Japan Energy Conservation Handbook

2003 / 2004

Contents

1 World Energy Situations

1.1 Energy resource reserves (2002)

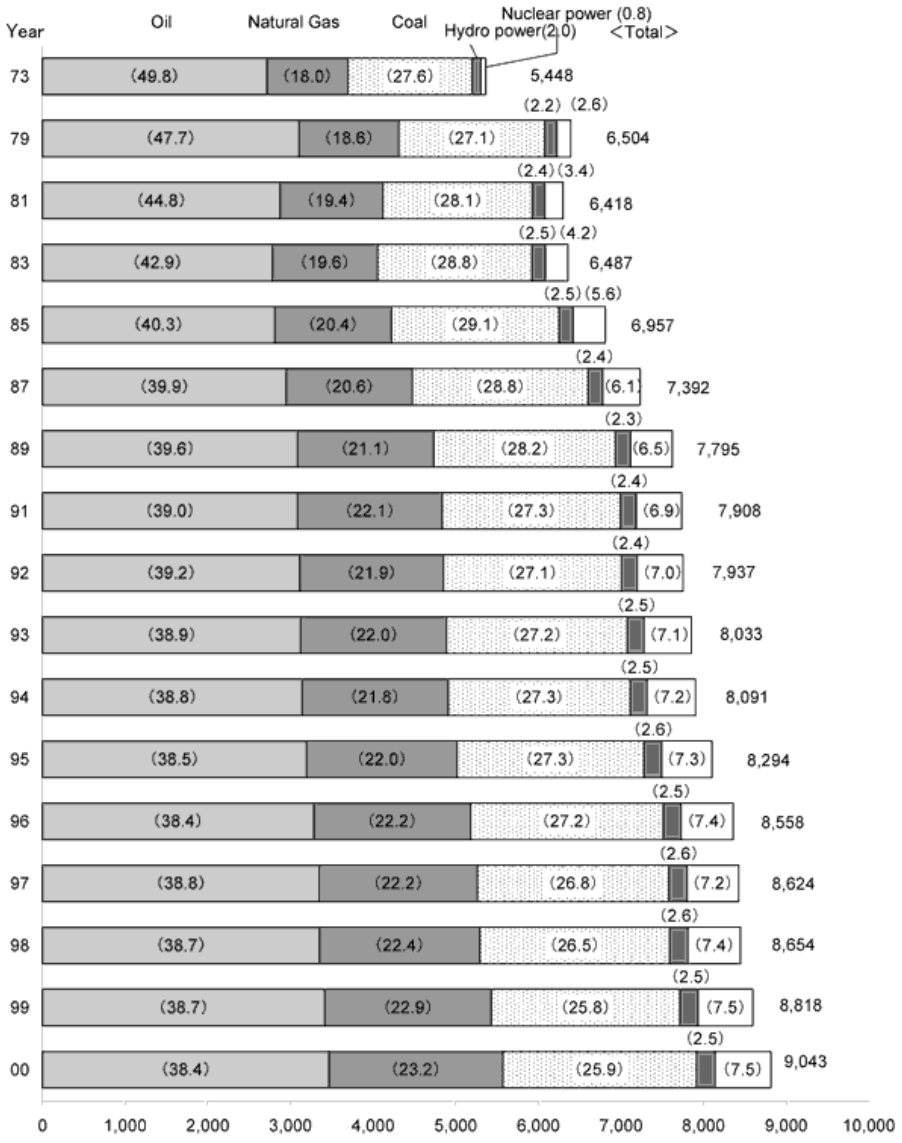
		Oil	Natural gas	Coal	Uranium
Proved recoverable reserves (R)		1.48 trillion barrels	156 trillion m^3	984.5 billion tons	3.93 million tons
Allocation by region	North America	3.6%	4.4%	26.1%	17.9%
	Central & South America[1]	10.6	4.7	2.3	6.5
	Europe	1.8	3.8	13.2	3.5
	Former Soviet Union	7.5	35.4	22.9	30.6
	Middle East	65.4	36.0	0.2	0.0
	Africa	7.4	7.6	5.6	17.8
	Asia / Pacific	3.7	8.1	29.7	23.8
Annual production (P)		27 billion barrels (73.9 million barrels/day)	2.5 trillion m^3	4.83 billion tons	37,000 tons
Recoverable years (R/P)		40.6 years	60.7 years	204 years	61.1 years[2]
Source		BP statistics (year 2002)			OECD/NEA, IAEA URANIUM (year 2001)

1Mexico has been included in South & Central America since 2001. You need to take account of that when comparing with the previous fiscal year.

2As the stockpile of uranium is abundant, its annual output is lower than its annual demand (62,000 tons in 2001). Therefore, uranium's recoverable year is figured out by dividing the value of the proven recoverable reserves by the annual demand of uranium.

1.2 Primary energy consumption by energy resource

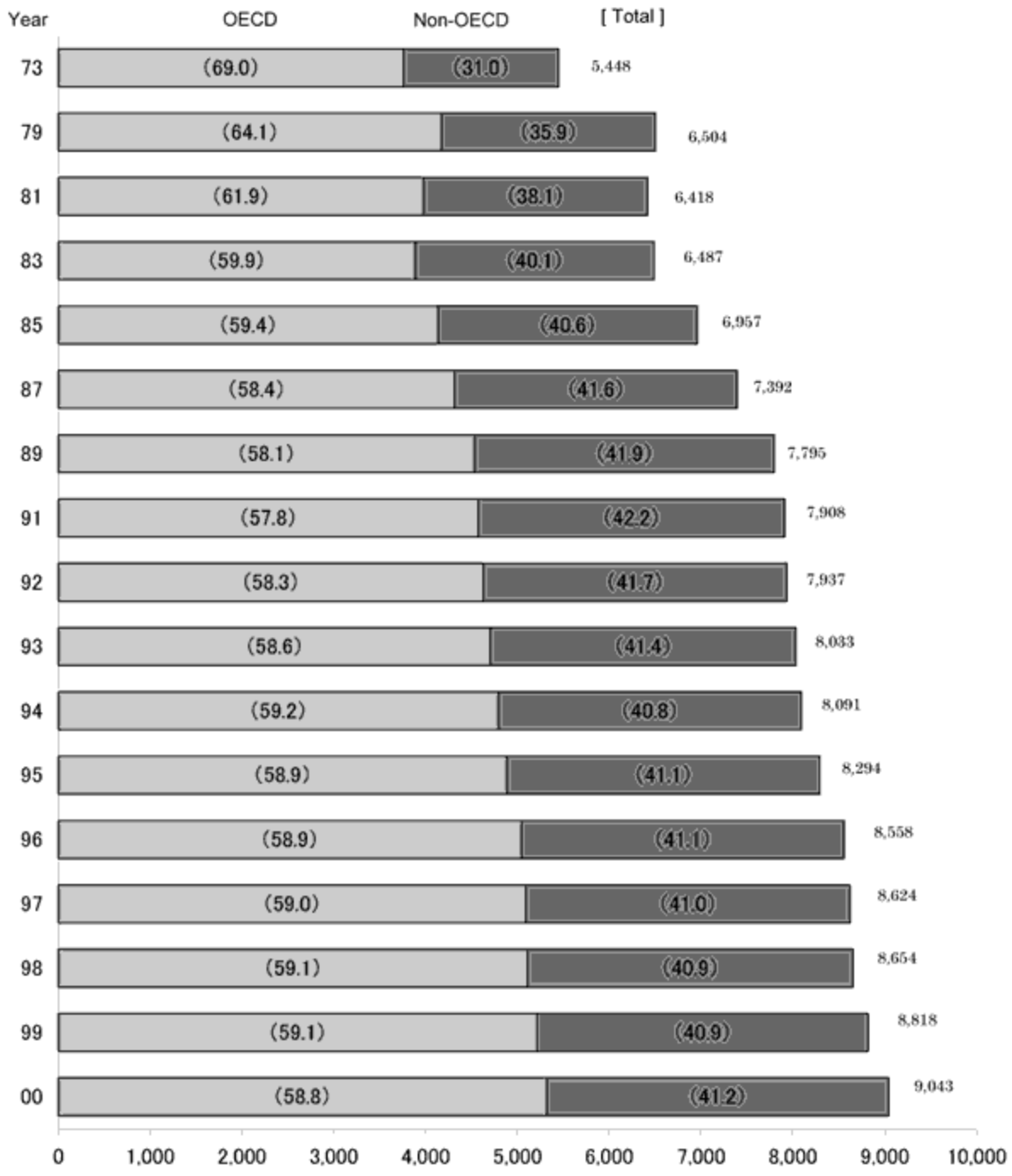
Unit: 1 million tons of oil equivalents (Mtoe).



Note) Figures in parenthesis represent percentage.
Source) Prepared based on the "2002 EDMC Handbook of Energy & Economic Statistics in Japan"

1.3 Primary energy consumption by region

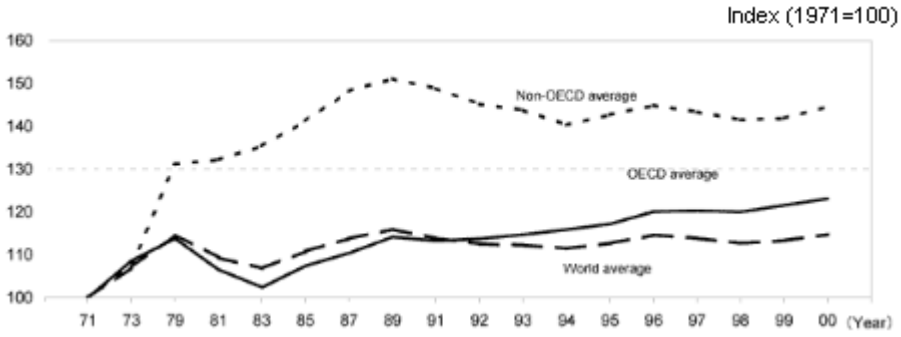
Unit: 1 Mtoe



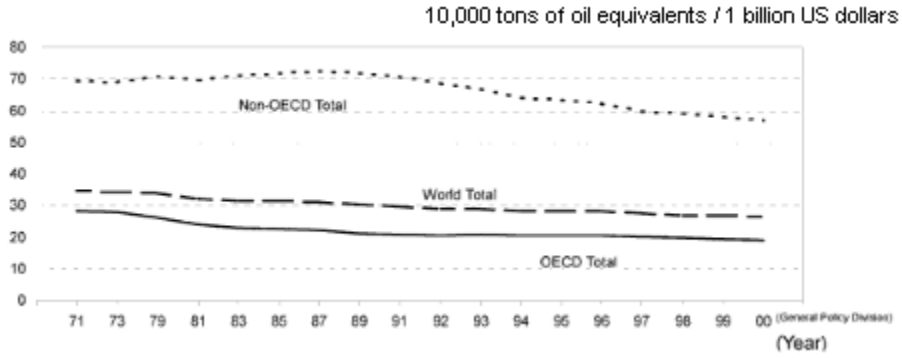
Note) Figures in parenthesis represent percentage.
Source) Prepared based on the "2002 EDMC Handbook of Energy & Economic Statistics in Japan"

1.4 Trends of Primary Energy Consumption

(1) Per-capita primary energy consumption



(2) Primary energy consumption per GDP



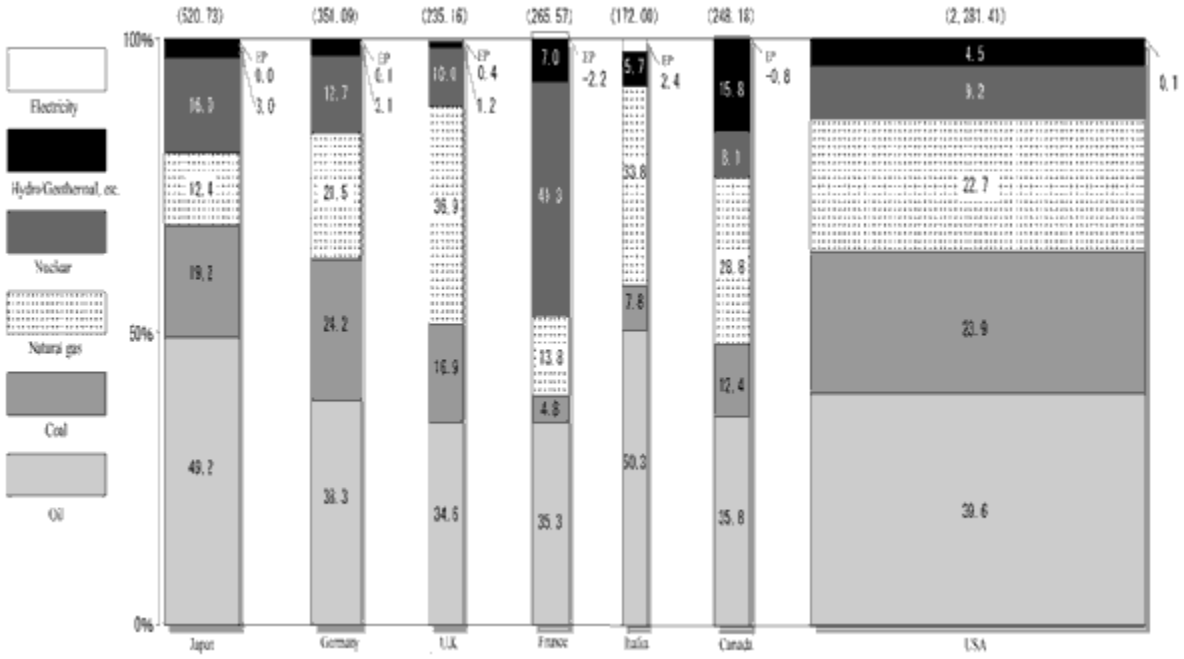
(3) World energy consumption (2000)

	Primary energy consumption			Real GDP (1995 US$ standard)			Population		
	1 Mtoe	Y/Y Growth Rate(%)	Avg. Growth Rate (1973-98) (%)	Billion US$	Y/Y Growth Rate(%)	Avg. Growth Rate (1973-98) (%)	Population (million)	Y/Y Growth Rate(%)	Avg. Growth Rate (1973-98) (%)
OECD Total	5,317	1.99	1.47	26,675	3.60	2.79	1,125	0.70	0.77
Non-OECD Total	3,726	3.37	2.66	6,525	5.22	3.47	4,901	1.43	1.75
World Total	9,043	2.55	1.97	34,199	3.91	3.01	6,027	1.29	1.70

1 Source: Prepared from "2002 EDMC Handbook & Economic Statistics"

1.5 Energy supply in major countries (2001)

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



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) OECD ENERGY BALANCES (2000-2001/ I EA)

(Comment)

1) The ratio of petroleum is especially high in Japan and Italy, accounting for 50%.

