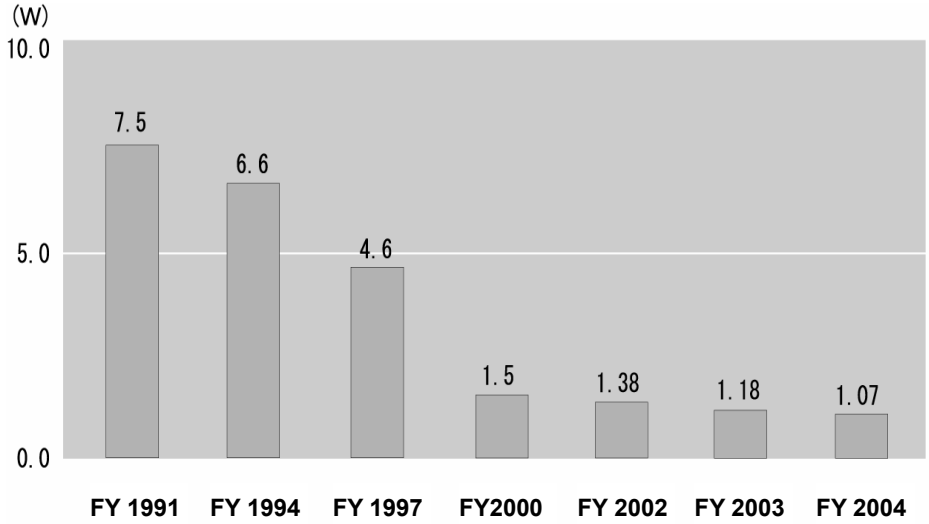
<Rated Power Consumption>



Source) up to 98 models : Electronic Industries Association of Japan
* Weighed average of shipped quantity
from 99 models : Estimated value of the Energy Conservation Center, Japan
* Simple average value of specification catalogues (summer and winter) of 28-inch wide screen TV in respective years

4) Changes in energy conservation performance of VTRs

<Changes in average per-unit power consumption during stand-by>



Note) These values represent weighted averages of all video tape recorders shipped during each of the years (subject to the Law concerning the Rational Use of Energy).
Source) Electronic Industries Association of Japan

(4) Diffusion rate and electricity consumption of home appliances

Item (Fiscal Year) / Appliances	Diffusion rate (%)			Electricity Consumption rate (%)		
	1980	1990	2003	1980	1990	2003
Electric Rice Cooker	54.9	61.8	69.1	4.1	3.3	-
Refrigerator	107.1	109.9	110.4	31.1	21.7	16.1
Electric Kotatsu	108.7	111.6	93.1	7.2	4.8	-
Airconditioner	52.1	95.2	149.3	7.8	9.3	10.6
Air-conditioner (heating&cooling)	-	43.8	116.3		7.6	14.6
Washing macnihe	98.2	98.7	98.7	1.6	1.2	-
Vacuum cleaner	96.1	98.1	98.1	4	3	-
Microwave oven	33.3	64.5	84.6	1.3	1.8	-
Dehydrator	-	16.3	27.2	-	1.9	2.8
Electric carpet	-	42.2	70.1	-	2.9	4.3
Warmed toilet Seat (with warm water shower)	-	-	44.6	-	-	3.9
Dish washer /dryers	-	-	6.9	-	-	1.6
Television						
Color TV (1st purchased)	97.9	98.5	98.6	13.2	8.4	7.8
Color TV (2nd purchased)	36.2	74.1	93.4	1.3	1.7	2.1
TV Total				15	10.1	9.9
Other				5.8	12.7	20.2
Total				80.3	83.1	83.9
For lighting				19.7	16.9	16.1
Total Electricity (A・B)				100	100	100
Instantaneous gas water heater	76.1	65.0	48.5			

Note 1) "Television Total" of “Consumption ratio (%)” in 1980 includes black-and-white television.
Note 2) The figures in “Air-conditioner (Heating & Cooling)” are not included in the figures in “Air-conditioner”.
Note 3) Some of the figures of FY2003 include estimated values.
Source) "Outline of Electric Power Supply", "Summary of Electric Power Supply" and "Household Energy Handbook"

(5) Energy conservation measures in the residential sector

1) Outline

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.;

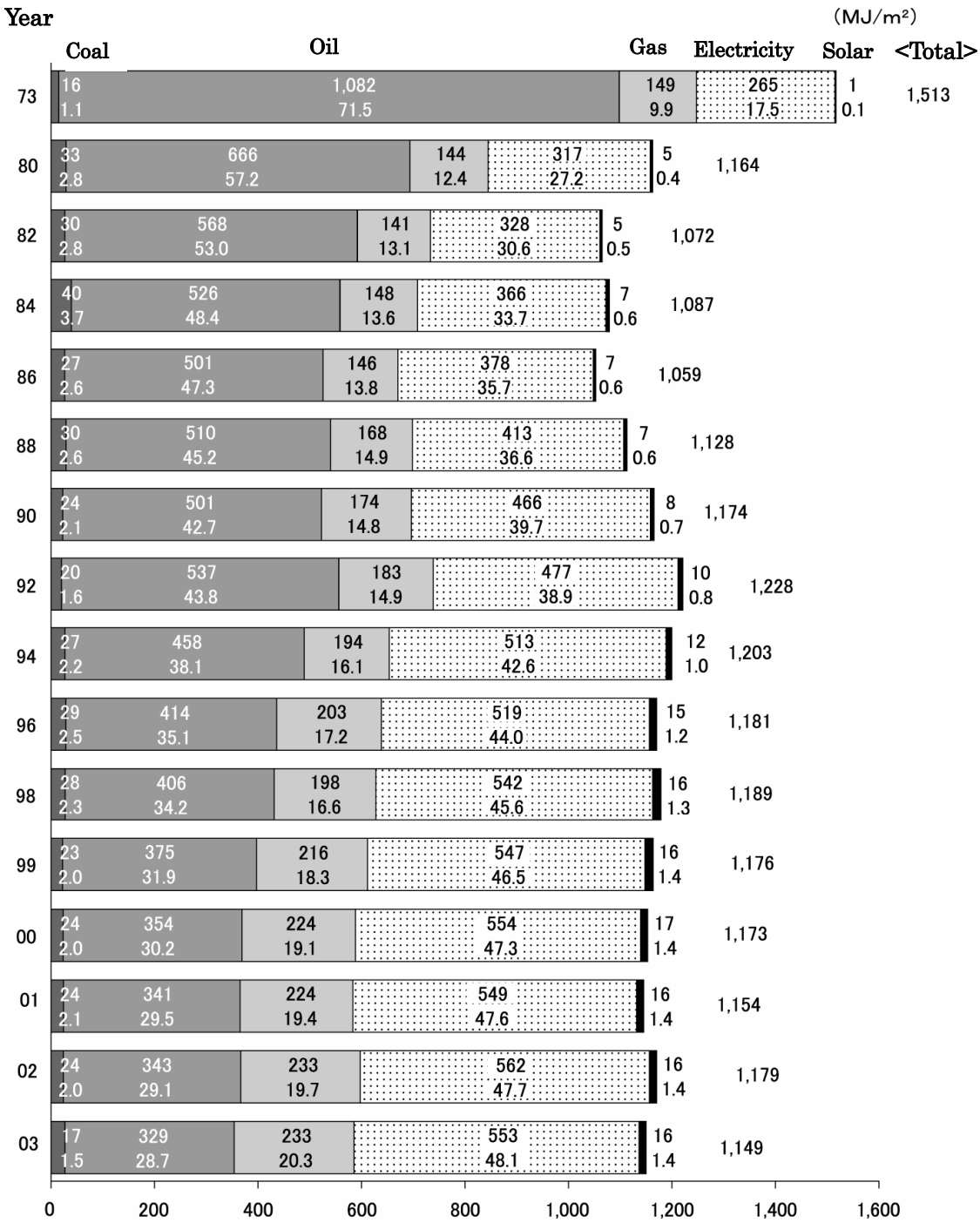
- Preparation and distribution of posters and pamphlets, conduction of symposiums,

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.

