Energy Situation in Japan

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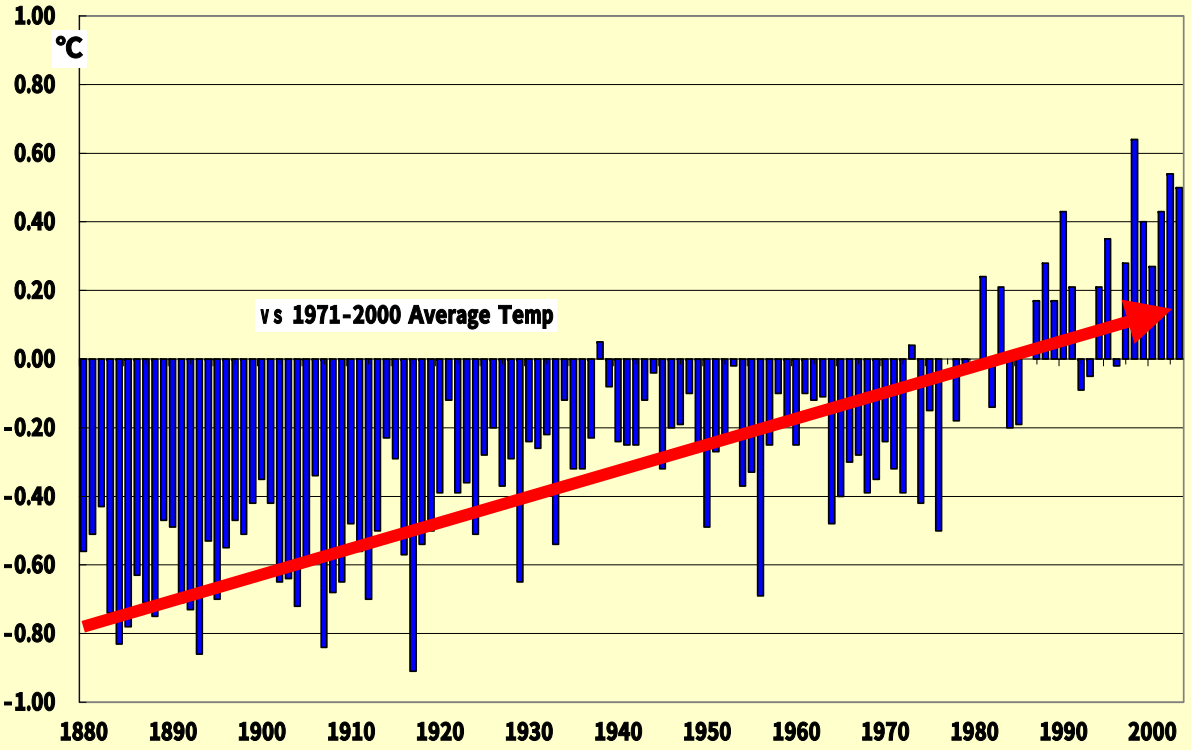
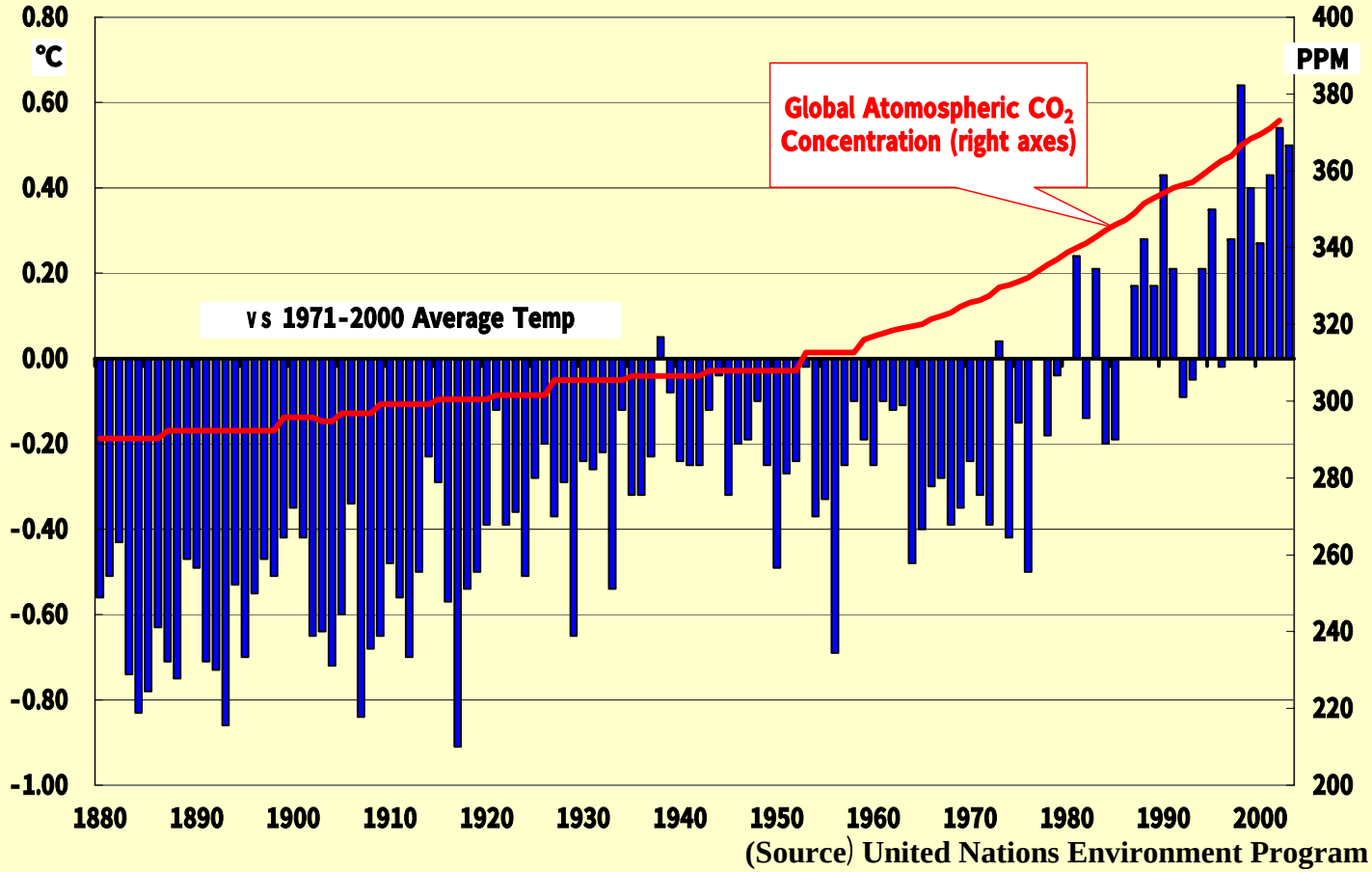
Trend in Global Temperature