3) In the U.S.A. and Germany, the share of coal is as high as 24%.

4) In Canada, the share of hydraulic power is as high as 17%.

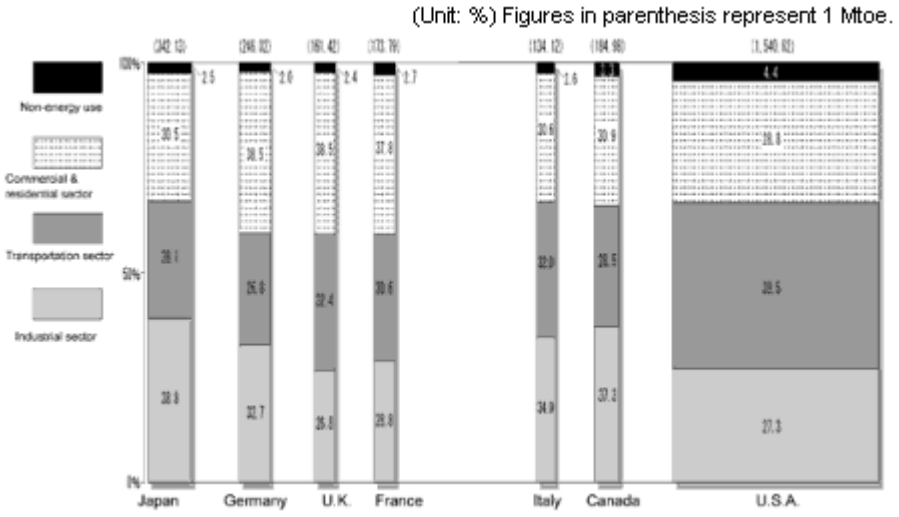
5) In France, the share of nuclear power is especially as high as 42%

(2) Import dependence (2001)

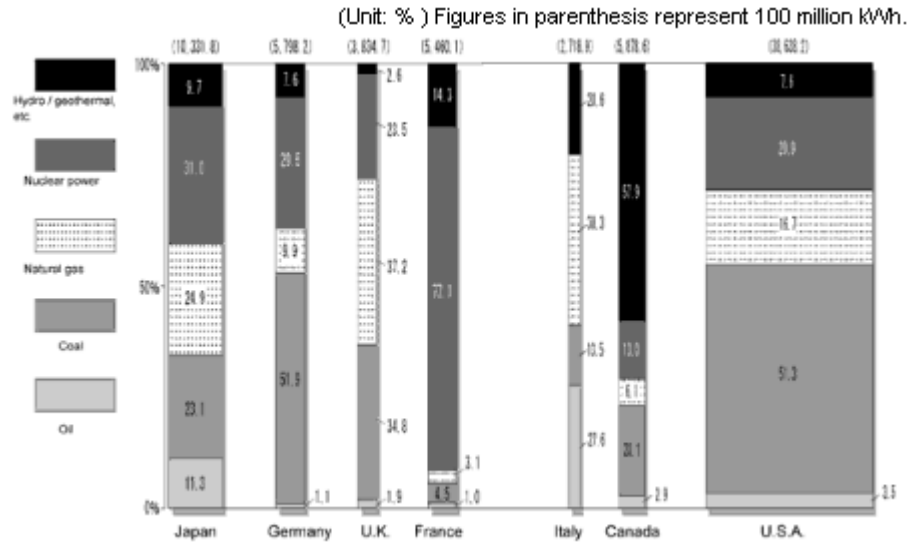
	Japan	Germany	U.K	France	Italy	Canada	U.S.A
Dependence on Energy import (%)	80.1	61.9	-9.2	50.3	85.3	-53.0	28.1
Dependence on Oil import (%)	99.7	97.1	-49.4	98.1	95.2	-46.6	59.8

Source) Energy Balances of OECD Countries 1999-2000 (IEA

(3) Percentage sector shares in final energy consumption (2001)



(4) Total electricity generated and percentage shares of power sources (2001)



Source: Energy Balances of OECD countries, 2000-2001

1.6 Energy consumption in major developed countries

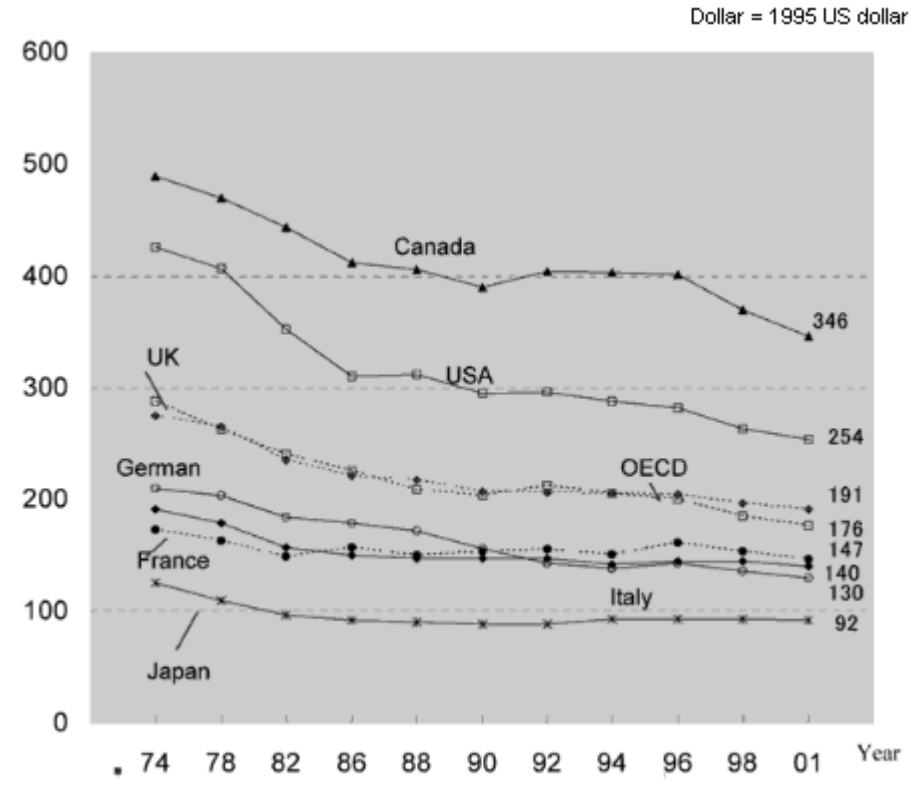
(1) Trend of energy consumption

(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	
	2000	2001	2000	2001	2000	2001	2000	2001
U.S.A.	3.8	0.3	2.5	-0.1	1.4	1.3	38.7	39.2
Japan	2.4	-0.6	1.7	-0.7	-1.8	-2.1	49.9	48.9
Germany	2.9	0.6	0.5	2.2	-2.5	2.1	38.4	39.2
U.K.	3.1	2.0	-0.3	1.7	-0.7	-2.7	36.2	35.2
France	3.8	1.8	1.0	3.2	-3.2	7.5	33.9	36.4

Source) OECD ENERGY BALANCES (2000-2001)

(2) Comparison of energy intensities



Source) OECD ENERGY BALANCES (2000 - 2001)

1.7 World Energy Outlook

(1) World Oil Demand

Unit: million barrels per day

	2000	2010	2020	2030	Average annual growth rate 2000-2030(%)
OECD North America	22.2	44.8	27.7	30.8	1.1
US and Canada	20.2	22.5	24.8	27.3	1.0
Mexica	1.9	2.3	2.9	3.5	3.5
OECD Europe	14.1	15.3	16.0	16.4	0.5
EU	12.3	13.2	13.7	13.9	0.4
Other OECD Europe	1.9	2.1	2.4	2.5	1.0
OECD Pacific	8.5	9.5	10.3	10.5	0.7
Japan/Australia/N.Zealand	6.4	6.9	7.2	7.0	0.3
Korea	2.1	2.6	3.1	3.4	1.6
OECD Total	44.8	49.6	54.0	57.6	0.8
Transition economies	4.6	5.4	6.3	7.1	1.5
Russia	2.7	3.1	3.7	4.4	1.7
Other	1.9	2.3	2.5	2.7	1.1
China	4.9	7.0	9.4	12.0	3.0
Indonesia	1.1	1.5	2.0	2.4	2.7
Other East Asia	3.2	4.4	5.7	7.0	2.7
India	2.1	3.0	4.2	5.6	3.3
Other South Asia	0.5	0.8	1.2	1.8	4.0
Brazil	1.8	2.4	3.1	3.8	2.5
Other Latin America	2.7	3.4	4.3	5.5	2.4
Africa	2.0	2.9	3.9	5.4	3.3
Middle East	4.1	5.2	6.3	7.7	2.2
Non-OECD	27.1	35.9	46.4	58.3	2.6
Bunkers and stock changes	3.1	3.3	3.6	4.1	1.0
Total demand	75.0	88.8	104.0	120.0	1.6

1 Source: International Energy Agency (2002), World Energy Outlook, Paris: OECD

(2) World Oil Supply1

Unit: million barrels per day

	2000	2010	2020	2030	Average annual growth rate 2000-2030(%)
Non-OPEC	43.4	47.8	45.7	42.1	-0.1
OECD Total	21.2	19.8	16.3	12.8	-1.7
OECD North America	13.6	14.0	12.3	9.9	-1.1
US and Canada	10.1	9.9	8.3	7.1	-1.2
Mexica	3.5	4.1	4.0	2.7	-0.8
OECD Europe	6.7	5.2	3.5	2.5	-3.3
EU	3.3	2.3	1.6	1.1	-3.5
Other OECD Europe	3.4	3.0	1.9	1.4	-3.0
OECD Pacific	0.9	0.5	0.5	0.5	-1.8
Non-OECD	22.2	28.0	29.4	29.3	0.9
Russia	6.5	8.6	9.0	9.5	1.3
Other transition economies	1.6	4.1	4.9	5.4	4.1
China	3.2	2.8	2.5	2.1	-1.4
India	0.7	0.5	0.4	0.3	-2.5
Other Asia	1.6	1.4	1.1	0.7	-2.8
Brazil	1.3	2.3	3.2	3.9	3.7
Other Latin America	2.3	2.0	2.0	1.9	-0.5
Africa	2.8	4.5	4.9	4.4	1.5
Middle East	2.1	1.8	1.5	0.9	-2.7
OPEC	28.7	35.9	50.2	64.9	2.8
OPEC Middle East	21.0	26.5	37.8	51.4	3.0
Indonesia	1.4	1.5	1.7	1.7	0.6
Other OPEC	6.3	7.9	10.7	11.8	1.9
Non-conventional oil	1.1	3.0	5.6	9.9	7.7
Of which GTL	0.0	0.3	1.1	2.3	14.2
Processing gains	1.7	2.2	2.6	3.1	1.9
OPEC share(%)	38.4	40.4	48.3	54.1	1.2
OPEC Middle East share(%)	28.1	29.8	36.4	42.9	1.4
Total supply	75.0	88.8	104.0	120.0	1.6

1 Source: International Energy Agency (2002), World Energy Outlook, Paris: OECD

1.8 Projections of Energy Demand and Growth Rates1

(1) World

	Energy Demand (Mtoe)				Growth Rates (% per annum)		
	2000	2010	2020	2030	2000 - 2010	2000 - 2020	2000 - 2030
Total Primary Energy Supply	9179	11132	13167	15267	1.9	1.8	1.7
Coal	2355	2702	3128	3606	1.4	1.4	1.4
Oil	3604	4272	5003	5769	1.7	1.7	1.6
Of which International Marine Bunkers	133	145	158	174	0.9	0.8	0.9
Gas	2085	2794	3531	4203	3.0	2.7	2.4
Nuclear	674	753	719	703	1.1	0.3	0.1
Hydro	228	274	327	366	1.9	1.8	1.6
Other Renewables	233	336	457	618	3.7	3.4	3.3

(2) OECD

	Energy Demand (Mtoe)				Growth Rates (% per annum)		
	2000	2010	2020	2030	2000 - 2010	2000 - 2020	2000 - 2030
Total Primary Energy Supply	5291	5994	6605	7117	1.3	1.1	1.0
Coal	1082	1089	1160	1182	0.1	0.3	0.3
Oil	2164	2394	2605	2779	1.0	0.9	0.8
Gas	1143	1477	1774	2012	2.6	2.2	1.9
Nuclear	581	631	574	538	0.8	-0.1	-0.3
Hydro	113	122	128	133	0.8	0.6	0.6
Other Renewables	208	280	364	473	3.0	2.8	2.8

(3) Transition Economies

	Energy Demand (Mtoe)				Growth Rates (% per annum)		
	2000	2010	2020	2030	2000 - 2010	2000 - 2020	2000 - 2030
Total Primary Energy Supply	1024	1220	1373	1488	1.8	1.5	1.3
Coal	213	252	248	260	1.7	0.7	0.7
Oil	222	260	303	343	1.6	1.6	1.5
Gas	492	604	708	763	2.1	1.8	1.5
Nuclear	67	66	62	54	-0.1	-0.4	-0.7
Hydro	25	28	32	34	0.9	1.1	1.0
Other Renewables	5	10	22	34	8.1	7.9	6.8

(4) Developing Countries

	Energy Demand (Mtoe)				Growth Rates (% per annum)		
	2000	2010	2020	2030	2000 - 2010	2000 - 2020	2000 - 2030
Total Primary Energy Supply	2732	3773	5031	6487	3.3	3.1	2.9
Coal	1060	1361	1721	2165	2.5	2.5	2.4
Oil	1085	1472	1938	2473	3.1	2.9	2.8
Gas	449	713	1050	1428	4.7	4.3	3.9
Nuclear	26	56	84	111	8.0	6.0	4.9
Hydro	90	124	167	199	3.3	3.1	2.7
Other Renewables	21	46	72	112	8.1	6.3	5.7