5.3 Energy conservation in the commercial sector

(1) Energy consumption per floor area by energy sources in the commercial buildings



Note) Lower figures in the bars represent percentage.
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2004)
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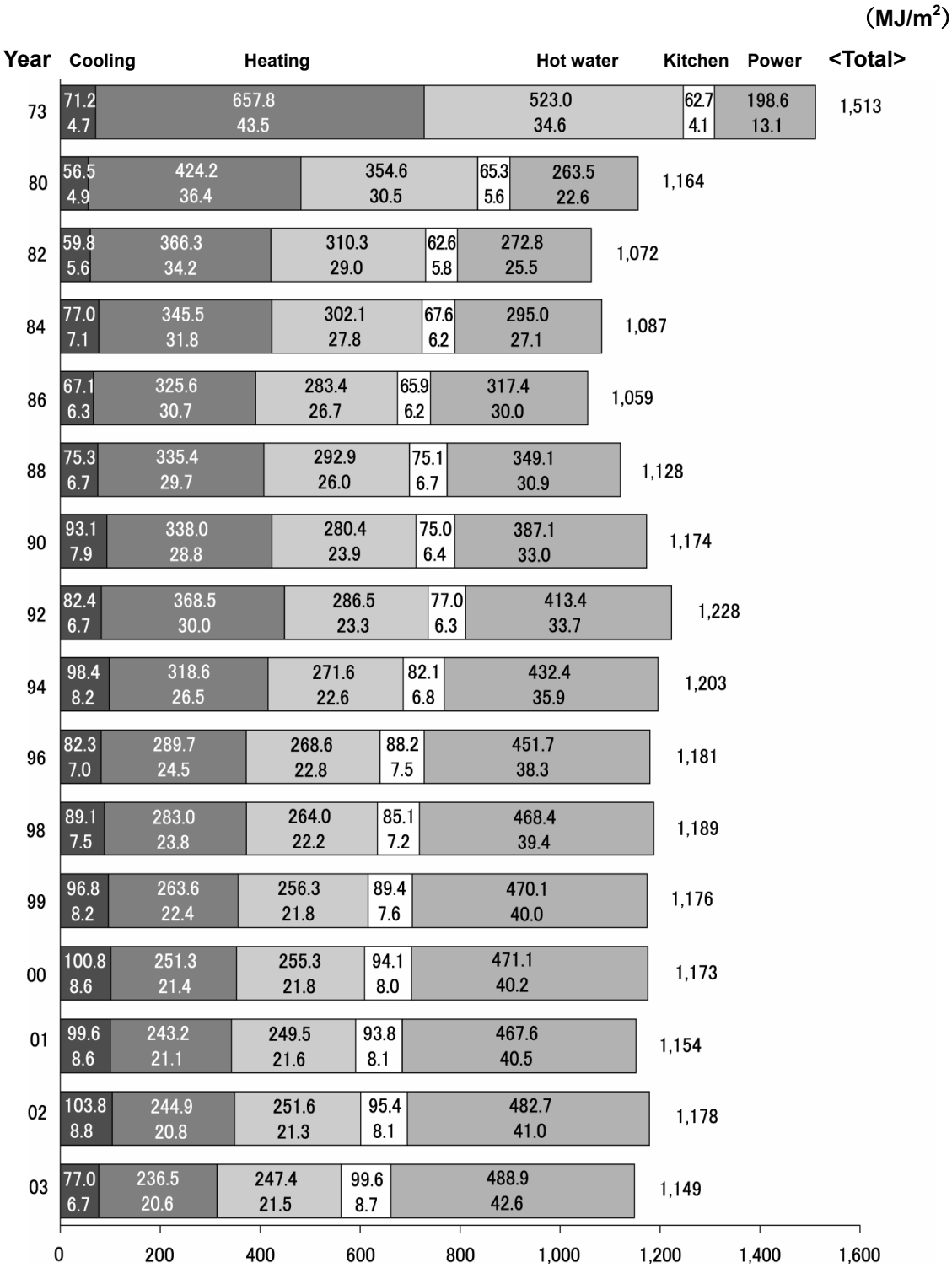
(2) Energy consumption per floor area by usage in the commercial buildings



Note) Lower figures in the bars represent percentage.
Source) Prepared from the "EDMC Handbook of Energy & Economic Statistics in Japan (2005)

(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 Concentration of same load, reduction of partition	· Construction plan Optimization of direction, construction style · Reduction of skin load Reduction of window space, adoption of layered glass, insulation of indoor (outdoor)wall, 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)
Transportation	· Control of fan operation time · Inspection/repair of duct air leakage · Adoption of pump unit control · Adoption of inverters	· 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 Hf-type lighting equipment · Task and ambient lighting · Introduction of automatic control equipment Daylight sensor, human sensor · Adoption of reflection free VDT, avoiding louver instrument
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

Source) "Energy Conservation Equipment Summary," 1995 edition, judgment standards for business operators regarding rational use of energy at factories (Notification of the Ministry of International Trade and Industry, January 1999)

(Continued from the previous table)

classification	operation control/simple remodeling	Equipment remodeling
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 (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	· 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 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 · Improvement of power factor (Installation of condenser) · Adoption of demand control system · Adoption of a super-high-efficiency transformer
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 Comparison to previous fiscal year, by equipment type	

Source) "Energy Conservation Handbook for Small Scale Service Industry", etc., Energy Conservation Center

(4) Other energy conservation measures in the commercial sector

1) Outline

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.

Meanwhile, 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 include all industries. Specifically, office buildings, large-scale retail stores, hotels, hospitals, etc., in the commercial sector came to be included in this category. 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.

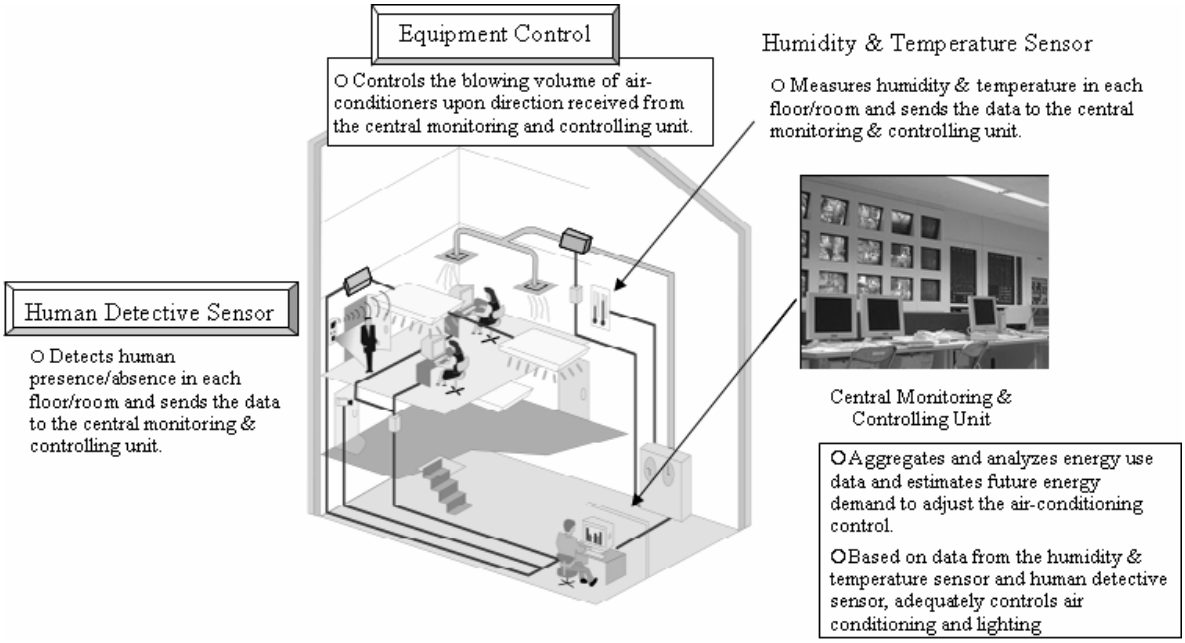
ii) Dissemination and publicity activities pushed through by the Energy Conservation Center, Japan, the Construction Environment and Energy Conservation Organization, etc.