(Source) World Meteorological Organization (WMO)

- The mean global surface temperature has increased by about 0.3 to 0.6℃ since the late 19th century and by about 0.2 to 0.3℃ over the last 40 years.
- Global Average Temperature in 2003 : +0.50℃ (against average temp. of 1971-2000) (3rd highest after 1880)(2002 : +0.58 ℃, Highest temperature was recorded in 1998, +0.64℃) .
- Japan's Average Temperature in 2002 : +0.53℃ (5th highest after 1898, highest temperature was +1.04℃ in 1990)

Atmospheric CO_2 Concentration

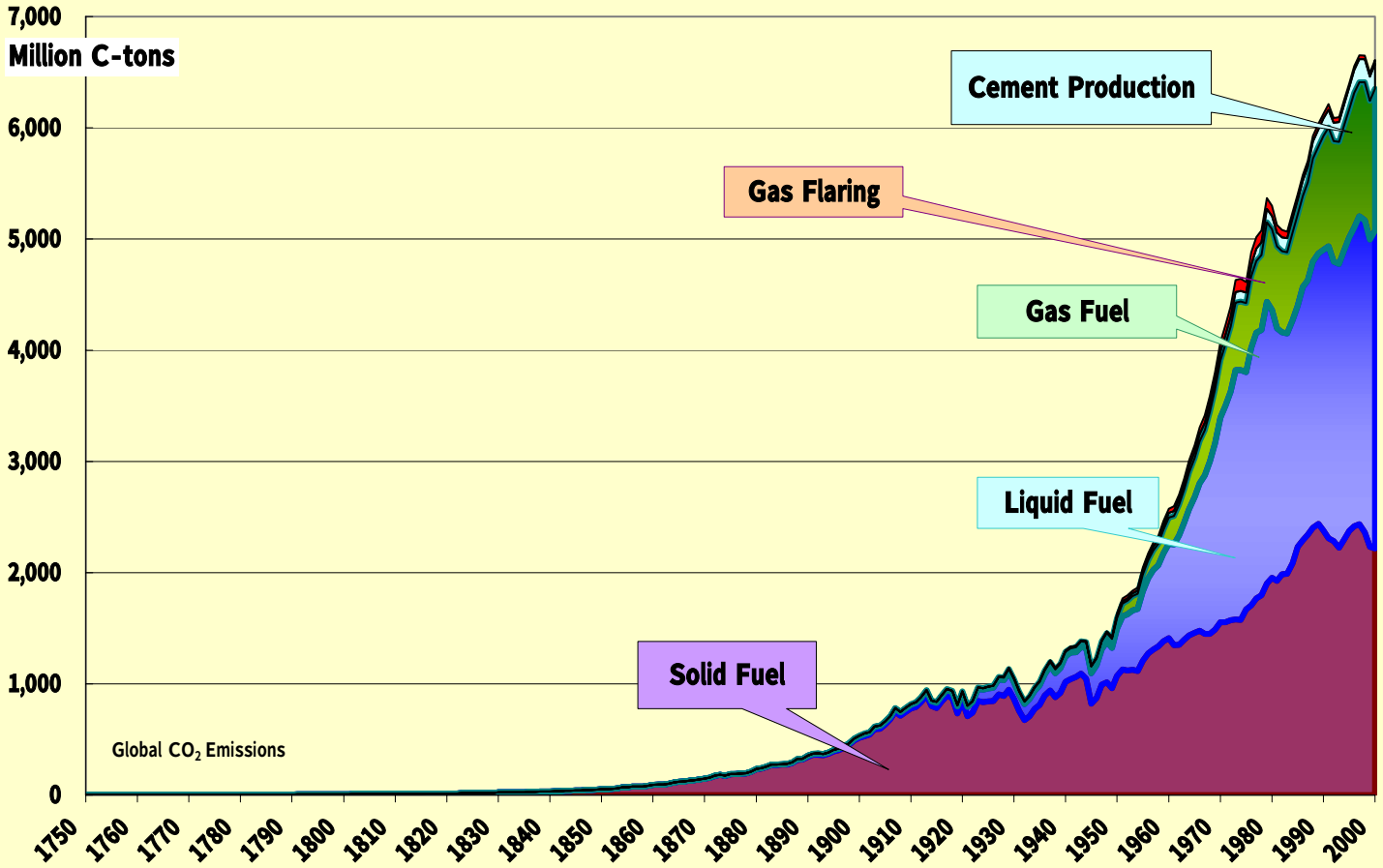


(Source) United Nations Environment Program

- **Atmospheric CO_2 has increased from a pre-industrial concentration of about 280 ppm to about 370 ppm at present.**

Note : CO_2 concentration data from before 1958 are from ice core measurements taken in Antarctica and from 1958 onwards are from the Mauna Loa measurement site.