(5) China

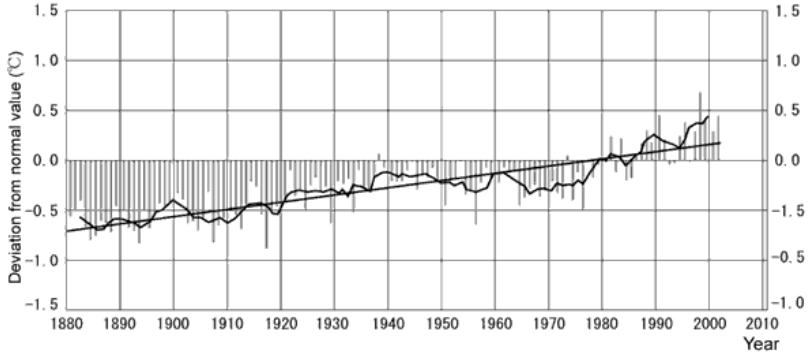
	Energy Demand (Mtoe)				Growth Rates (% per annum)		
	2000	2010	2020	2030	2000 - 2010	2000 - 2020	2000 - 2030
Total Primary Energy Supply	950	1302	1707	2133	3.2	3.0	2.7
Coal	659	854	1059	1278	2.6	2.4	2.2
Oil	236	336	455	578	3.6	3.3	3.0
Gas	30	57	102	151	6.5	6.3	5.5
Nuclear	4	23	43	63	18.3	12.1	9.3
Hydro	19	29	44	54	4.1	4.2	3.5
Other Renewables	1	4	5	9	10.7	7.0	6.8

1 Source: International Energy Agency (2002), World Energy Outlook, Paris: OECD

2 Global Environmental Trends

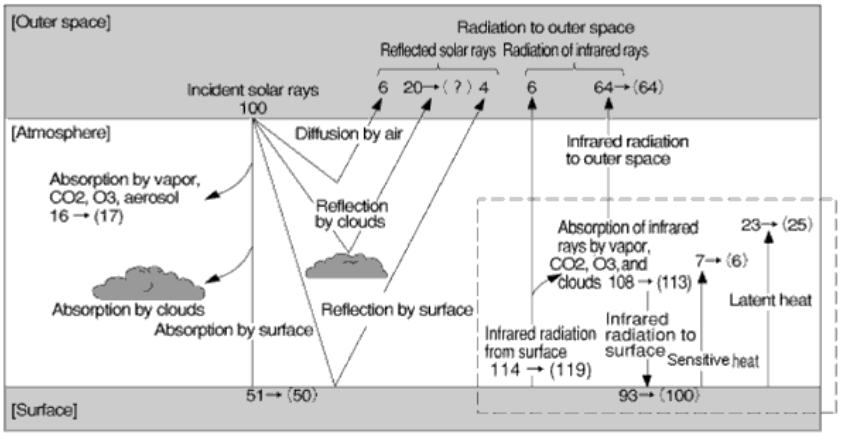
2.1 Climate change and energy consumption

(1) Transition of deviation from normal surface temperatur



Note)Bars represent the temperature of each year, lines show 5-year running average and straight lines stand for long term trend.
Source)IPCC (1995) and White Paper on the Environment 2002 (Ministry for the Environment)

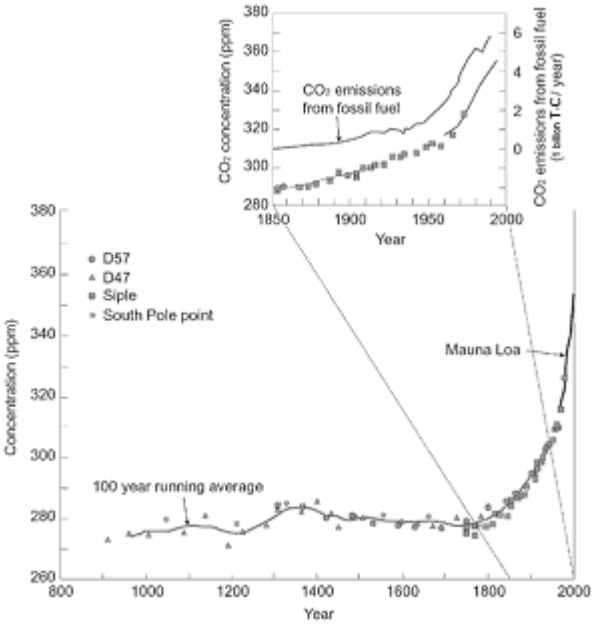
(2) Global energy balance (Index incident solar rays = 100)



Note) Figures in parenthesis represent estimated values when we assume the CO2 concentration becomes double. In case the concentration of greenhouse effect gas such as CO2 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 degrees centigrade if no carbon dioxide or no steam should be contained in the atmosphere.

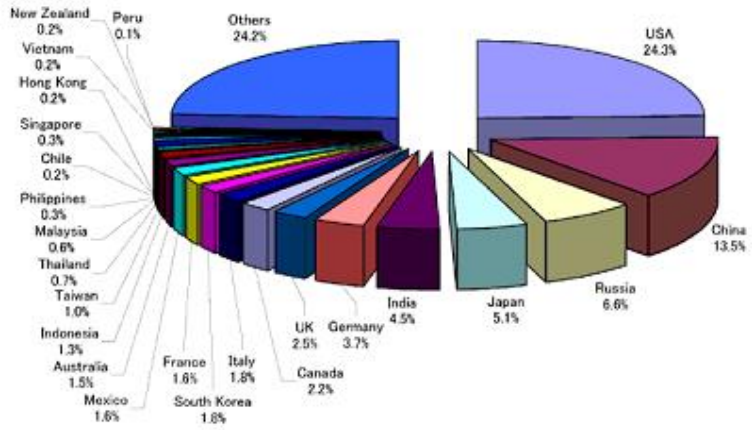
Source) "Meteorological Research Notes No. 160, Carbon Dioxide Special", Taro Matsuno, 1987, Meteorological Society of Japan (partially modified).

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



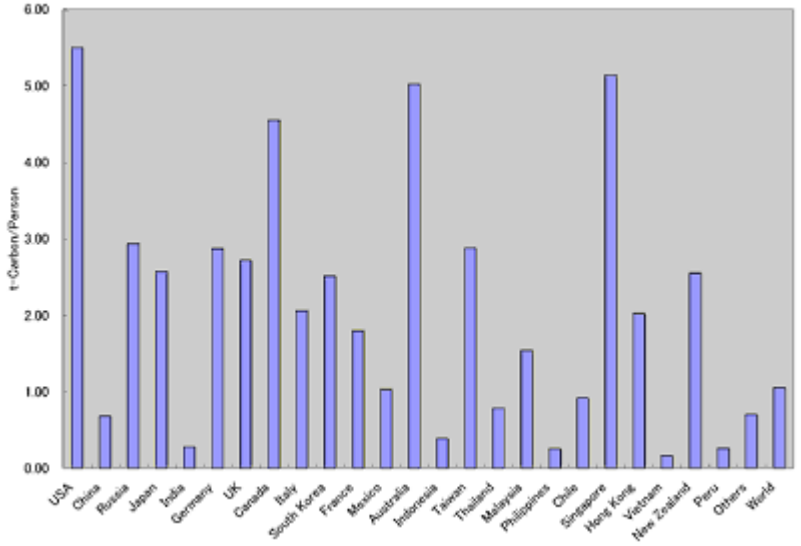
Note)This chart is prepared from the data of CO2 concentration level of the past millennium based on the ice sheet core records by the Siple Station (D47, D57 at the South Pole), and the CO2 level since 1958 that are measured at Mauna Loa Observatory in Hawaii. Ice sheet cores were all collected on the Antarctic Continent. The smooth curve is a 100-year running average. The sharp rise of the CO2 level since the outset of the Industrial Revolution is evident, going along with the increase of CO2 emissions originating from the use of fossil fuels (See the enlarged chart since fiscal 1850).
Source)IPCC (1995), translated by the Meteorological Agency.
Source)White Paper on the Environment (Ministry of Environment, 2000)

(4) CO2 emissions by country (2001)



Source: EDMC, Handbook of Energy & Economic Statistics in Japan (2004)

(5) Per-capita CO2 emissions (2001)



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.

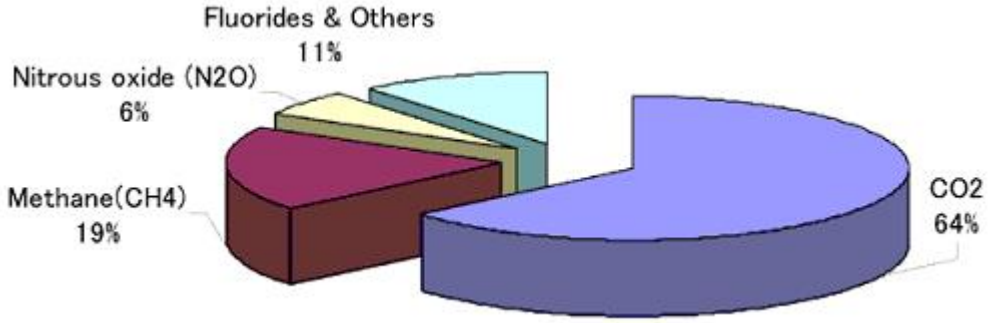
(3) IPCC report on global warming

Increase of Atmospheric CO_2
* 265 - 285 ppm before the Industrial Revolution (1750 - 1800)
* 365 ppm in 1996
* Over 600 ppm estimated by the end of 2100

Rise of Sea Level
* 10 - 25 cm rise over the past 100 years.
* Estimated 9 - 88 cm rise between 1990 - 2100.

Rise of Average World Tempera-ture
* 0.3 - 0.6 degrees centigrade rise over the past 100 years.
* Estimated rise of 1.4 - 5.8 degrees centigrade between 1990 - 2100.

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



(4) COP3 outline of the Kyoto Protocol

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

Target gases	CO2, CH4, N2O, HFC, PFC, SF6
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 CO2 emission in 1990 is 55% or more of total CO2 emissions of all Annex I parties, ratify the Protocol.
Effect	When no Protocol exists, the global CO2 emission in 2010 will increase by 24% compared with 1990. When the Protocol is enforced in 2000, the global CO2 emission in 2010 will reduce by 5.2% compared with 1990.

2.3 Japan's policy to deal with global warming

(1) The General Principle to Promote Measures to Counter Global Warming

On March 19, 2002, the meeting of "the Headquarters to Promote Countermeasures on Global Warming (HPCGW)" was held in Prime Minister's official residence, where the members agreed on "the General Principle to Promote Measures to Counter Global Warming".

The General Principle presents a broad overview 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 General Principle sets a reduction goal for each green house effect gas. For instance, in terms of the CO2 which originates 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 CO2 from non-fossil fuels (e.g. waste incineration), methane and dinitrogen monoxide should be lowered by 0.5% in relation to the 1990 level. In terms of CFCs substitute, the emission level should be curtailed to the 1% up compared with the base year (1995).

(2) Basic Aims of the Principle

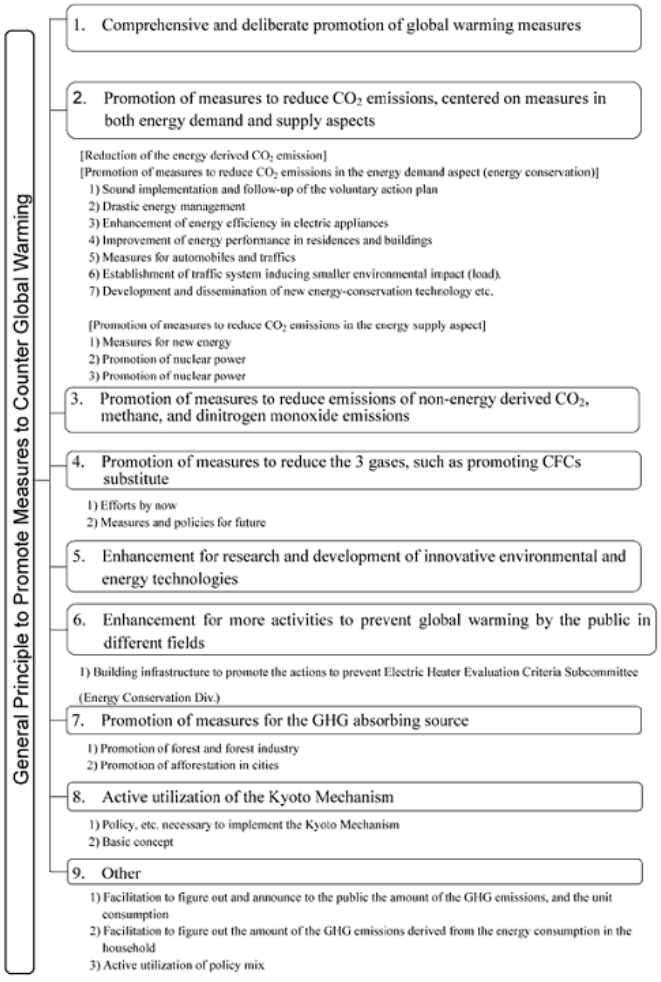
a)Establish the framework which can contribute to both environmental and economic development and make full use of technological innovations and inventive efforts by the business sector in order for the actions on global warming to vitalize the economy and create employment.

b)The Principle is scheduled to be reviewed and reevaluated in 2004 and in 2007 (Step-by-step approach).

c)The concerted participation from the central government, local governments, business operators, and the public is a sine-qua-non because attaining the Kyoto targets will be far from plain sailing. Therefore the Principle focuses on the commercial and residential sector and the transportation sector, encouraging the business operators to further promote their voluntary actions.