- 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.



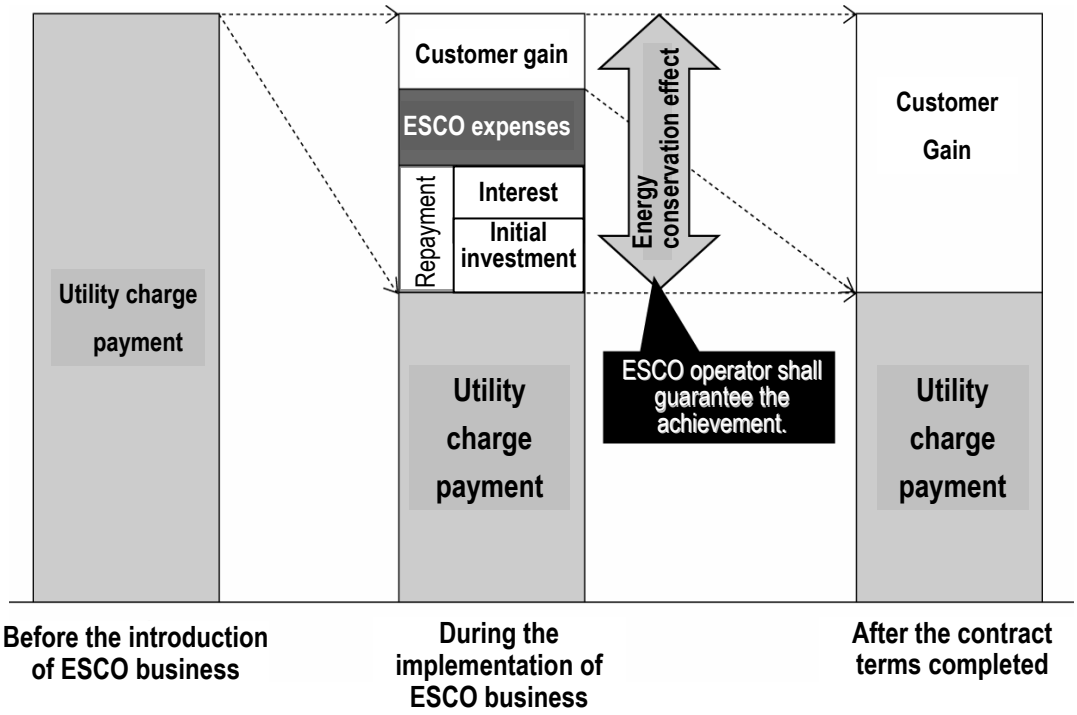
(6) Promotion of ESCO Business

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.)

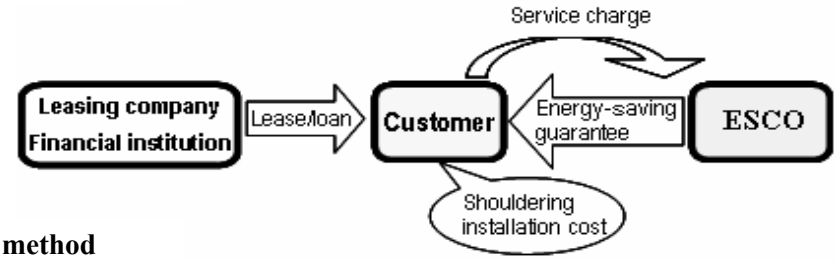
The business has two forms: "Guaranteed savings agreement", where customers cover business costs, and "Shared savings agreement", where the ESCO business covers business costs. These options enable service provision according to customer needs.

* ESCO stands for Energy Service Company



There are two methods of ESCO business as follows.

(a) Guaranteed method

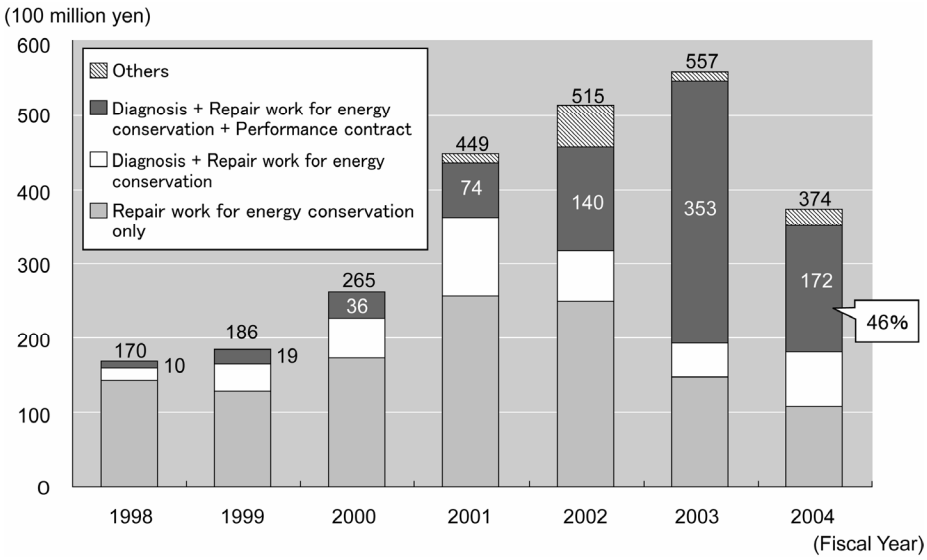


(b) Shared method

2) Scale of ESCO-Related Market

The ESCO-related market has been growing rapidly in these years. The amount of orders received decreased in 2004, because the number of large plans in the industrial division decreased. However, there is still plenty of scope for the expansion of the scale of market as shown below. (Amount of orders received in 2004: Approx. 37,400 million yen)

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).