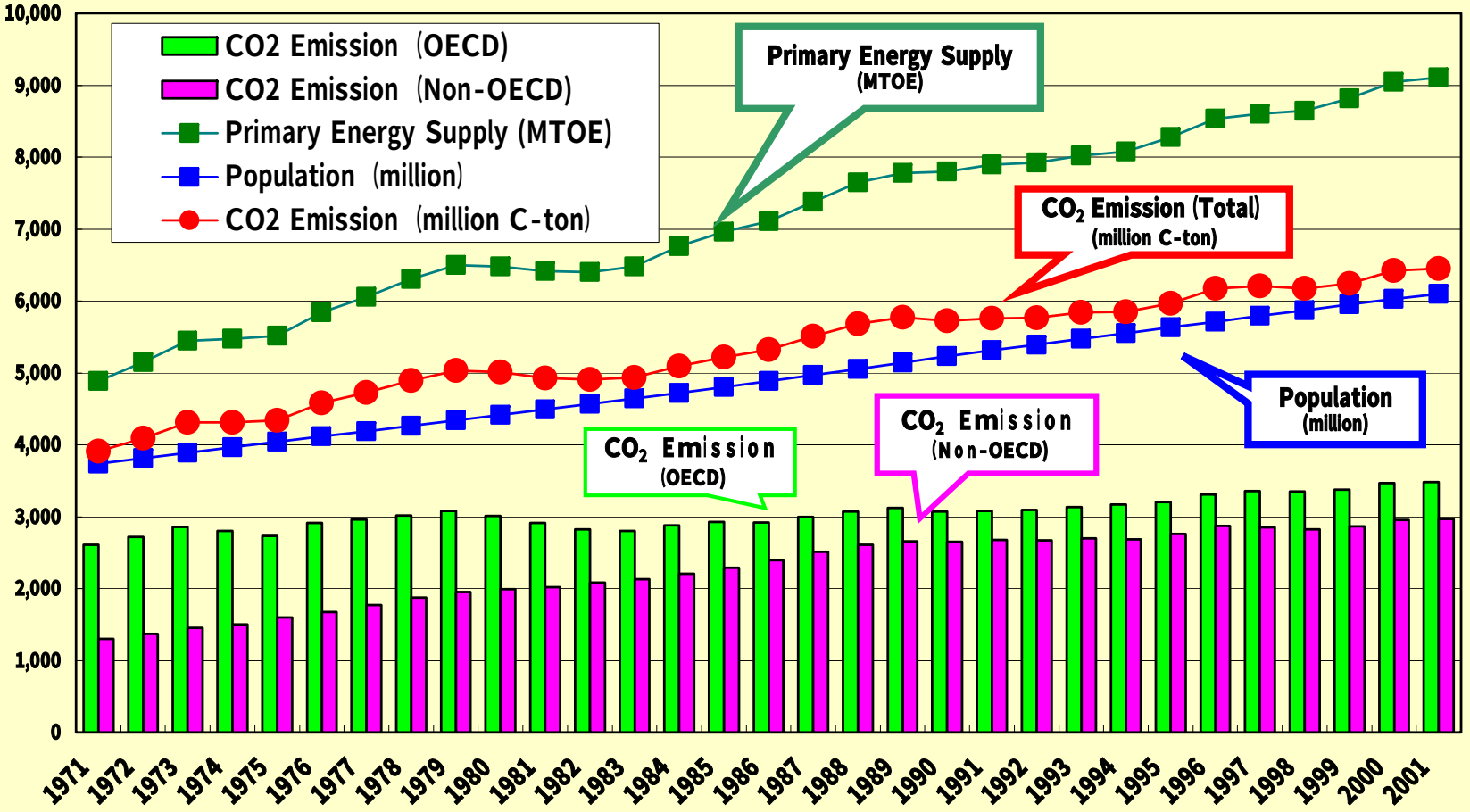
CO_2 Emission from Fuel Combustion



(Source) Oak Ridge National Laboratory

- **It is evident that the rapid increase in CO2 concentrations has been occurring since the onset of industrialization. The increase has closely followed the increase in CO2 emissions from fossil fuels.**