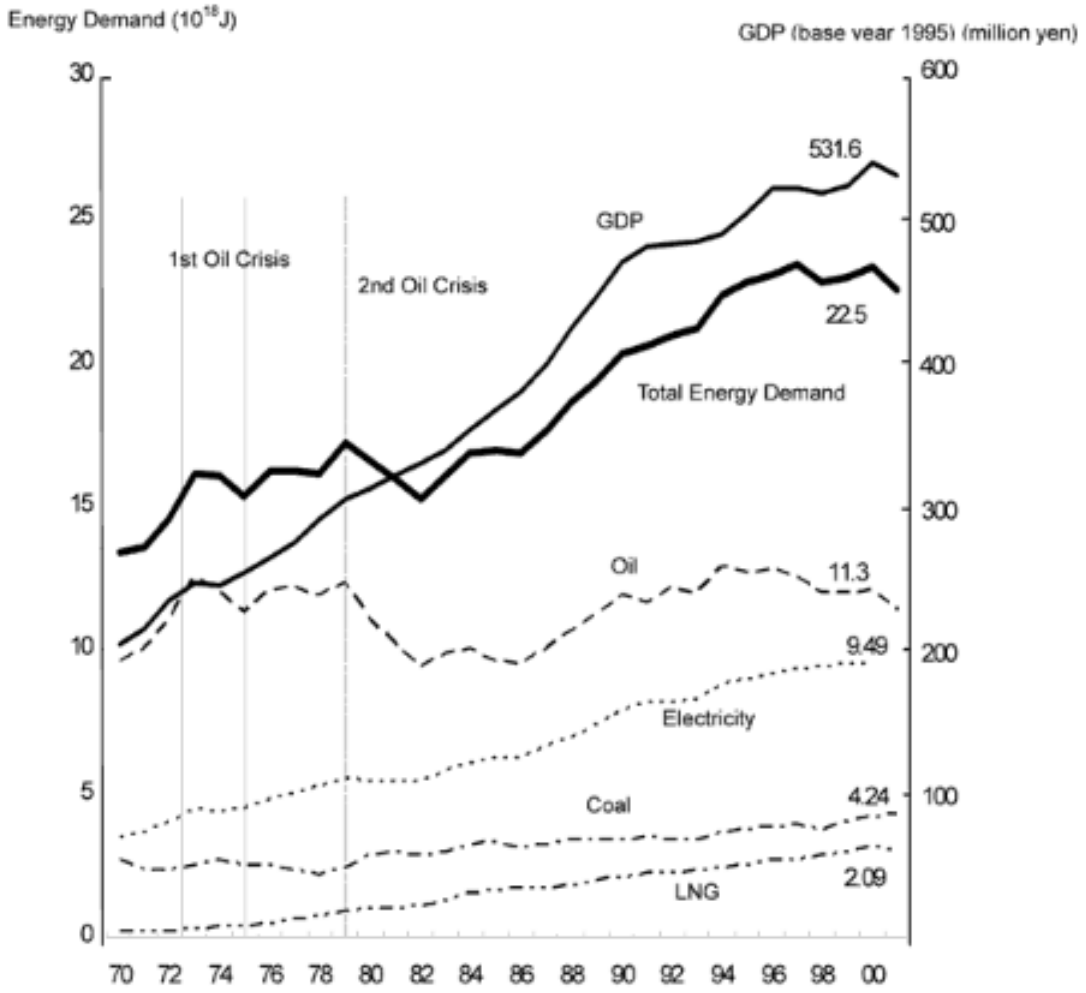
d)Japan will continue maximum efforts to establish universal rules that the US and developing nations can adopt.

A systematic tree of the Principle will be shown below.



3 Energy Situation in Japan

3.1 Demand of energy sources and GDP

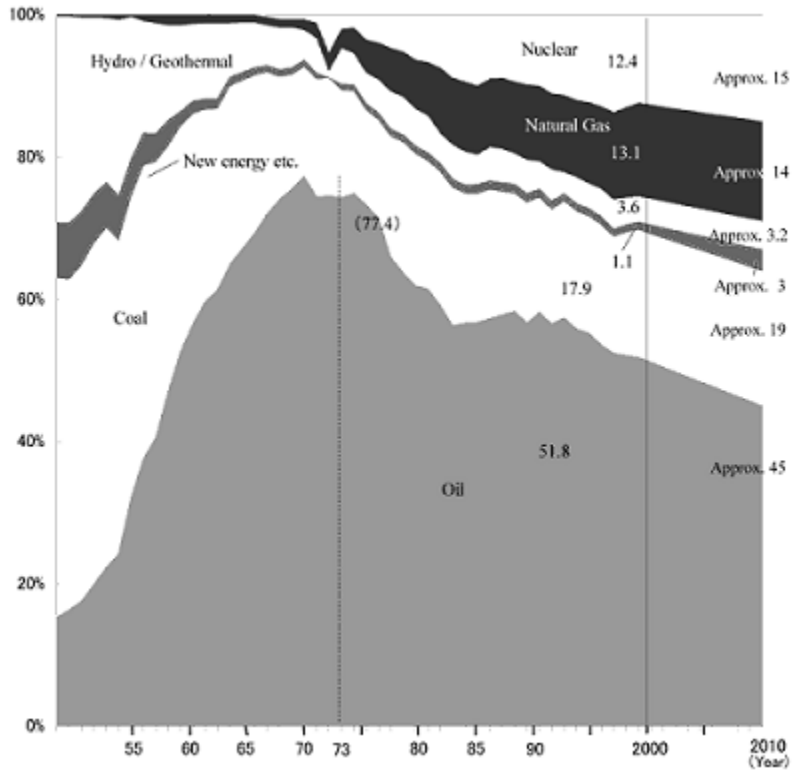


Changes in Energy / GDP elasticity

Fiscal year	1965 - 73	1973 - 80	1980 - 90	1990 - 95	1995 - 01
GDP growth rate	9.05%	3.45%	4.17%	1.46%	0.86%
Average growth rate of energy demand per annum	10.86%	0.43%	2.04%	2.26%	-0.17%
Energy/GDP elasticity	1.2	0.13	0.49	1.55	-0.2

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

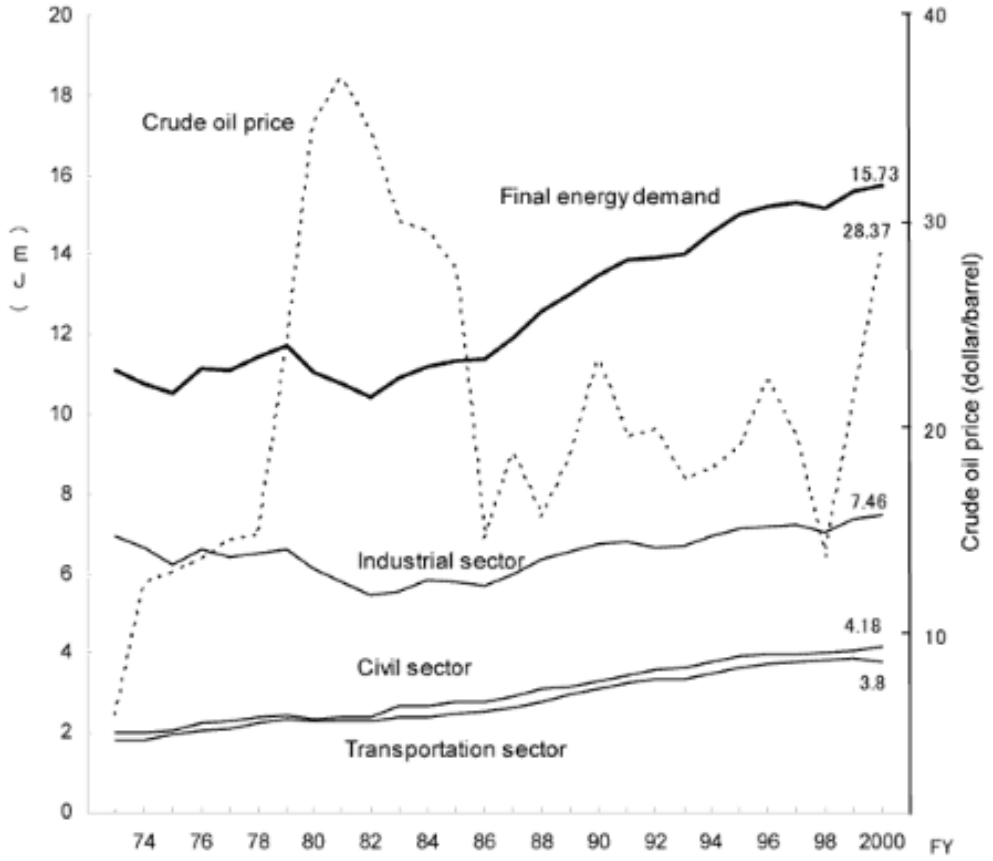
3.2 Transition of percent distribution of primary energy supply (1955- 2010)



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 (2001).The percentage shares of energy resources in primary energy supply in the fiscal 2000 are:

Nuclear power	12.4%
Natural gas	13.1%
Hydro/geothermal	3.6%
New energy	1.1%
Coal	17.9%
Oil	51.8%

3.3 Final energy consumption by sector



Fiscal year	73	79	82	85	90	92	94	95	96	97	98	99	2000
Final energy consumption	11.1	11.7	10.42	11.33	13.52	13.93	14.56	15.02	15.21	15.33	15.2	15.62	15.73
		2.3	-3.2	1.2	3.8	0.4	3.7	3.2	1.3	0.8	-0.9	2.8	0.7
Industrial sector	6.94	6.61	5.45	5.8	6.73	6.65	6.94	7.11	7.19	7.23	7.05	7.35	7.46
		1.8	-6.2	-0.4	3	-2.2	3.8	2.5	1.2	0.5	-2.4	4.2	1.5
Commercial / residencial sector	2.01	2.45	2.41	2.76	3.3	3.6	3.76	3.95	3.95	3.98	4	4.08	4.18
		2.3	0.5	3.7	4.6	3.9	3.2	5	0.1	0.9	0.5	1.8	2.4
Transportation sector	1.82	2.33	2.29	2.47	3.11	3.33	3.52	3.63	3.72	3.78	3.82	3.88	3.8
		3.8	0.6	2.5	4.5	2.2	4.7	3.2	2.6	1.5	1.1	1.7	-2.2

[1] Source) General Energy Statistics

3.4 Outlook of final energy consumption

(Unit: 1 million kL in terms of crude oil)

Fiscal year / Items	Fiscal 1990		Fiscal 1999		Fiscal 2010			
					Base Case		Target Case[1]	
		Share (%)		Share (%)		Share (%)		Share (%)
Industrial	183	52.5	197	49.0	187	45.8	185	46
Commerce / residence	85	24.4	105	26.1	126	30.8	120	30
Household	46	13.3	55	13.8	60	14.7	58	14
Business	39	11.2	50	12.3	66	16.1	63	16
Transportation	80	23.0	100	24.9	96	23.4	94	24
Passenger cars	39	11.0	53	13.2	51	12.5	50	12
Trucks	42	12.0	47	11.7	45	10.9	45	11
Total	349	100	402	100	409	100	100	100%

Note) All the figures in "Target Case" represent "approximate" values.

3.5 Outlook of primary energy supply

(Unit: 1 million kL of crude oil equivalents)

Fiscal year / Items	Fiscal 1990		Fiscal 1999		Fiscal 2010			
					Base Case		Target case	
Primary energy supply	526		593		622		602	
Classification by energy	Amount	Share (%)	Amount	Share (%)	Amount	Share (%)	Amount	Share (%)
Oil	307	58.3	308	52.0	280	45.0	271	45
Coal	87	16.6	103	17.4	136	21.9	114	19
Natural gas	53	10.1	75	12.7	82	13.2	83	14
Nuclear power	49	9.4	77	13.0	93	15.0	93	15
Hydro power	22	4.2	21	3.6	20	3.2	20	3
Geothermal	1	0.1	1	0.2	1	0.2	1	0.2
New energy, etc.	7	1.3	7	1.1	10	1.6	20	3
Renewable energy note)	29	5.6	29	4.9	30	4.8	40	7

Note:[1]"Target Case" means estimated values when policy measures are implemented.

[2]New energy, hydro power and geothermal energy are included in "Renewable energy".

[3]The 2010 figures of the tables 3.4 - 3.6 should be interpreted with some qualifications because they were calculated with presupposed conditions.

[4]All the figures in "Target Case" represent "approximate" figures except for light shaded areas.

3.6 Outlook of CO2 emissions originating from energy use

(Unit: 1 million t-C)

Fiscal year / Items	Fiscal 1990	Fiscal 1999	Fiscal 2010	
			Base Case	Target case
CO_2 emissions from energy use (Growth rate compared with fiscal 1990)	287	313 (8.9%)	307 (6.9%)	287

Note) The figure in "Target Case" represents "approximate" value.

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

a) 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.

b) 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.

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

a. Industrial sector: Guidelines for factories, 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

d) 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 in summer and winter."

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

e) Active promotion of an energy conservation labeling system

a. 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

From the international viewpoint, Japan is engaged in the following activities by offering rich experiences, excellent technologies, and know-how in energy conservation to the developing countries.

a) 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.

b) 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) announced the draft of the Basic Energy Plan on 25 July, 2003. This plan defines the next 10-year direction of measures on the demand and supply based on the three principles of the Basic Act of Energy Policy. Here are the details of the three principles.

a) 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.

b) Environmental sustainability
In addition to reducing the emissions of NOx and SOx, 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.

c) 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".

4.3 Law concerning the rationalization of the energy use

(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 covered 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 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

The Minister of Economy, Trade and Industry 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.

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 new criteria is scheduled to be enforced on 1st April 2003.)

2)Guidance and advice

The competent minister (the Minister of Economy, Trade and Industry, 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)1st class designated energy management factories

The Minister of Economy, Trade and Industry may designate factories which consume large amount of fuel etc. or electricity (in terms of fuel 3,000 kL or more per year in crude oil equivalents. In terms of electricity, 12 million kWh or more per year) and belong to the five manufacturing industries from the view point that the rational energy utilization has to be promoted.

Those who establish the Factory 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, under the amended law in June 2002, it is applied to the business operators of large-scaled office buildings etc. and of who were designated as 1st class Designated Energy Management Factory that they may appoint, instead of appointing an energy manager, a person, who has completed a designated training course that were conventionally conducted in the past, as an energy officer to deal with day-to-day energy management, only if they include a participation of an energy manager at the time of preparing a mid-to-long term plan.