Scale of ESCO business-related market

Source: Japan Association of Energy Service Companies

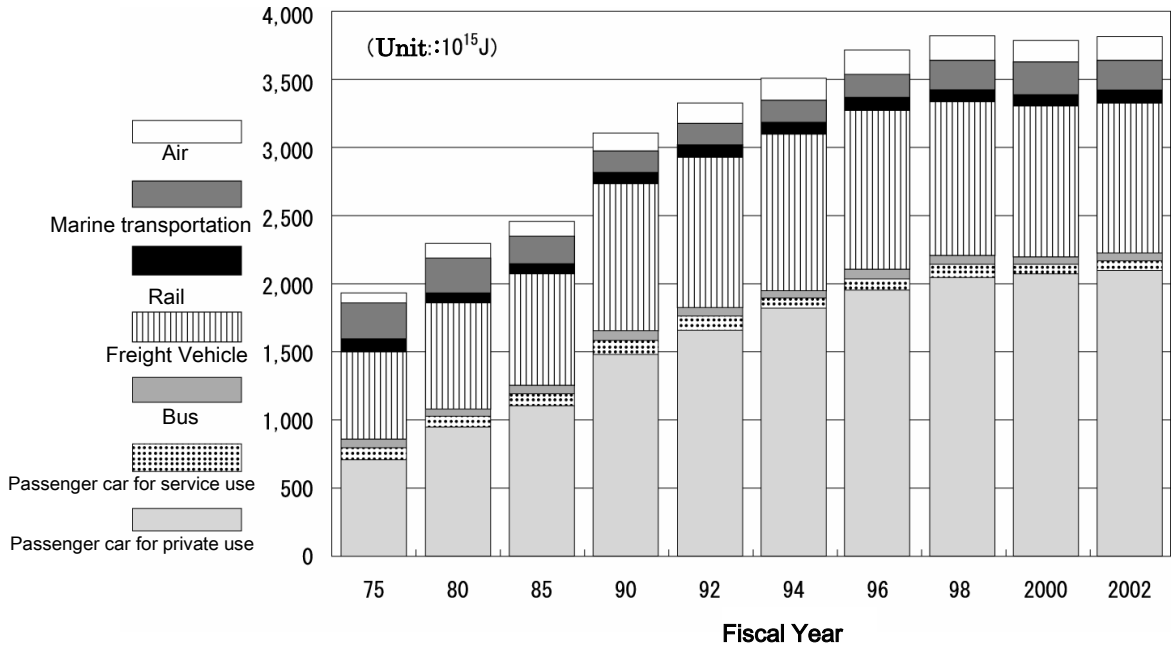
3) Future challenge

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 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.

5.4 Energy conservation in the transportation sector

(1) Energy consumption by type of transport

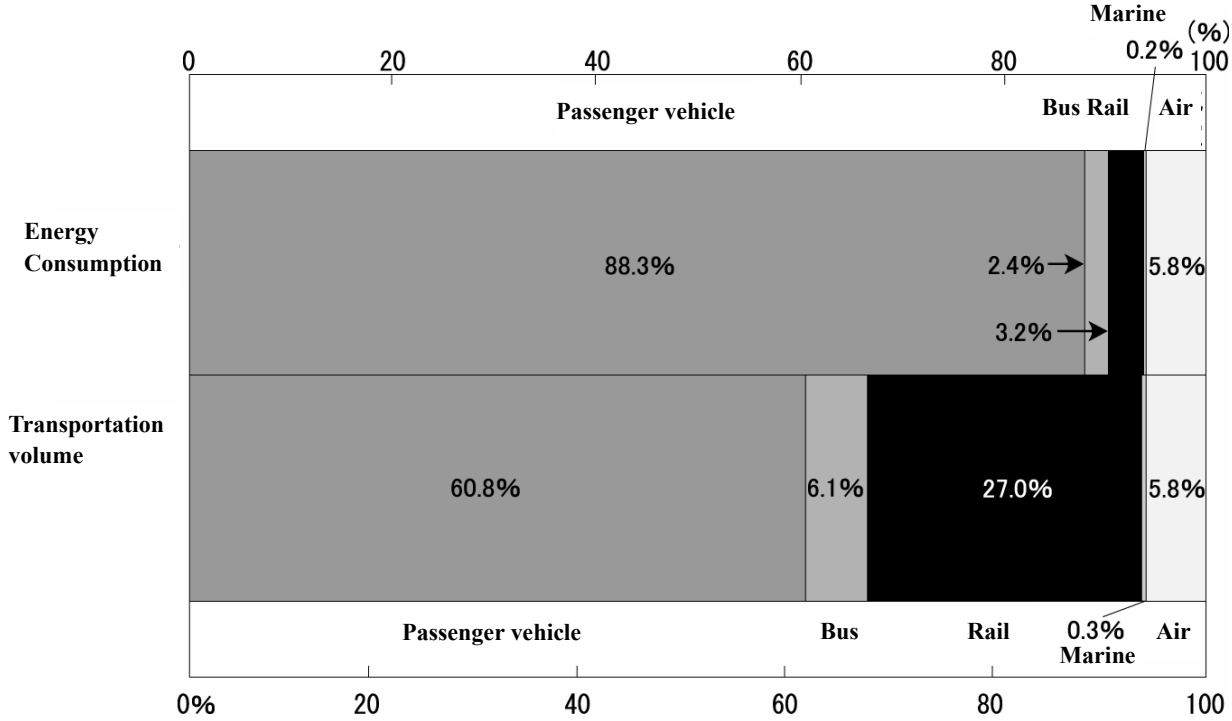


	75	80	85	90	92	94	96	98	2000	2002
Grand total of Transport sector energy consumption	1,938	2,302	2,465	3,114	3,327	3,516	3,722	3,820	3,799	3,812
	(5.3)	(-1.2)	(2.4)	(4.5)	(2.3)	(4.7)	(2.6)	(1.1)	(-2.2)	(0.0)
Total of passenger sector energy consumption	997	1,245	1,417	1,855	2,044	2,193	2,346	2,448	2,431	2,469
	(7.5)	(0.9)	(3.4)	(6.5)	(3.5)	(5.4)	(3.4)	(1.8)	(-2.7)	(0.1)
Passenger car for private use	713	942	1,108	1,485	1,664	1,823	1,955	2,050	2,075	2,109
Passenger car for business use	88	78	88	100	104	76	87	94	64	67
Bus	59	56	55	67	62	64	62	61	58	57
Rail	61	63	64	78	79	81	81	82	80	81
Marine Transportation	6	5	4	5	8	7	9	7	9	7
Air	70	99	98	119	127	143	151	154	145	147
Total of freight sector energy consumption	941	1,058	1,047	1,259	1,283	1,323	1,376	1,372	1,368	1,342
	(3.1)	(-3.6)	(1.2)	(1.6)	(0.2)	(3.6)	(1.3)	(0.1)	(-1.3)	(-0.2)
Motor truck	657	791	826	1,084	1,105	1,147	1,178	1,140	1,116	1,085
Rail	17	13	8	7	7	6	6	6	6	6
Marine transportation	262	244	200	151	153	149	171	203	222	230
Air	5	9	14	17	18	21	21	23	24	22

Note) Values in parentheses represent the increase rate (%) in relation to the previous year.

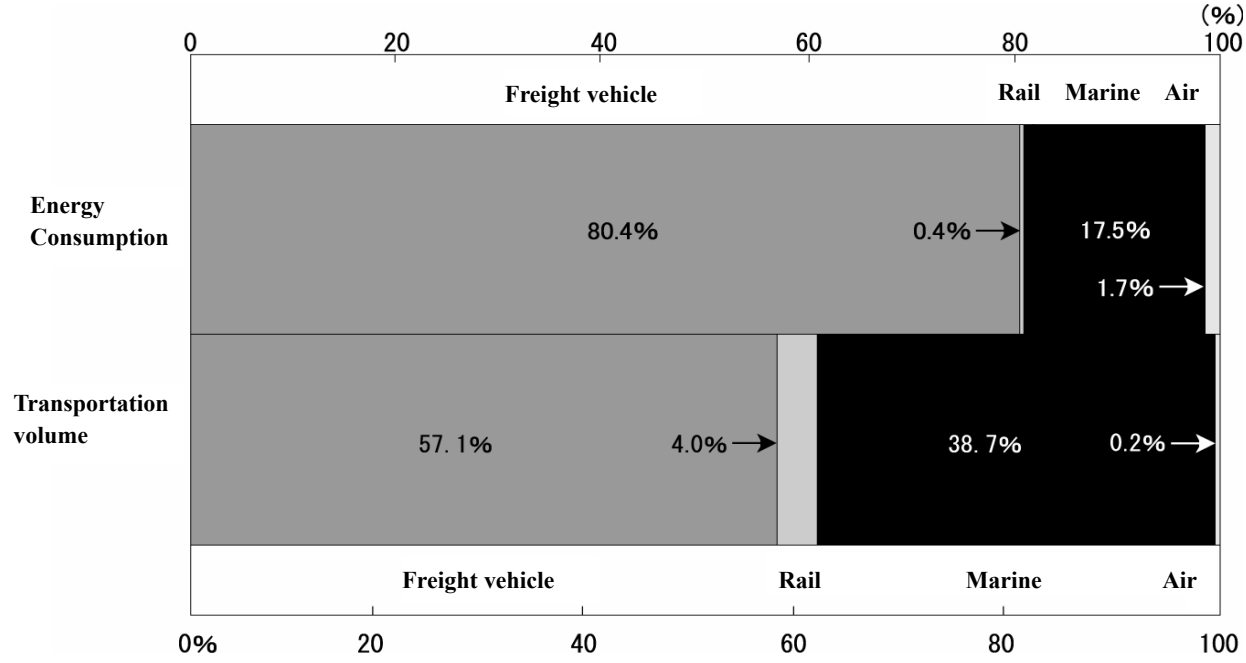
(2) Energy consumption and transportation volume by type of transport (FY 2003)