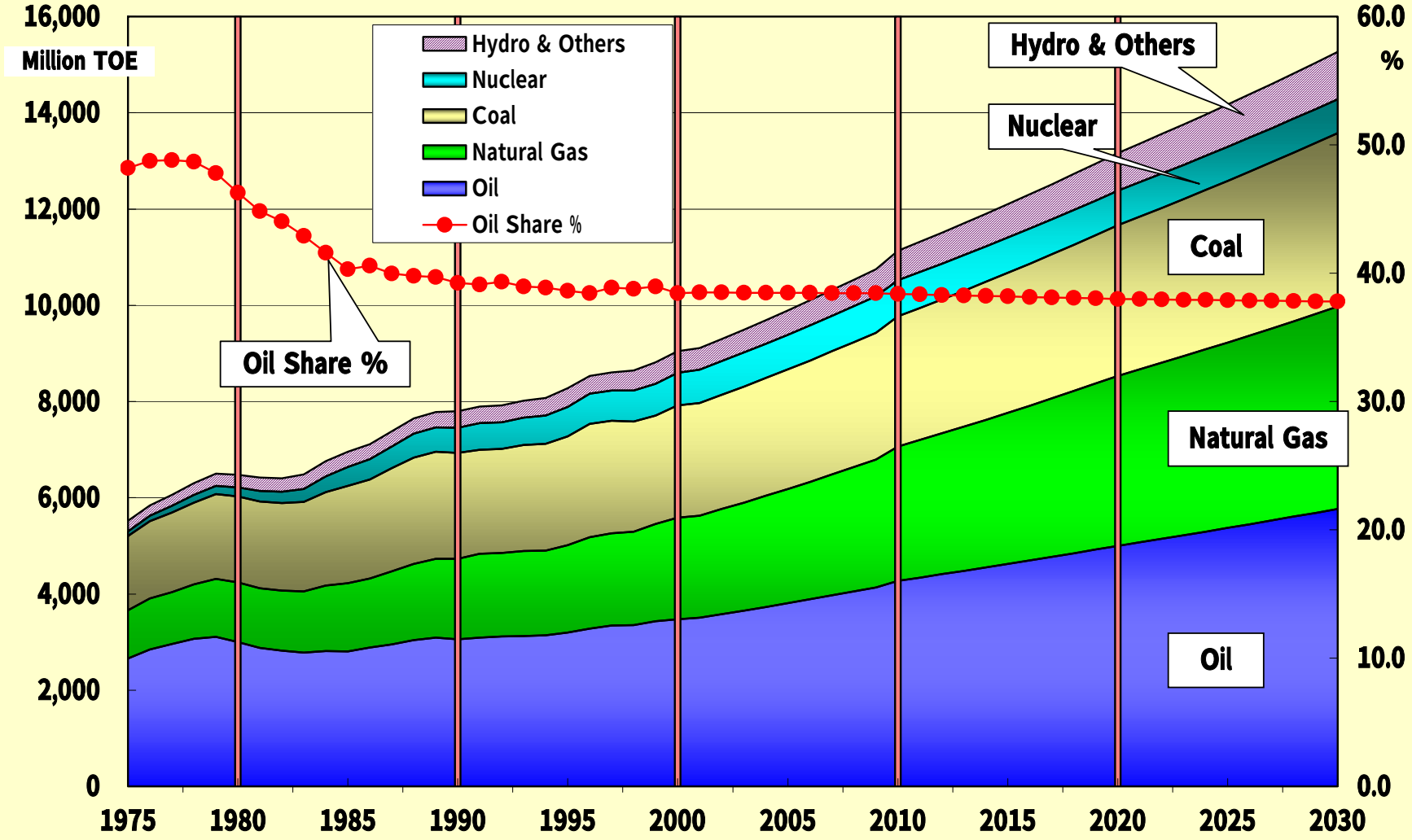
World Primary Energy Supply



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