4)Instructions, announcement and order to make rationalization plans

If 1st class Designated Energy Management Factory is judged to be in egregious breach of the evaluation criteria for energy rationalization, the competent minister may instruct the factory operator 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

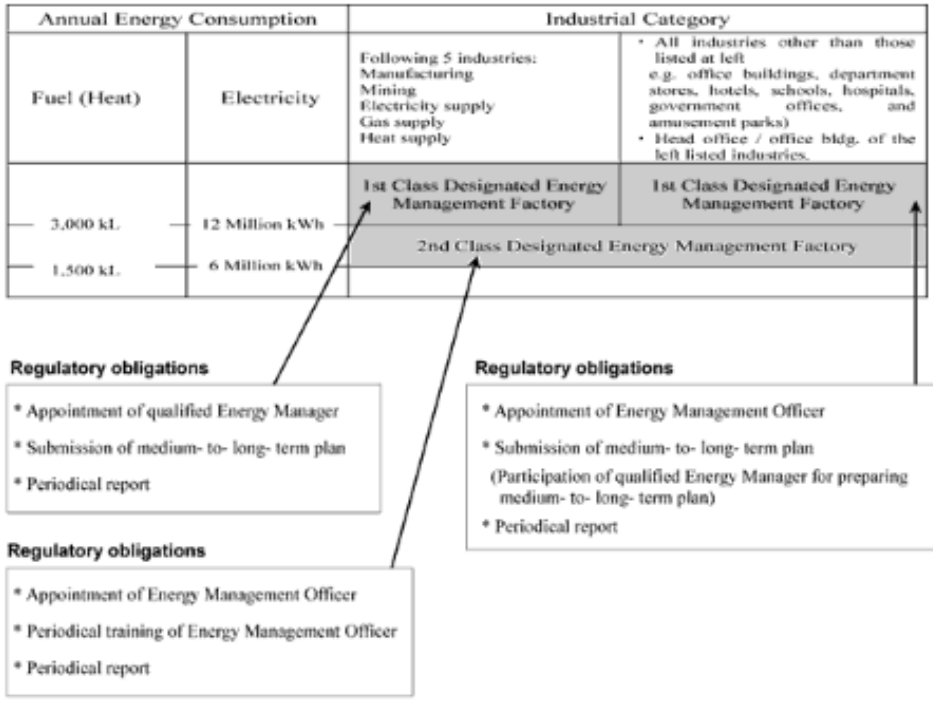
5)2nd class designated energy management factories

Factories other than 1st class Designated Energy Management Factories whose consumption of fuels, etc. or electricity is on a medium scale (whose annual consumption of fuels is l,500kL or more in terms of crude oil and whose annual electric consumption is 6 million kWh or more), shall promote the rational use of energy in the same way as 1st class designated energy management factories. Thus the Law provides that the Minister of Economy, Trade and Industry may designate these factories as 2nd class Designated Energy Management Factories. The Law prescribes that those who manage 2nd class Designated Energy Management Factories shall appoint energy management officers, have the energy management officers take 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.

6)Recommendation

If a 2nd class 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.

7) Category of designated energy management factory



8) Number of Energy Managers Required by the Law

1st Class Designated Mining, Electricity/Gas/Heat Supply Factories	
Annual Fuel Consumption	Number Required
3,000 or less than 100,000 kl-oe	1
100,000 kl-oe or more	2
1st Class Heat Designated Manufacturing Factories	
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
1st Class Electricity Designated Manufacturing Factories	
Annual Electricity Consumption	Number Required
12,000 or less than 200,000 MWh	1
200,000 or less than 500,000 MWh	2
500,000 MWh or more	3

4.4 Evaluation criteria on the rationalization of energy use for factories

Category <equipment>	Standard	
	Management	Measurement and recording
Rationalization of fuel combustion <Combustion equipment>	"Management standard" shall be established to lower the air ratio to "standard value" for control of combustion process.	"Management standard" shall be established to periodically measure and record the amount of fuel supplied, etc.
Rationalization of heating, cooling, heat transfer, etc. <Heating equipment>	"Management standard" shall be established on the temperature of the heat medium required for heating, etc., for control of processes such as heating. "Management standard" shall b establish-ed for air conditioning temperature, etc. for control of air conditioning.	"Management standard" shall be established to periodically measure and record the temperatures of heated objects, etc. "Management standard" shall be established to periodically measure and record the temperature, etc. of each air conditioned section.
Prevention of heat loss due to radiation, conduction, etc. <Heat utilizing equipment>	Heat insulation work of heat utilizing equipment shall be executed in conformity with JIS standard. Actions shall be taken to improve the heat insulation of industrial furnaces to "standard value".	"Management standard" shall be established to periodically measure and record the status of heat loss.
Recovery and utilization of waste heat <Waste heat recovery equipment>	"Management standard" shall be established to raise the waste heat recovery rate to "standard value".	"Management standard" shall be established to periodically measure and record the status of waste heat.
Rationalization in the conversion of heat to power, etc. <Combined heat and power generation equipment>	"Management standard" shall be established for operation control of combined heat and power generation and equipment for power generation.	"Management standard" shall be established to periodically measure and record thermal efficiency, etc.
Prevention of electricity loss due to resistance, etc. <Electricity receiving and distributing equipment>	The power factor at the receiving end shall be 90% or more.	"Management standard" shall be established to periodically measure and record the electricity consumption, etc.
Rationalization of conversion from electricity to mechanical power, heat, etc. <Electricity utilizing equipment>	For motor applied equipment and electric heating equipment, Management standard" shall be established to stop the equipment when it is not required. For lighting system, "Management standard" shall be established based on JIS standard.	"Management standard" shall be established to periodically measure and record the voltage, etc. For lighting system, "Management standard" shall be established to periodically measure and record the illuminance, etc.
Utilization of surplus steam, etc.	(Not specified.)	

(Based on "Standards for judgment for entrepreneurs regarding the rational use of energy at factories" revised on January 25, 1999)

Standard		Target
Maintenance and check	Others	Improvement of equipment and installation of energy conservation equipment
"Management standard" shall be established to periodically maintain and check combustion equipment.	When combustion equipment is newly installed, a combustor capable of adjusting the amount of fuel supplied and the air ratio shall be introduced.	Efforts shall be made to lower the air ratio to "desired value". It shall be examined to install a combustion controller. It shall be examined to convert existing combustion equipment into combustors capable of adjusting the amount of fuel supplied and the air ratio.
"Management standard" shall be established to periodically maintain and check equipment such as boilers. "Management standard" shall be established to periodically maintain and check air conditioners.	When heating equipment is newly installed, measures such as using the materials having high thermal conductivity shall be taken. When air-conditioning equipment is newly installed, measures such as the separate control of the sections to be air conditioned shall be taken.	The target shall be to reduce the temperature at the inlet of the cooler or condenser to less than 200degrees centigrade and efforts shall be made to recover heat as efficiently as possible. The forms of industrial furnaces, etc. shall be examined for improving the emissivity. It shall be examined to improve the heat insulation of industrial furnaces to "desired value".
"Management standard" shall be established to periodically maintain and check for prevention of heat dissipation, etc.	When heat utilizing equipment is newly installed, measures such as doubling the heat insulation shall be taken.	For heating equipment such as boilers, it shall be examined to adopt equipment higher in thermal efficiency. For air conditioning, it shall be examined to adopt equipment high in thermal efficiency such as heat pumps.
"Management standard" shall be established to periodically maintain and check waste heat recovery equipment.	When waste heat recovery equipment is newly installed, measures such as intensifying heat insulation shall be taken.	Efforts shall be made to raise the waste heat recovery rate to "desired value".
"Management standard" shall be established to periodically maintain and check the combined heat and power generation equipment.	When power generation equipment or cogeneration equipment is newly installed, the capacity of the equipment shall be on a proper level.	The possibility of installing cogeneration equipment shall be studied if there is a great demand for steam or hot water. Remodeling of turbine shall be examined, if there is possibility of enhancing its efficiency.
"Management standard" shall be established to periodically maintain and check the receiving and transforming equipment, etc.	When a transformer is newly installed, its actual and future demand for electric power shall be examined to determine the voltage of power distributed and the capacity of the transformer.	When a totally-enclosed motor having an output of 0.2 to 37kW and a high efficiency is adopted, efforts shall be made to realize an efficiency higher than the "target value".
"Management standard" shall be established to periodically maintain and check the electric power applying equipment. "Management standard" shall be established to clean the lighting system occasionally.	When power using equipment is newly installed, its structure shall be the one easy to adjust the operational conditions. When lighting equipment is newly installed, considerations shall be given to adopt an energy-saving type.	It shall be examined to keep the power factor at 95% or more at the receiving end. For electric power applying equipment, it shall be examined to install a rotational speed controller. Efforts shall be made to adopt high efficiency lighting appliances, such as Hf fluorescent lamps and HID lamps.
		It shall be examined to effectively utilize the surplus factory steam, etc. inside or outside the factory.

4.5 Criteria for clients on the rationalization of energy use for buildings

(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 due to insolation 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"

(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.

4.6 Criteria for clients on the rationalization of energy use for houses

(Ministry of International Trade and Industry/Ministry of Construction Notice No. 2 March 30, 1999)

(1) Standards for annual heating and cooling loads, etc. according to area classification

The clients shall ensure that their houses satisfy either of the following standards; standards for annual heating and cooling loads specified in (a) below or standards for heat loss coefficient and summer insolation acquisition coefficient specified in (b) below.

(a)Standards for annual heating and cooling loads according to area classification

The annual heating and cooling load of the house shall be equal to or smaller than the standard value given in Table 1 according to area classification.

Annual heating and cooling load shall be a total of heating and cooling loads for a year (in mega joules) obtained according to the predetermined conditions.

(b)Standards for heat loss coefficient and summer insolation acquisition coefficient according to area classification

The heat loss coefficient of the house shall be equal to or smaller than the standard value given in Table 1 according to area classification.

$$\text{Heat loss coefficient} = \frac{\text{Overall heat transfer of walls, floors, earth floors, ceilings, windows, etc. combined + 0.35 no. of times of ventilation air volume of house}}{\text{total floor space of house}}$$

The summer insolation acquisition coefficient of the house shall be equal to or smaller than the standard value given in Table 1 according to area classification.

$$\text{Coefficient of summer solar radiation received} = \frac{\text{Total of (summer solar radiation entry rate for each site of walls and roofs area of that site)}}{\text{Total floor area of house}}$$

Table 1

Region \ Standard	Cooling and heating load/year (Unit: MJ/m^2 year)	Heat loss coefficient (Unit: W/(m^2 degree Celsius)	Coefficient of summer solar radiation received
I. Hokkaido	390	1.6	0.08
II. Aomori Pref./Iwate Pref./ Akita Pref.	390	1.9	0.08
III Miyagi Pref./Yamagata Pref./Fukushima Pref., etc.	460	2.4	0.07
IV Ibaraki Pref./Gunma Pref./ Saitama Pref., etc.	460	2.7	0.07
V. Miyagi Pref./Kagoshima Pref.	350	2.7	0.07
VI. Okinawa Pref.	290	3.7	0.06

(2) Standards for equivalent clearance area according to area classification

The equivalent clearance area of the house concerned shall be equal or smaller than the standard value given in Table 2 according to area classification.

$$\text{Equivalent clearance area} = \frac{\text{0.7 airflow volume passing through the clearance}}{\text{total floor area of house}}$$

Table 2

Region \ Standard	Equivalent clearance area (unit cm^2/m^2)
I. Hokkaido	2.0
II. Aomori Pref./Iwate Pref./ Akita Pref.	2.0
III Miyagi Pref./Yamagata Pref./ Fukushima Pref., etc.	5.0
IV Ibaraki Pref./Gunma Pref./ Saitama Pref., etc.	5.0
V. Miyagi Pref./Kagoshima Pref.	5.0
VI. Okinawa Pref.	5.0

(3) Moisture condensation proof

(a)Prevention of surface moisture condensation

In the sites requiring insulation, no portions (except opening) that may cause surface condensation and are significantly lacking in heat insulation shall be created.

(b)Prevention of condensation within walls

Proper measures shall be taken to prevent condensation within the walls, such as the installation of a moisture-proof airtight layer and ventilation layer, the use of dry timber, the construction of a ventilation opening in the attic or under the floor.

(4) Keeping necessary amount of ventilation

A comprehensive ventilation plan shall be developed so that the number of ventilation times of 0.5 or more times per hour for the entire house can be ensured.

(5) Prevention of inside air contamination caused by heating systems, etc.

Measures to prevent inside air contamination should be taken in the case where a combustion-type heating system or hot water supply system is installed.

(6) Maintaining energy efficiency in heating and cooling systems

System operation methods and energy efficiency shall be taken into account in the case where a heating or cooling system is installed.

(7) Employing ventilation routes for heat prevention

In areas where ventilation is effective against heat in summer, ventilation routes shall be ensured within the range that will not cause trouble or inconvenience to daily living by permitting the entry of burglars or excessive noise in houses.

4.7 Design and construction guidelines on the rationalization of energy use for houses

(Ministry of Land, Infrastructure and Transport, Notice No. 1,291, partially revised on August 1, 2001)

(1) Objective

This section aims to define guidelines relating to the design and construction of houses as well as proper measures to rationalize the use of energy for houses, according to the provisions prescribed in the "Criteria for Clients on the Rationalization of Energy Use for Houses".

(2) Portions required to be designed for heat insulation structure

Roofs or ceilings immediately beneath the roofs, ceilings exposed to the outdoor air, etc, walls, floors and openings, and earthen floors, etc. whose peripheries are exposed to the open air, shall be insulated according to the area classification.

(3) Standards relating to the heat insulation performance, etc. of building frames

(a) Standards for the design of building frames

The heat transfer coefficient of each portion shall be equal to or under the standard value determined according to the type of house, the construction method for heat insulation material and the area classification.

The thermal resistance of heat insulating agent used for each portion shall be equal to or higher than the standard value determined according to the type of house, the construction method for heat insulation material and the area classification.

(b) Standards for the installation of insulation materials

Keeping the heat insulation performance of the building frames

Preventing moisture condensation that could potentially degrade the heat insulation performance and the durability of the building frames

Reducing heat loss in heat bridges and preventing moisture condensation on their surfaces

(c) Standards for the construction of airtight layer

The equivalent clearance area shall be equal to or smaller than the standard value specified in the criteria according to the area classification.

(4) Standards for the heat insulation performance, etc. of openings

When making openings of a heat insulation structure, the standards prescribed for heat transfer coefficient and summer insolation entry rate or the standards for fixtures, etc. shall be followed.

(5) Standards for the ventilation plans

When making building frames and openings of heat-insulation structure, a ventilation plan shall be developed according to the standards for ventilation systems and the standards for ventilation plans depending on ventilation systems. When designing and constructing a house in connection with a ventilation plan, the designated points shall be taken into consideration.

(6) Standards for heating and cooling and hot water supply plans

When making building fames and openings of heat insulation structure, cooling and heating and hot water supply plans shall be developed according to the standards provided in 1) to 4) below.

1) Equipment which is proper for the heating and cooling load of the room concerned and has high partial load efficiency shall be selected.

2) When installing a combustion-type heating system, etc., an enclosed-type or outdoor-type heating system shall be selected so that the indoor air contamination can be reduced.

3) When using a semi-enclosed-type heating system, etc., proper measures shall be taken to prevent exhaust gas from flowing backward at the time of use of a local ventilation unit.

4) Heating and cooling equipment shall be designed so that continuous heating, partial heating, intermittent heating, etc. may be available as the resident desires.

(7) Standards for airflows

In order to keep rooms comfortable with airflow when the open air is comfortable, an opening shall be provided in each room in a different direction whenever possible.

(8) Provision of information regarding how to live

In view of the high air-tightness performance of the houses constructed according to this volume of guidelines, the person who designs and constructs a house shall clearly state the information in manuals for houses, etc., and provide the information to clients.