1) The rate of energy consumption and transportation volume by type of passenger transport



Source) Prepared from "the EDMC Handbook of Energy and Economic Statistics in Japan (2005)"

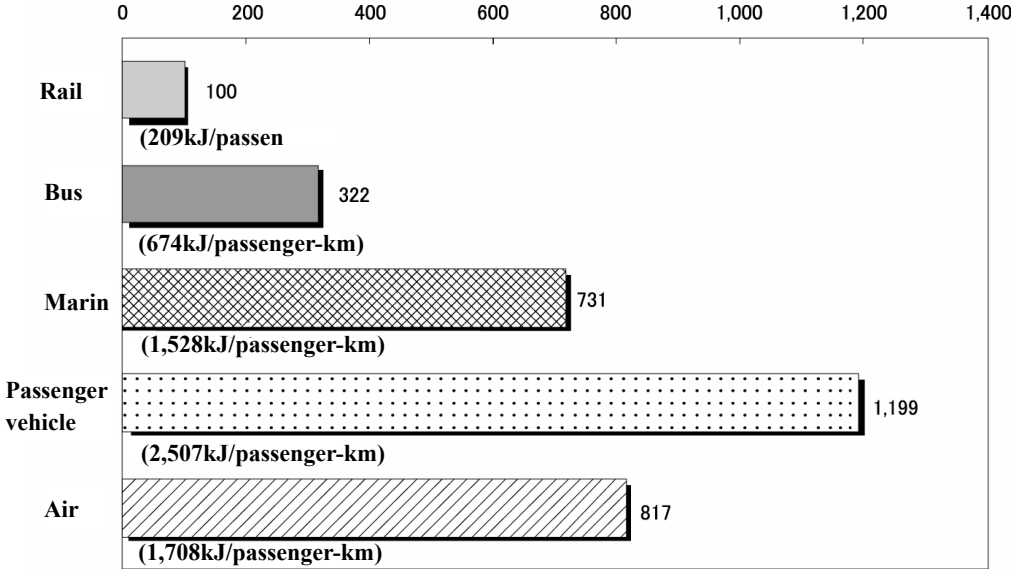
2) The rate of energy consumption and transportation volume by type of freight transport



Source) Prepared from "the EDMC Handbook of Energy and Economic Statistics in Japan (2005)"

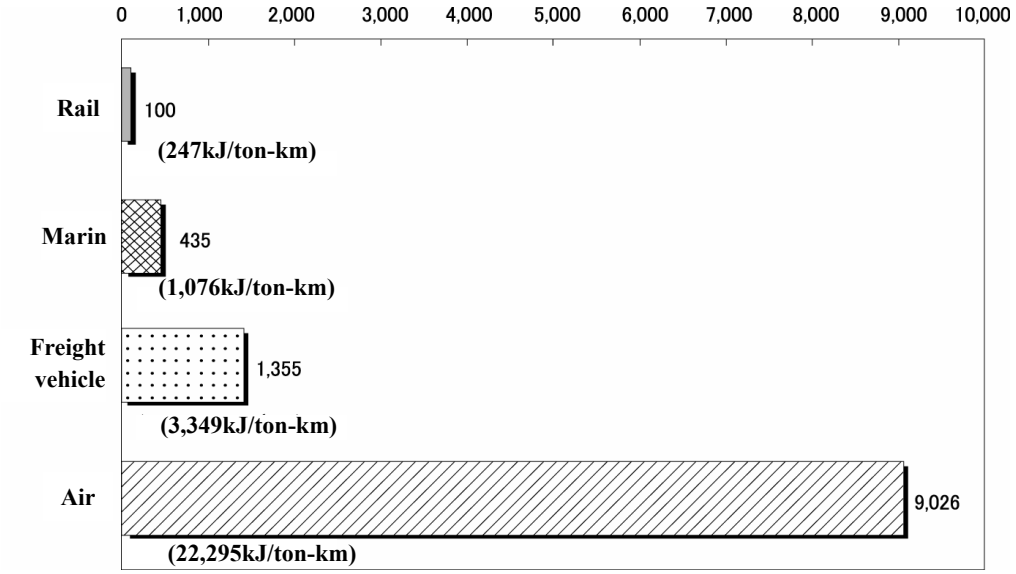
(3) Energy intensity by type of transport (FY 2003)

1) Energy consumption per passenger-kilometer



Note) Index Rail =100
Source) Prepared from "the EDMC Handbook of Energy and Economic Statistics in Japan (2004)"

2) Energy consumption per freight ton-kilometer

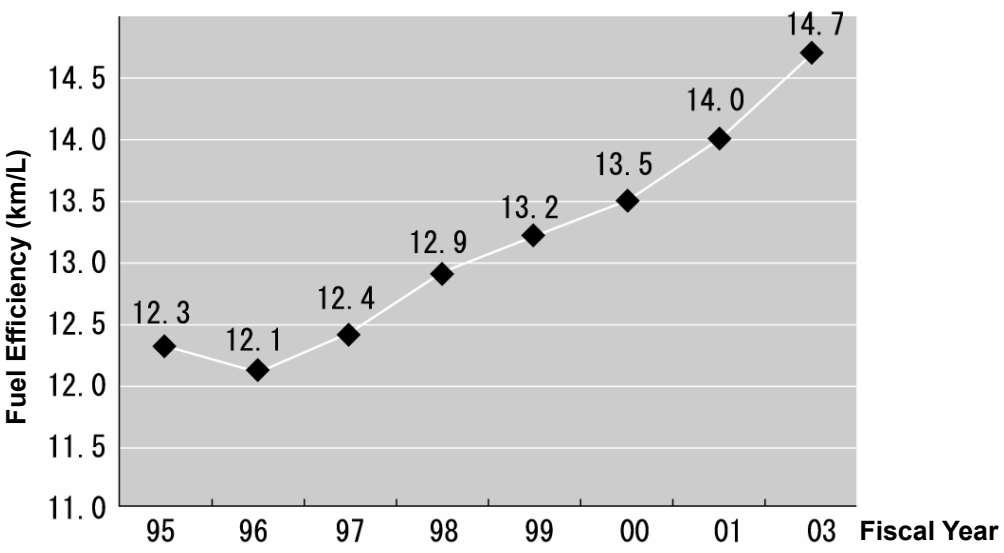


Note) Index Rail =100
Source) Prepared from "the EDMC Handbook of Energy and Economic Statistics in Japan (2004)"

(4) Improvements in energy efficiency of vehicles
- Effects of Top Runner Program -