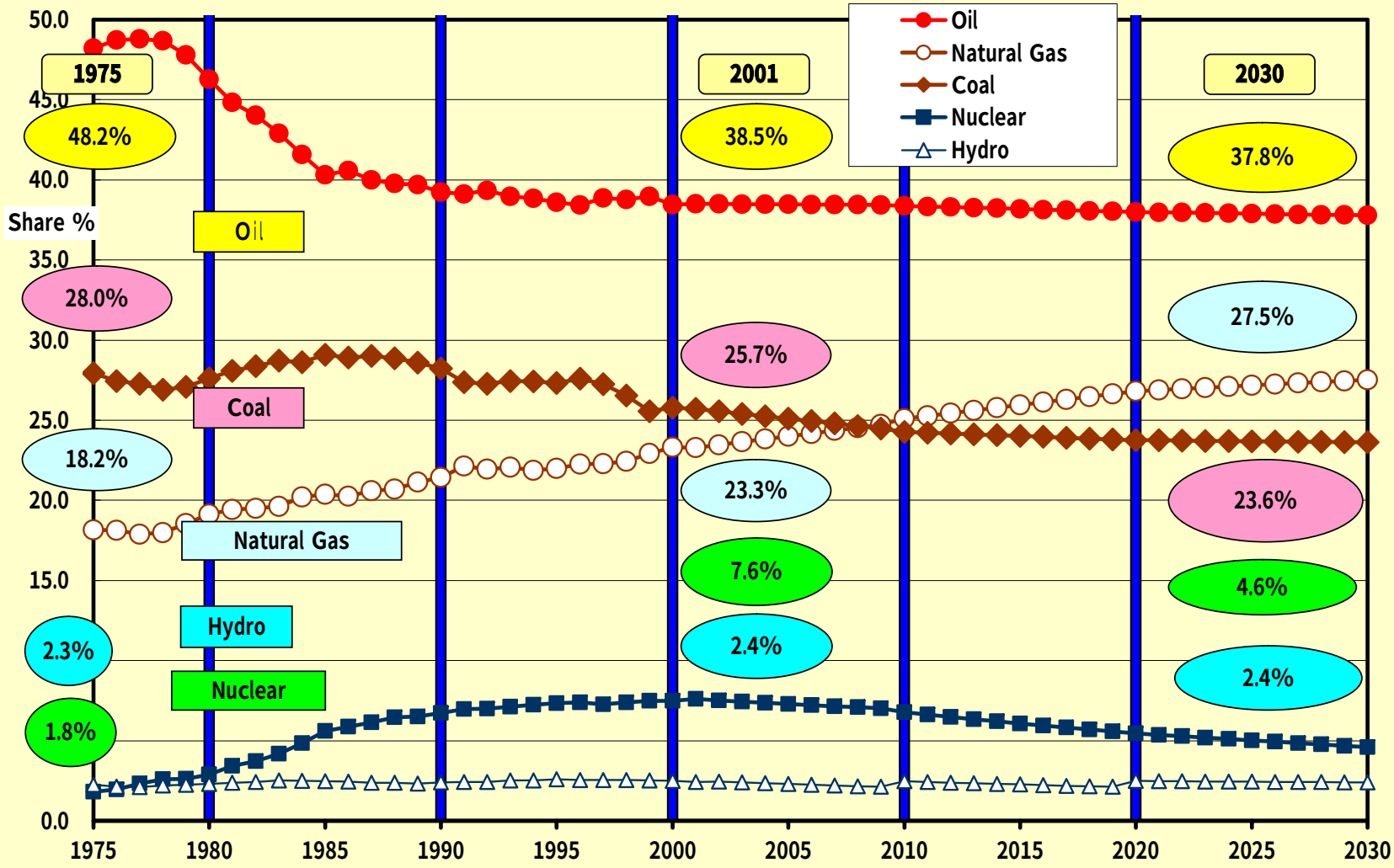
Note : 1 Ton of Oil Equivalent (TOE) = 1.08127 KL of Crude Oil = 1×10^7 Kcal