4.8 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 time established for each category. The details of the standards of each product will be shown in the section 4.9.

(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 18 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) Additional 7 products were designated in April 2003. LPG passenger vehicles were designated in July 2003.
11 products were designated originally in April 1999.	Total 18 products are designated as of November 2004.

(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
a	Gasoline passenger vehicles	FY2010	Approx. 23% compared to FY1995
b	Diesel passenger vehicles	FY2005	Approx. 15% compared to FY1995
c	LPG passenger vehicles	FY2010	Approx. 11.4% compared to FY2001
d	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
e	Fluorescent lights	FY2005	Approx. 16.6% compared to FY1997
f	TV sets	FY2003	Approx. 16.4% compared to FY1997
g	Video cassette recorders	FY2003	Approx. 58.7% compared to FY1997
h	Copying machines	FY2006	Approx. 30% compared to FY1997
i	Computers	FY2005	Approx. 83% compared to FY1997
j	Magnetic disk units	FY2005	Approx. 78% compared to FY1997
k	Diesel freight vehicles	FY2005	Approx. 7% compared to FY1995
	Gasoline freight vehicles	FY2010	Approx. 13% compared to FY1995
l	Electric refrigerators and freezers	FY2004	Approx. 30% compared to FY1998
		FY2004	
m	Space heaters	FY2006	Approx. 1.4% compared to FY2000 for gas space heaters; approx 3.8% for oil space heaters
n	Gas cooking appliances	FY2006	Approx. 13.9% compared to FY2000
o	Gas water heaters	FY2006	Approx. 4.1% compared to FY2000
p	Oil water heaters	FY2006	Approx. 3.5% compared to FY2000
q	Electric toilet seats	FY2006	Approx. 10% compared to FY2000
r	Vending machines	FY2005	Approx. 33.9% compared to FY2000
s	Transformers	FY2006: oil-filled transformers FY2007: mold transformers	Approx. 30.3% compared to FY1999

4.9 Evaluation criteria for machinery and appliances

(Based on Article 18 of "Energy Conservation Law")

a. Gasoline passenger vehicles

1) Target scope:

Gasoline passenger vehicles which have received designation with the seating capacity of 10 persons or less

2) Energy Consumption Efficiency

A numeric value (km/l) expressed as mileage per liter when driven in 10-15 mode.

3) Category, Target values

Category Weight (kg)	Target standard value (km/L)
- 703	21.2
703 - 828	18.8
828 - 1,016	17.9
1,016 - 1,266	16.0
1,266 - 1,516	13.0
1,516 - 1,766	10.5
1,766 - 2,016	8.9
2,016 - 2,266	7.8
2,266 -	6.4

4) Target fiscal year: 2010

5) Energy conservation effects

Approximately 23% improvement in efficiency compared to 1995 levels by 2010.

b. Diesel passenger vehicles

1) Target scope:

Diesel passenger vehicles that have received designation, with the seating capacity of 10 persons or less.

2) Energy Consumption Efficiency

A numeric value (km/l) expressed as mileage per liter when driven in 10/15 mode.

3) Category and Target values

Category Weight (kg)	Target standard value (km/L)
- 1016	18.9
1,016 - 1,266	16.2
1,266 - 1,516	13.2
1,516 - 1,766	11.9
1,766 - 2,016	10.8
2,016 - 2,266	9.8
2,266 -	8.7

4) Target fiscal year: 2005

5) Energy conservation effects

Approximately 15% improvement in efficiency compared to 1995 levels by 2005.

c. LP gas passenger vehicles

1) Target scope:
LP gas passenger vehicles that have received designation, with the seating capacity of 10 persons or less.

2) Energy Consumption Efficiency
A numeric value (km/l) expressed as mileage per liter when driven in 10-15 mode.

3) Category and Target values

Category Weight (kg)	Target standard value (km/L)
- 1016	18.9
1,016 - 1,266	16.2
1,266 - 1,516	13.2
1,516 - 1,766	11.9
1,766 - 2,016	10.8
2,016 - 2,266	9.8
2,266 -	8.7

4) Target fiscal year: 2010

5) Energy conservation effects
Approximately 11.4% improvement in efficiency compared to 2001 levels by 2010.

4.10 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 .
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 ,
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 June 25, 1993 and had a ten-year life span. However, it was partially revised in March 15 and determined to be extended until 31 March 2013.

4.11 Financial measures to accelerate the introduction of energy efficient technologies/equipment in the industrial and commercial sectors

Target Projects	Organization	Interest rate
Energy conservation promotion projects for the industrial sector The following projects which will make it possible to reduce energy consumption by 100kL or more per year in terms of crude oil: (Effective energy use) (1) The projects (including ESCO projects) for installing the additional equipment for collecting non-used energy, such as waste heat, or the equipment for raising the efficiency of energy use, which will increase energy, use efficiency by 20% or more. (Promotion of the introduction of the approved equipment for the industries of the effective energy use type) (2) The projects in which the enterprises approved under Article 4 of Energy Conservation Assistance Law install or improve the approved equipment at their factory or place of business.	DBJ ODFC	Preferential rate I *1 *2 *3
Energy conservation promotion projects for the buildings (1) Repairing projects contributing to improvement in energy saving performance (exclusive to ESCO projects) (Promotion of the introduction of the approved equipment for the business approved as the one of the effective energy use type, etc.) (2) In the case where the enterprises approved under Article 4 of Energy Conservation Assistance Law, etc. construct buildings (including the case where the enterprises extend or reconstruct buildings), the projects for installing or improving the approved equipment, etc. (3) The energy conservation projects for the buildings such as office buildings, department stores, hotels, etc. in which those mid-and-long term plans made by those investors according to Energy Conservation Law need to be accomplished.	DBJ ODFC	Preferential rate I *4
Energy conservation promotion projects for the consumer sector (1) The projects which will install or improve the manufacturing equipment which meets the Judgment Standard for the equipment specified under the Energy Conservation Law, and the projects which will be approved to be sufficient to meet the standard at an early stage of the onset of the projects.	DBJ ODFC	Preferential rate I *5
Improving Cogeneration Systems Projects which will introduce the cogeneration facilities with 60% or more of efficiency of primary energy use and 50kW or more output.	DBJ ODFC	Preferential rate I

*1 The preferential rate II is applied until the end of FY2004.

*2 Energy conservation promotion projects for the industrial sector are provided with interest subsidies from Oil Special Account in Category (2) and only to ESCO in Category (1). The preferential rate I is applied only to the projects until the end of FY2004 that are given a loan during the period when an application for interest subsidy is accepted.

*3 The preferential rate III is applied only to ESCO until the end of FY2004.

*4 Energy conservation promotion projects for buildings are provided with interest subsidies from Oil Special Account in Category (2). The preferential rate II is applied only to the projects that are given a loan during the period when an application for interest subsidy is accepted.

*5. These projects are provided with interest subsidies from Oil Special Account.

DBJ: Development Bank of Japan
ODFC: The Okinawa Development Finance Corporation
NEF: North East Finance of Japan
JFS: Japan Finance Corporation for Small Business
PFC: People's Finance Corporation

For Small and Medium-sized Enterprises

Target Projects	Organization	Interest Rate
(Promoting the efficient use of energy) Projects which will acquire energy conservation facilities (including remodeling and updating of existent facilities). In terms of Specified Facilities and ESCO projects, lease and rental of energy conservation facilities fall within the scope of the fund.	JASME NFLC ODFC	Special interest rate 1
(Promoting the introduction of energy conservation facilities) Projects which will replace obsolete industrial furnaces and boilers or projects that will install additional equipment which has performance comparable to energy conservation-type equipment.	JASME NFLC ODFC	Special Interest rate 3 *
(Promoting the use of alternative energy sources) Projects which will install equipment which use alternative energy sources for oil as its fuel.	JASME NFLC	Special interest rate 1 *

* Interests are subsidized from Oil Special Account.

JASME: Japan Finance Corporation for Small and Medium Enterprise
NFLC: National Life Finance Corporation
ODFC: The Okinawa Development Finance Corporation

4.12 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 : 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 JMF2.

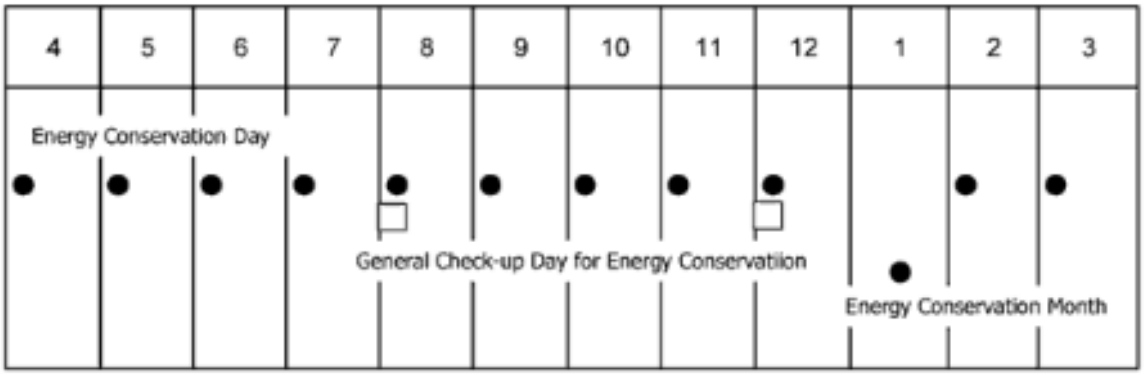
(9) The Energy Conservation Grand Prize will be awarded to equipment, resources or systems which have already or likely to be launched into markets and have high excellence in energy conservation. The prize has three genres: i) home-use, ii) commercial use, and iii) automobiles. Entries are judged on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

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

4.13 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 25, 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 29, 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 24, 1980	Energy and Resources Conservation Measures Promotion Conference

4.14 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.

a. Target factories: A firm whose capital is less than 100 million yen or whose total number of employees is less than 300.
b. Cost: Free of charge
c. Number of auditors and auditing period: Number of experts: 1-2; Period: 1-2 days
d. Audit
1) Advice on heat energy
2) Advice on electric energy
e. Organization: The Energy Conservation Center, Japan

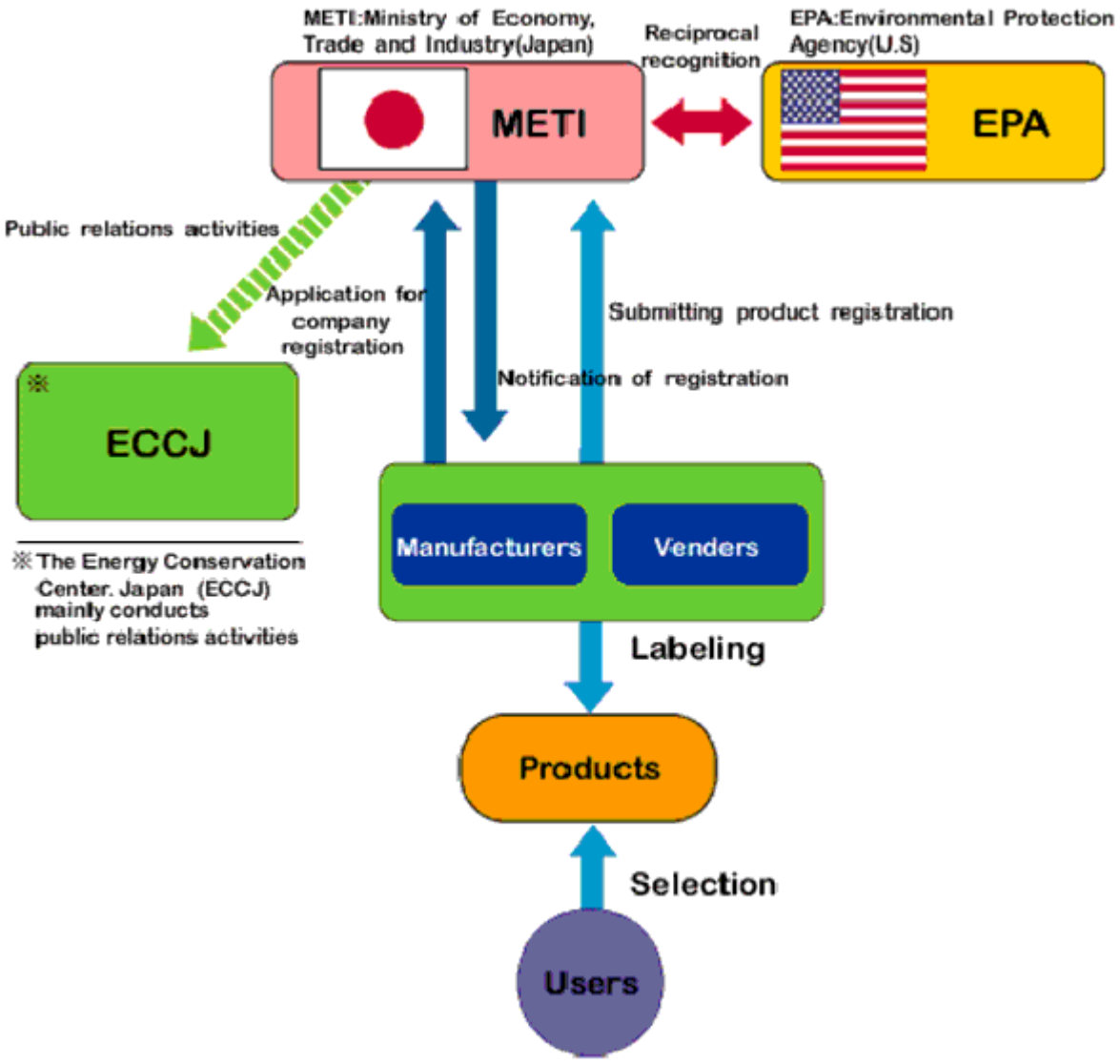
(2) Energy Audit for commercial buildings
a. Target buildings: Buildings designated as "1st class designated Building" according to the Energy Conservation Law.
b. Cost: Free of charge
c. Details of audit: Two or three audit experts will make an interview with the persons in charge about the management 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.
d. Organization: The Energy Conservation Center, Japan

4.15 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.