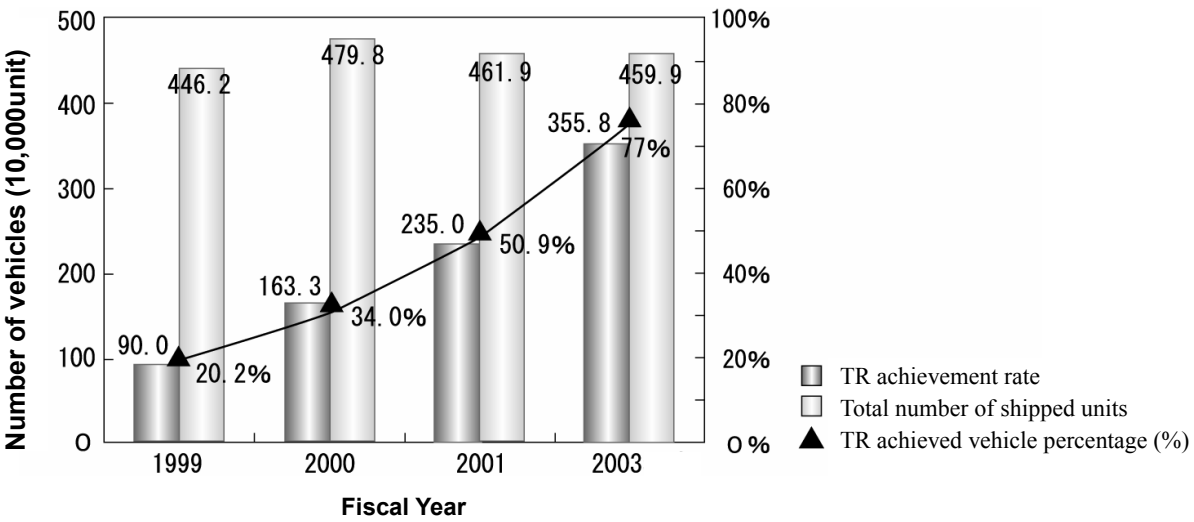
1) Trends in average fuel efficiency of gasoline passenger vehicles

The fuel efficiency of vehicles under the top runner standards has been remarkably improved. The figure below shows the changes of fuel efficiency of gasoline passenger vehicle.



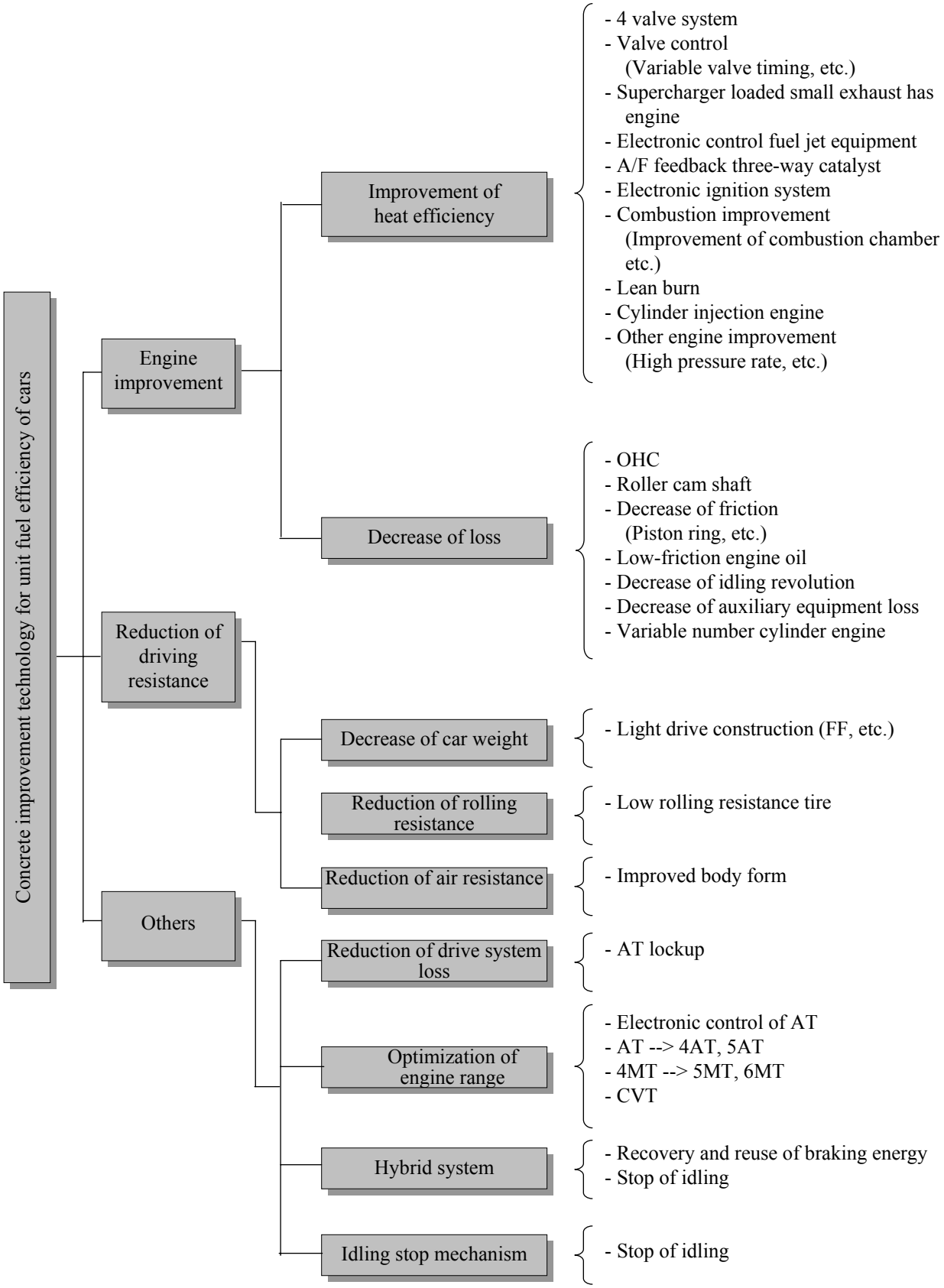
Source) "Energy Conservation handbook 2005"; The Energy Conservation center, Japan

2) Trends in shipment of gasoline passenger vehicles that have achieved fuel efficiency standards of FY2010



Source) "Energy Conservation handbook 2005"; The Energy Conservation center, Japan

(5) Measures to improve fuel efficiency of vehicles



Source) Japan Automobile Manufacturers Association, Inc.

(6) Energy conservation measures in the transportation sector

1) Energy conservation measures in the transportation sector

The energy consumption in the transportation sector has been in upturn trend since the oil crisis. This trend accelerated during the 1990s. Its major factor is attributed to the increasing number of the ownership of passenger vehicles. The energy consumed by passenger vehicles accounts for 90 % of the total fuel consumption in this sector. Thus implementing the measures that focus on passenger vehicles is seen very crucial.

Specifically, both gasoline- and diesel-powered automobiles have been designated as specified equipment, under the Law Concerning the Rational Use of Energy, aiming to improve fuel consumption of automobiles. And publicity activities have been conducted to promote automobiles that have high energy efficiency performance or "Stop Idling" campaign.