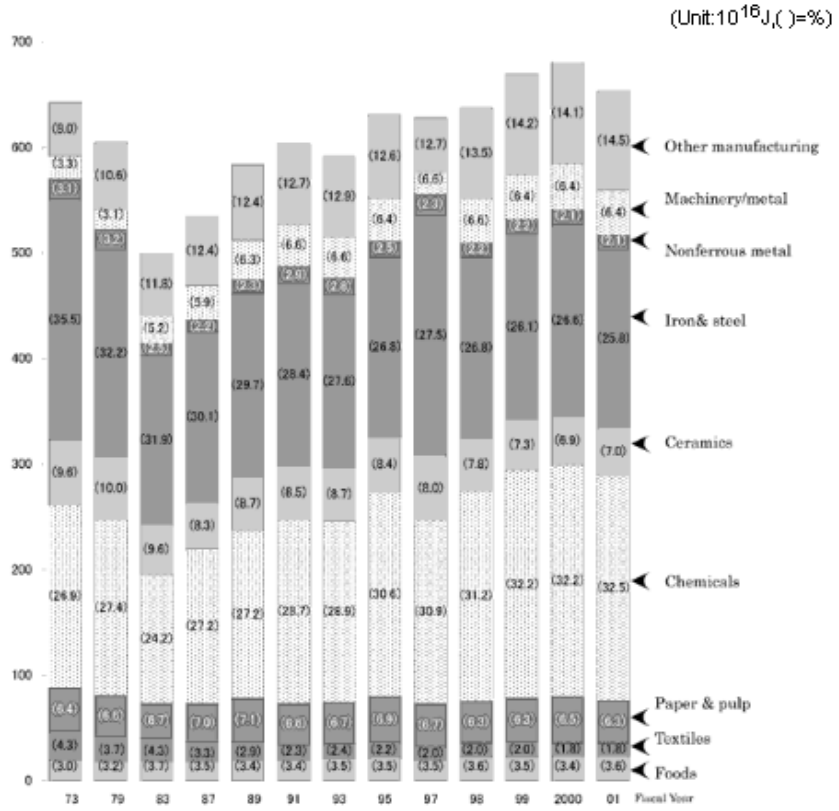
(2) Scheme



5 Energy Conservation by sector

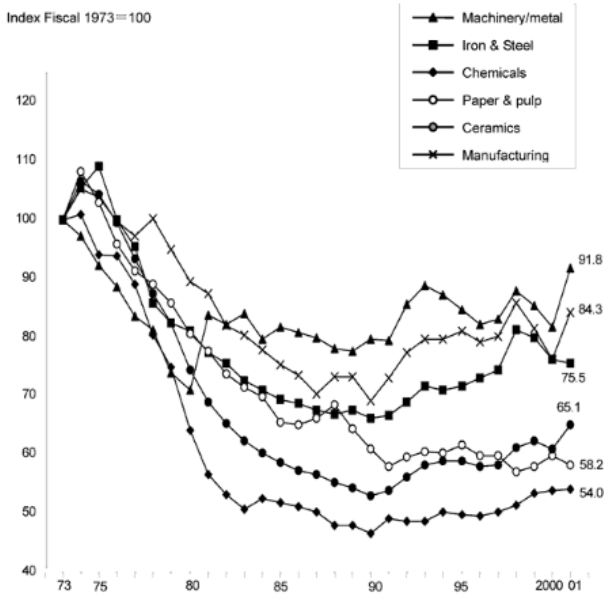
5.1 Energy conservation in the industrial sector

(1) Energy consumption by manufacturing industry



Source) "Energy Production, Supply and Demand Statistics"

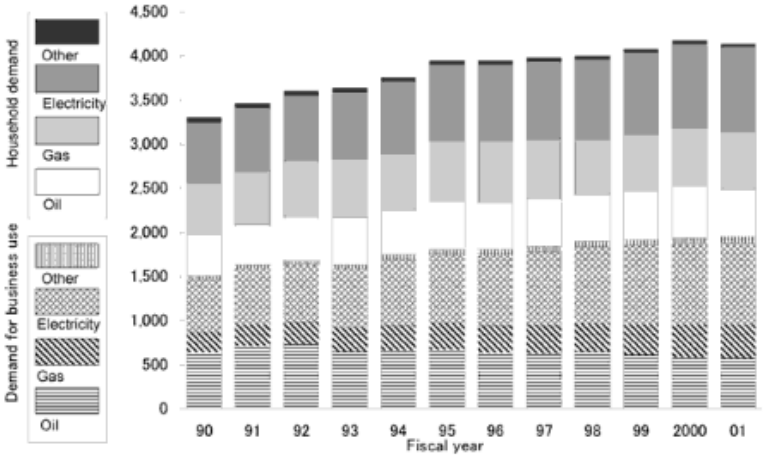
(2) Energy intensities in major industries (IIP)



Note) IIP means indices of Industrial Production (Energy consumption, calorie / production, yen)
Source) Prepared based on the 2002 Directory of EDMC Handbook of Energy and Economic Statistics

5.2 Energy conservation in the commercial/residential sector

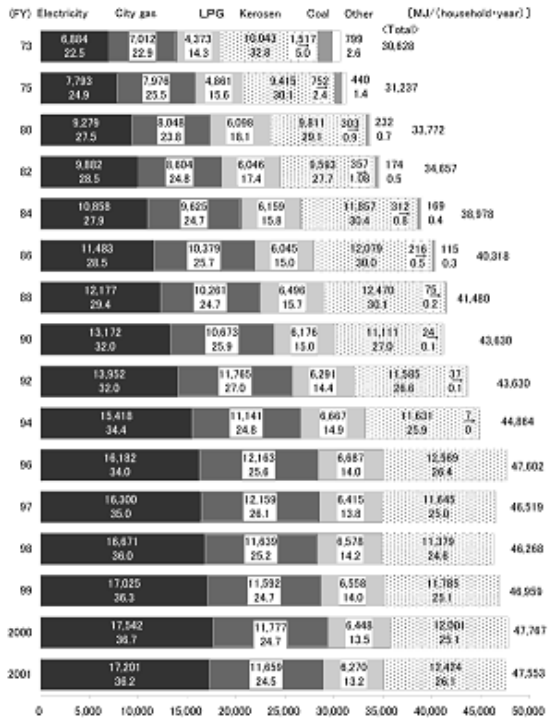
(1) Energy consumption by fuel



	90	91	92	93	94	95	96	97	98	99	2000	2001
Energy demand of residential and civil sector	3,304	3,465	3,599	3,640	3,757	3,946	3,948	3,983	4,002	951	956	971
Demand for domestic use	1,796	1,837	1,923	2,005	2,009	2,144	2,143	2,139	2,099	2,159	2,235	2,186
Oil	457	454	496	536	504	557	536	535	524	558	582	541
Gas	598	616	638	661	638	687	698	684	629	632	661	658
Electricity	685	713	737	758	818	852	864	877	906	932	955	952
Other	56	54	52	50	49	47	45	44	40	37	37	34
Demand for service use	1,507	1,628	1,676	1,634	1,749	1,802	1,805	1,843	1,903	1,917	1,940	1,948
Oil	643	717	734	651	666	672	634	630	650	611	586	576
Gas	224	241	250	267	281	299	310	322	316	352	370	378
Electricity	599	630	651	672	745	765	794	826	867	891	917	925
Other	42	41	41	45	57	67	67	65	69	64	67	69
Energy intensity per household(106,i/household)	43,648	43,945	45,297	46,549	45,996	48,460	47,797	47,020	45,483	46,120	47,133	45,529
Energy intensity per business area(106,i/m2)	1,173.60	1,227.00	1,227.80	1,161.80	1,203.20	1,203.60	1,180.50	1,179.10	1,179.10	1,176.20	1,172.60	1,155.40

Source) Prepared based on the 2002 Directory of EDMC Energy and Economic Statistics

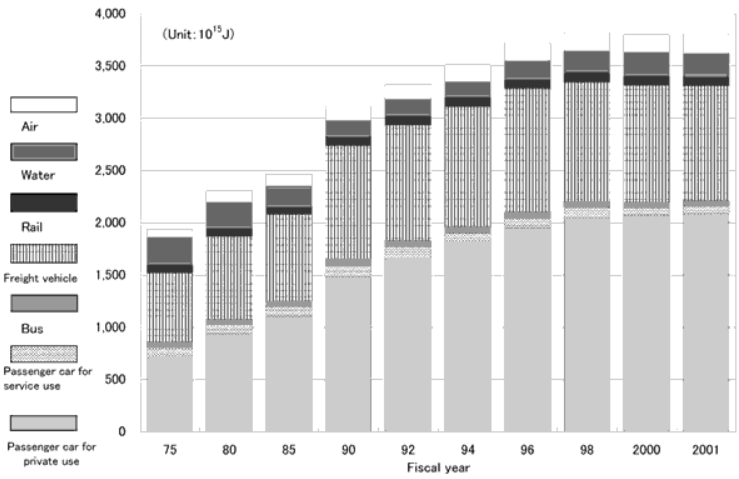
(2) Energy consumption per household, by fuel



Note) The lower figures in the bar represent percentage distribution.
Source) "Domestic Energy Statistics Annual Report 2001", Residential Environment Planning & Research Center

5.3 Energy conservation in the transportation sector

(1) Energy consumption by type of transport



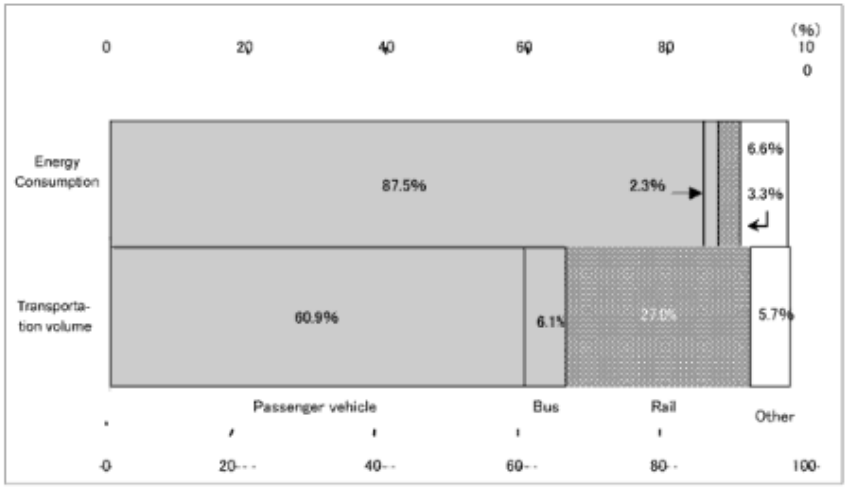
Unit: 10^{15}J

	FY 75	80	85	90	92	94	96	98	2000	2001
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	3,806
	(5.3)	(-1.2)	(2.4)	(4.5)	(2.3)	(4.7)	(2.6)	(1.1)	(-2.2)	(0.2)
Total of passenger sector energy consumption	997	1,245	1,417	1,855	2,044	2,193	2,346	2,448	2,431	2,465
	(7.5)	(0.9)	(3.4)	(6.5)	(3.5)	(5.4)	(3.4)	(1.8)	(-2.7)	(1.4)
Passenger car for private use	713	942	1,108	1,485	1,664	1,823	1,955	2,050	2,075	2,090
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	58
Rail	61	63	64	78	79	81	81	82	80	80
Water	6	5	4	5	8	7	9	7	9	9
Air	70	99	98	119	127	143	151	154	145	162
Total of freight sector energy consumption	941	1,058	1,047	1,259	1,283	1,323	1,376	1,372	1,368	1,341
	(3.1)	(-3.6)	(1.2)	(1.6)	(0.2)	(3.6)	(1.3)	(0.1)	(-1.3)	(-2.0)
Motor truck	657	791	826	1,084	1,105	1,147	1,178	1,140	1,116	1,096
Rail	17	13	8	7	7	6	6	6	6	6
Water	262	244	200	151	153	149	171	203	222	218
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.
"Water" means "Internal navigation"

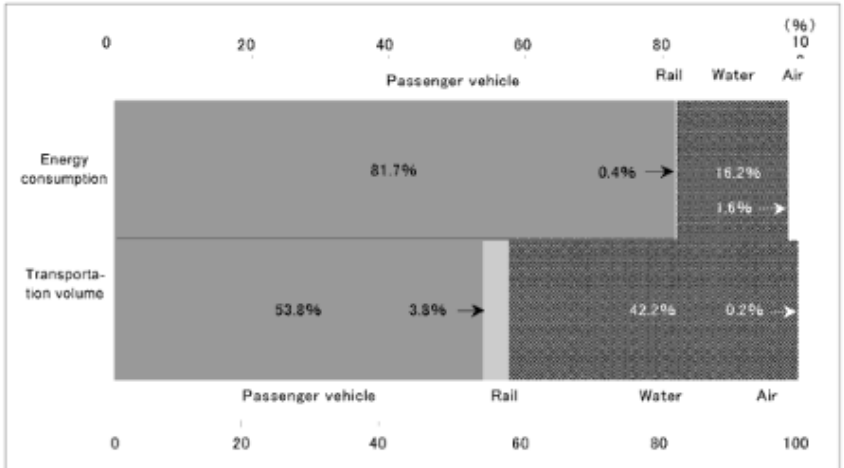
(2) Energy consumption and transportation volume by type of transport (2001)

(A) Energy consumption and transportation volume by type of passenger transport



Source) Prepared based on "2002 EDMC Energy/Economy Statistics Summary"

(B) Energy consumption and transportation volume by type of freight transport



Source) Prepared based on "2002 EDMC Energy/Economy Statistics Summary"

5.4 Current trend and development of energy conservation efforts

(1) Background

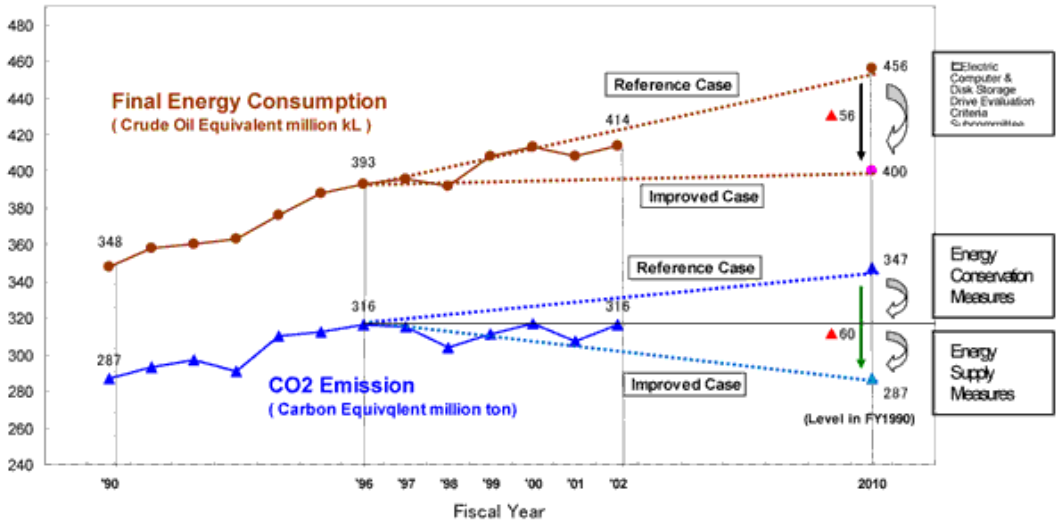
At the Third Conference of the Parties to the UN Framework Convention on Climate Change (COP3), held in Kyoto in December 1997, an agreement was reached on greenhouse gas emissions reduction targets for developed countries. As part of this agreement, Japan pledged a 6% reduction in greenhouse gas emissions 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) Current trend

On the heels of COP3, the Long-term Energy Supply-Demand Outlook was reviewed and revised by METI's Advisory Committee in 1998, aiming to attain the GHG emission reduction target committed to at COP3.