2) Outline of energy conservation measures in the transportation sector

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

i) Establishment of energy conservation target values and requiring indication of energy consumption efficiency, regarding specified equipment out of energy-consuming machines and tools (revised in June 1999)

Specified equipment related to the transportation sector: gasoline-powered passenger cars, diesel-powered passenger cars, gasoline-powered trucks, diesel-powered trucks

* How to set the energy standards

To establish the target values through considering the performance level of equipment with the best consumption efficiency among presently commercialized products (except for special products, etc.), in the set division.

ii) Advising, public announcement, commanding, and penalty imposition toward manufacturers of specified equipment that is significantly below the energy conservation target values (revised in 1998)

iii) Advising, public announcement, commanding, and penalty imposition toward manufacturers of specified equipment with no indication of energy consumption efficiency.

b) Support measures

i) Spreading and promotion of automobiles which use clean energy as fuel

Preferential measures in terms of the tax rates 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 consumption of individual transportation equipment. Implementation of investment and financing, etc., to introduce equipment with excellent energy consumption efficiency

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

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

ii) Preparation and distribution of posters and pamphlets, conduction of symposiums, and information supply through mass media, by related ministries and agencies, and in various 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.

5.5 Reinforcement of Energy Conservation Measures in Each Sector

(1) Background

At the Third Conference of the Parties to the UN Framework Convention on Climate Change (COP3), held in Kyoto in December 1997, an agreement was reached on greenhouse gas emissions reduction targets for developed countries. As part of this agreement, 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. Japan's target for energy-related carbon dioxide emissions, which account for about 80% of all greenhouse gas emissions, is the achievement of stabilization at the FY 1990 level by FY 2010.

(2) Additional Measures and Expected Effect

(Unit:1,000kl-oe)

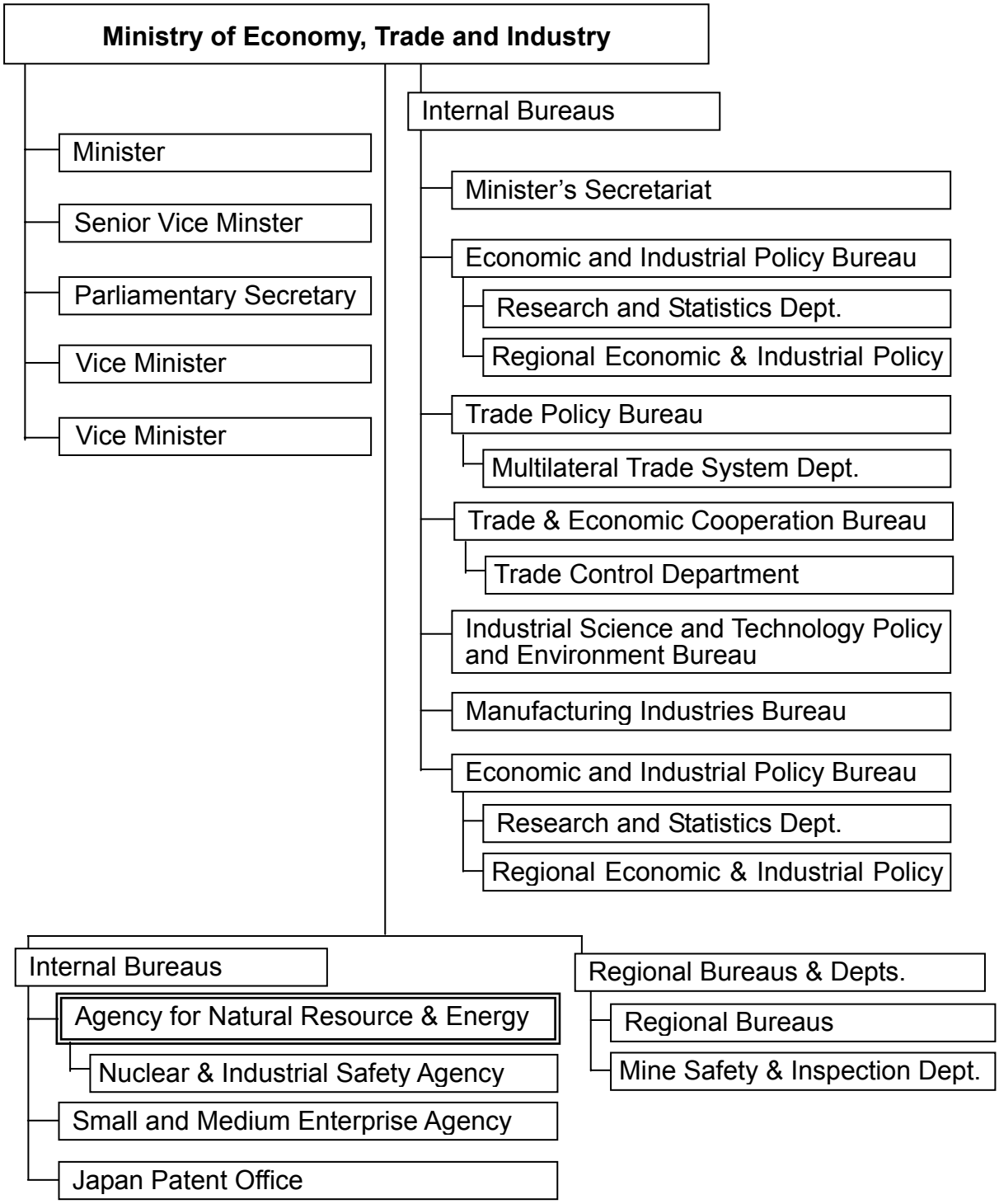
		Reference case	Current measures	Additional measures	Total
Industrial sector	1. Implementation of voluntary technical action plan by Nippon Keidanren	11,900	11,900	0	11,900
	2. Introduction of high performance furnaces, boilers, etc.	400	900	500	1,400
	3. Energy conservation by coordination among factories	0	0	1,000	1,000
	4. Reinforcement of energy management			400	400
Residential/commercial sector	1. Efficiency improvement of equipment by top runner standards, etc.	4,700	4,700	1,100	5,800
	2. Improvement of energy saving performance of buildings	4,900	8,100	500	8,600
	3. Dissemination of high efficient water heater and lighting	200	1,600	1,500	3,100
	4. Dissemination of high efficient air-conditioners and refrigerators	0	0	400	400
	5. Efforts to replacement of equipment by people	0	0	2,700	2,700
	6. Dissemination of HEMS and BEMS	1,200	2,200	0	2,200
	7. Reinforcement of energy management	0	0	700	700
Transportation sector	1. Improvement of fuel consumption of vehicles by top runner standards	8,000	8,000	100	8,100
	2. Introduction of clean energy, etc.	200	600	800	1,400
	3. Introduction of idling stop vehicles	0	0	200	200
	4. Energy saving concerning transportation system	3,800	7,900	1,900	9,800
	(Technology development on energy conservation)			(1,100)	(1,100)
	Total of all measures	35,300	45,900	11,800	57,700

Source) Material-4 in the 8th meeting of Energy Conservation Subcommittee of Advisory Committee for Natural Resources and Energy