Outlook of Energy Consumption and CO2 Emission

Based on the revised outlook made by METI's Advisory Committees in 1998
- To attain the GHG emission reduction target committed at COP3 -



The above chart shows the long-term energy consumption outlook of Japan, forecasting that energy consumption and the emission of greenhouse gases in 2010 will increase respectively to 456 million kL of crude oil equivalent and to 347 million carbon tons of CO2 in the case of BAU (Business-As-Usual).
To attain Japan's target of the COP3 commitment, it would need not only to maintain the energy consumption in 2010 at 400 million kL, which means reducing it by 56 million kL through energy conservation, but also to introduce more active energy supply measures with lower CO2 emissions including atomic energy, new energies and other non-fossil energies.

(3) Outlook & Projection for Energy Consumption and CO2 Emission

The Long-term Energy Supply-Demand Outlook was further reviewed and revised by METI's Advisory Committee in 2001 and in 2004.

Outlook & Projection for Energy Consumption and CO2 Emission
(Based on the outlooks made by METI's Advisory Committee)

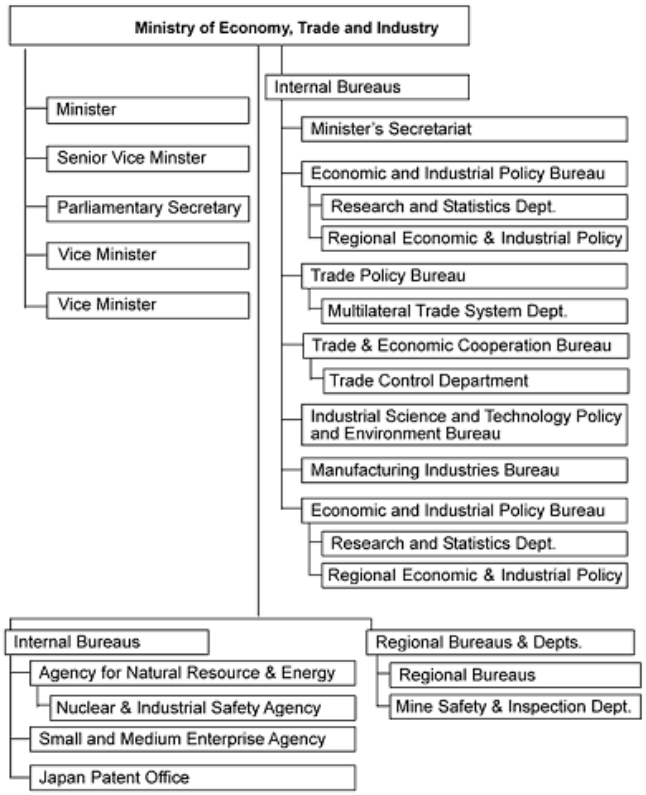
	FY1990 (Actual)	Outlook and Projection for FY2010								
		Revised in 1998			Revised in 2001			Revised in 2004		
		BAU	Effect of Measure(A)	Improved State	Effect of Measure(A)	Additional Measure(B)	Improved State	Effect of (A)+(B)	Additional Measure(C)	Improved State
Final Energy Consumption (million kL)	348	456	-56	400	-50	-7	402	-55	-10	394
CO_2 Emission (million tons - Carbon)	287	347	-60	287	[-60]		287	[-60]		287
Compared to FY1990 level	-	21%	---------->	0%	63%	---------->	0%	49%	---------->	0%

According to the further review and revision in 2001, the energy conservation effects of the conventional measures projected in 1998 would be 50 million kL, revised from 56 million kL. Therefore additional measures for the reduction of 7 million kL would be needed to attain the target.
According to the further review and revision in 2004, the energy conservation effects of the conventional measures projected in 2001 would be 55 million kL, revised from 57 million kL. Therefore, additional measures for the reduction of 10 million kL would be needed to attain the target.

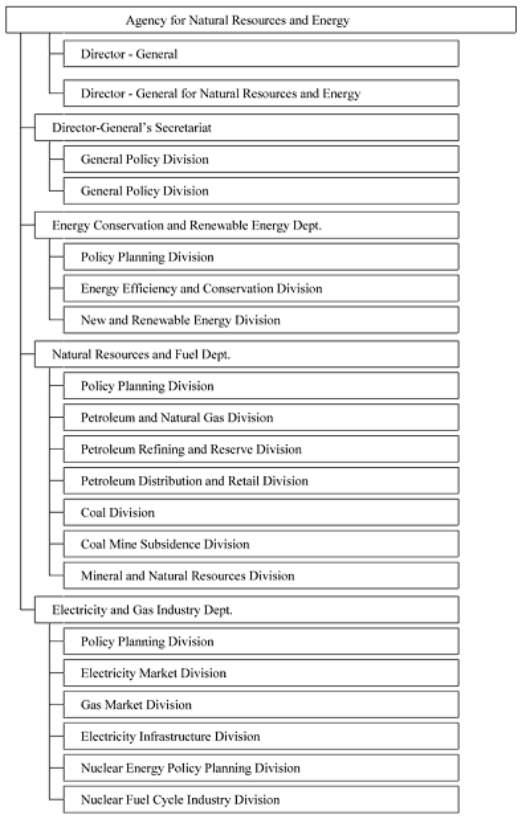
6 Institutional Organization

6.1 Ministry of Economy, Trade and Industry (METI)

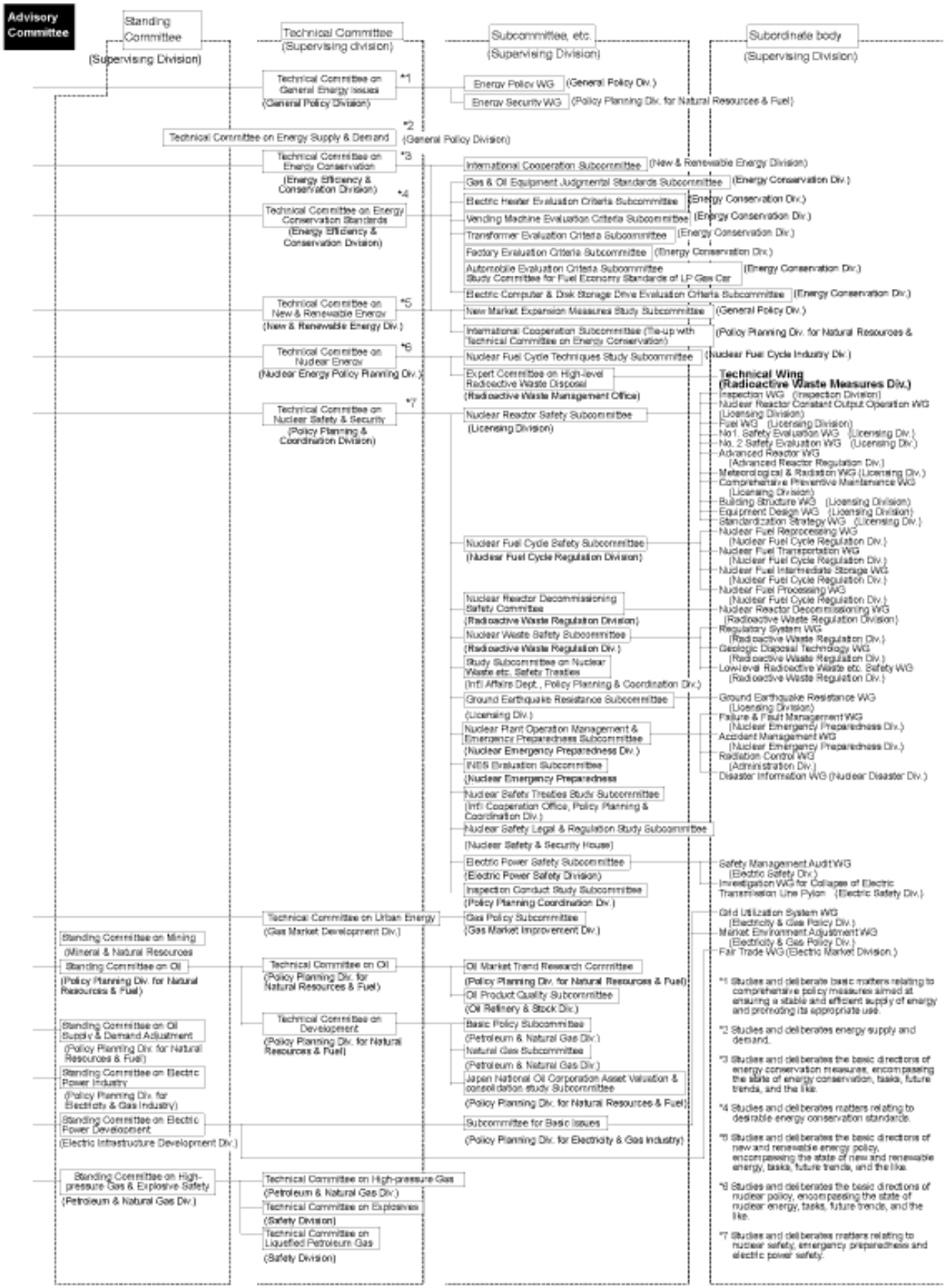
(1) Organizational chart of METI



(2) Organizational chart of Agency for Natural Resources and Energy (ANRE)



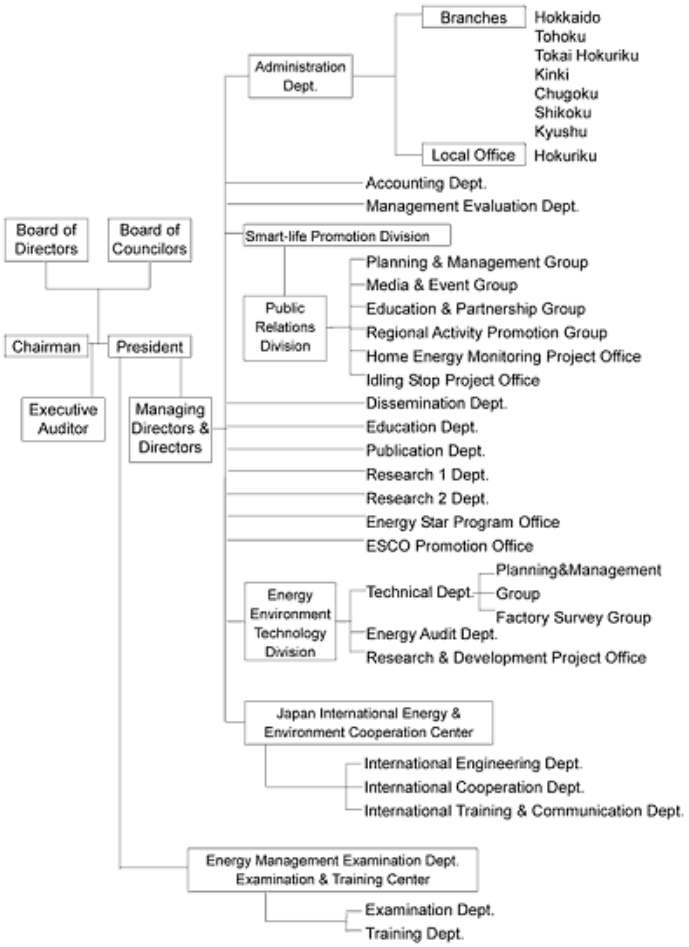
6.2 Advisory Committee (As of Oct. 2001)



6.3 The Energy Conservation Center, Japan (ECCJ)

(1) Organizational chart of ECCJ

<As of 1 April 2004>



(2) About ECCJ

Legal status:An incorporated foundation under the supervision of METI
Establishment:1978 (just when hit by the 2nd oil crisis)
Mission:Core organization responsible for promotion of energy conservation
Office location: Head office & 8 branches in Japan
Supporting member:2,868 members (as of Dec. 2003)
Staff:153 persons (as of Apr. 2003)
Budget:5,869 million yen in 2003FY (53 million U$)
Fields of activity:Industrial, Residential/Commercial and Transportation sectors
Major activities: For Industry sector;
1) Energy conservation audit services for factories
2) Education & training on energy conservation
3) State examination for energy managers
4) Technological development
5) Disseminating excellent energy conserving equipment
6) ISO14001 seminar for environmental inspectors
For Residential & Commercial sector;
1) Energy conservation audits services for buildings
2) Energy labeling system
3) Ranking catalogue for energy efficient appliances
4) Energy Saving Navigation (ESN)
5) Establishment of "Energy Conservation Republic"
6) Education at primary/middle model schools
7) International Energy Star program implementation
8) ESCO research and development
Cross-sector and for Transportation sector ;
1) Energy conservation campaign & exhibition (ENEX)
2) Conference for presentation of successful cases
3) Commendation (grand energy conservation prize)
4) Survey and monitoring
5) Information & data base
6) Publicity and publishing
7) Consulting service through e-mail
8) International cooperation and 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	
(20.70%)		1953	4,150
(22.20%)		1954	3,850
(24.00%)		1955	3,600
(25.80%)		1956	3,350
(26.80%)		1957	3,200
(28.60%)		1958	3,000
(31.10%)		1959	2,750
(31.90%)		1960	2,700
(32.70%)		1961	2,650
(33.90%)		1962	2,550
(36.00%)		1963	2,400
(36.50%)		1964	2,350
(36.90%)		1965	2,350
(37.40%)		1966-70	2,300
(38.10%)		1971-99	2,250
(39.98%)		2000-	2,150

Source) "Energy Production, Supply and Demand"