6. Related Organization

6.1 Ministry of Economy, Trade and Industry (METI)

(1) Organization of METI



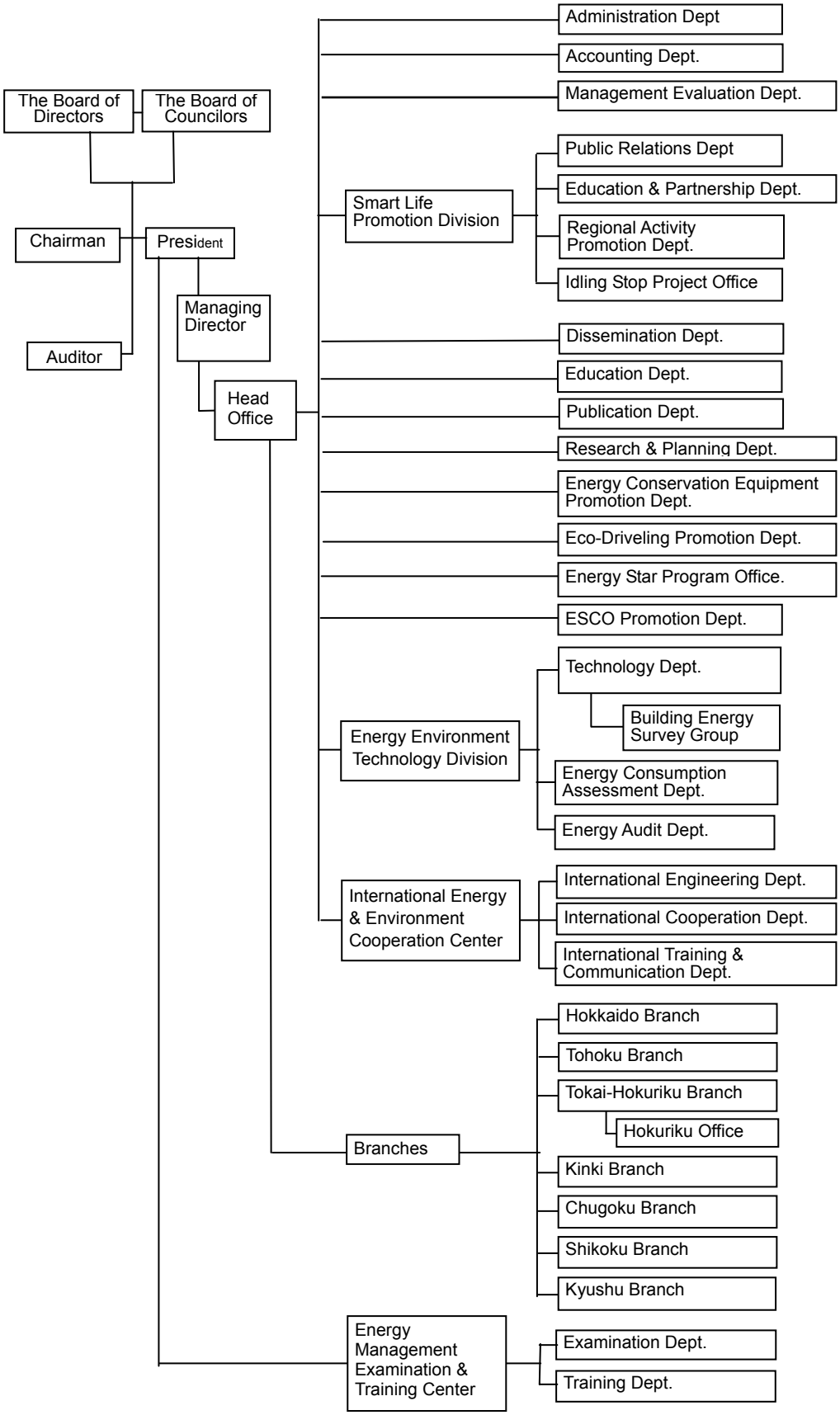
(2) Organization of Agency for Natural Resources and Energy (ANRE)

- **Agency for Natural Resources and Energy**
  - Director - General
  - Director - General for Natural Resources and Energy
  - Director-General's Secretariat
    - General Policy Division
    - General Policy Division
  - Energy Conservation and Renewable Energy Dept.
    - International Cooperation Office
    - Policy Planning Division
    - Energy Efficiency and Conservation Division
    - New and Renewable Energy Division
  - Natural Resources and Fuel Dept.
    - Policy Planning Division
    - Petroleum and Natural Gas Division
    - Petroleum Refining and Reserve Division
    - Petroleum Distribution and Retail Division
    - Coal Division
    - Coal Mine Subsidence Division
    - Mineral and Natural Resources Division
  - Electricity and Gas Industry Dept.
    - Policy Planning Division
    - Electricity Market Division
    - Gas Market Division
    - Electricity Infrastructure Division
    - Nuclear Energy Policy Planning Division
    - Nuclear Fuel Cycle Industry Division

6.2 The Energy Conservation Center, Japan (ECCJ)

(1) Organization of ECCJ

<As of 1 July, 2006>



(2) About ECCJ

(as of July, 2006)

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 & 8 branches in Japan
Supporting member:	2,833 members
Number of employees	122 persons
Budget:	4,527 million yen in FY2005 (39 million US$: @116¥/US$)
Fields of activity:	Industrial, Residential / Commercial and Transportation sectors

Major activities:

Industry sector ;

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

Residential / Commercial and Transportation sector ;

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

Cross sector ;

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

Reference

Energy Calories (Japan)

Energy	Unit	Average Calorie (kcal)	
<Coal>		F.Y.	
Coking Coal (Domestic)	kg	1953-55	7,400
		1956-60	7,500
		1961-65	7,600
		1966-	7,700
Coking Coal (Import)	kg	1953-99	7,600
		2000-	6,904
Steam Coal (Domestic)	kg	1953-65	5,900
		1966-70	5,800
		1971-80	5,600
		1981-99	5,800
		2000-	5,375
Steam Coal (Import)	kg	1953-99	6,200
		2000-	6,354
Hard Coal (Domestic)	kg	1953-65	5,700
		1966-70	5,600
		1971-75	6,100
		1976-	4,300
Hard Coal (Import)	kg	1953-99	6,500
		2000-	6,498
Brown Coal	kg	1953-99	4,100
		2000-	4,109
Coke	kg	1953-99	7,200
		2000-	7,191
Coke Oven Gas	m^3	1953-99	4,800
		2000-	5,401
Blast Furnace Gas	m^3		800
Converter Gas	m^3	1953-99	2,000
		2000-	2,009
Patent Fuel	kg	1953-99	5,700
		2000-	5,709
<Oil>			
Crude Oil	L	1953-55	9,300
		1956-60	9,350
		1961-70	9,400
		1971-80	9,300
		1981-99	9,250
		2000-	9,126
NGL	L	1953-99	8,100
		2000-	8,433
Gasoline	L	1953-99	8,400
		2000-	8,266
Naphtha	L	1953-99	8,000
		2000-	8,146
Jet Fuel		1953-99	8,700

Energy	Unit	Average Calorie (kcal)	
Jet Fuel	L	2000-	8,767
Kerosene	L	1953-99	8,900
		2000-	8,767
Gas Oil	L	1953-99	9,200
		2000-	9,126
Fuel Oil A	L	1953-99	9,300
		2000-	9,341
Fuel Oil B	L	1953-99	9,600
		2000-	9,651
Fuel Oil C	L	1953-99	9,800
		2000-	9,962
Lubricants	L	1953-99	9,600
		2000-	9,603
Other Petroleum	kg	1953-99	10,100
		2000-	10,105
Refinery Gas	m^3	1953-99	9,400
		2000-	10,726
Petroleum Coke	kg	1953-99	8,500
		2000-	8,504
LPG	kg	1953-99	12,000
		2000-	11,992
Natural Gas	m^3	1953-99	9,800
Natural Gas (Domestic)	m^3	2000-	9,771
LNG	kg	1953-99	13,000
Natural Gas (Import)	kg	2000-	13,019
Coal Field Gas	m^3		8,600
Town Gas	m^3	1953-99	10,000
		2000-	9,818
Electricity	kWh	( ) is thermal efficiency	
(20.7%)		1953	4,150
(22.2%)		1954	3,850
(24.0%)		1955	3,600
(25.8%)		1956	3,350
(26.8%)		1957	3,200
(28.6%)		1958	3,000
(31.1%)		1959	2,750
(31.9%)		1960	2,700
(32.7%)		1961	2,650
(33.9%)		1962	2,550
(36.0%)		1963	2,400
(36.5%)		1964	2,350
(36.9%)		1965	2,350
(37.4%)		1966-70	2,300
(38.1%)		1971-99	2,250
(39.98%)		2000-	2,150

Source) "Energy Production, Supply and Demand"