World Energy Outlook



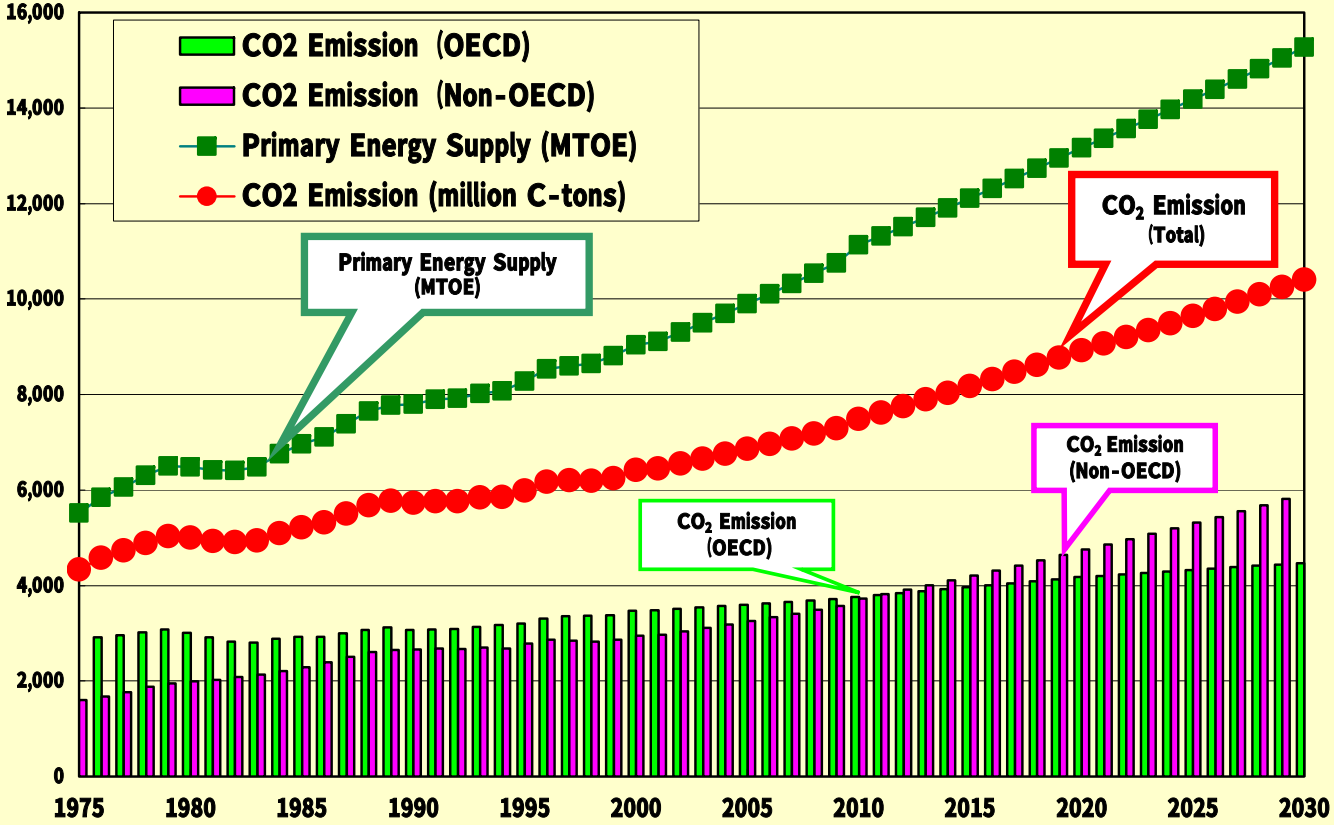
(source) IEA, World Energy Outlook 2002

Energy Share in 2030



(source) IEA, World Energy Outlook 2002

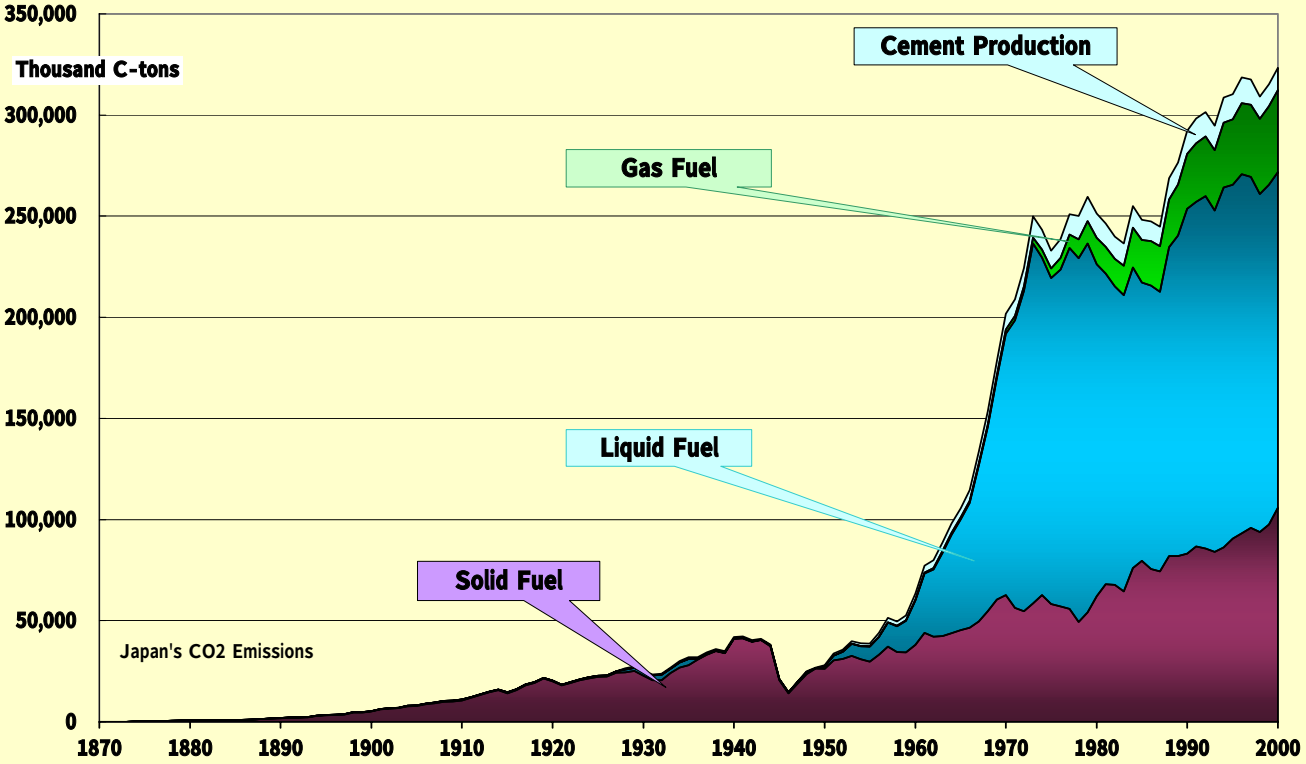
CO_2 Emission in 2030



	1975	2001	2030
Population (Million)	3,739	6,099	8,200
Primary Energy Supply (MTOE)	5,517	9,109	15,267
CO2 Emission (OECD)	2,736	3,483	4,472
CO2 Emission (Non-OECD)	1,600	2,966	5,936

(source) IEA, World Energy Outlook 2002

Japan's CO_2 Emission



(Source) Oak Ridge National Laboratory

	Japan	World	Share %
Population (2001, Million)	127	6,099	2.1
Primary Energy Supply (2001, MTOE)	521	9,109	5.7
CO2 Emission (2001, Mt-C)	327	6,449	5.1
GDP (2001)（1995 Price, Billion USD)	5,648	34,657	16.3

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

Kyoto Protocol

- Reduction in emission of greenhouse effect gases by 6 % at least from the base year (1990) in the target period (2008 to 2012)

Trends in Japan's GHGs Emission

Gases by years in Japan (in Million Tons of CO_2 equivalent)								in Million Tons of C-Equivalent
Year	CO_2	CH_4	N_2O	HFC_s	PFC_s	SF_6	Total	
1990	1,119.3	26.7	38.8	17.9	5.7	38.2	1,246.7	340.0
1991	1,138.5	26.9	38.4	18.1	6.4	43.5	1,271.8	346.9
1992	1,148.9	26.5	38.7	19.8	6.4	47.8	1,288.0	351.3
1993	1,136.4	26.4	38.5	21.3	8.9	45.4	1,276.9	348.2
1994	1,194.8	26.0	39.4	28.8	12.3	45.4	1,346.7	367.3
1995	1,208.0	25.3	39.6	31.2	16.6	52.6	1,373.2	374.5
1996	1,219.4	24.6	40.5	31.6	18.6	50.2	1,385.1	377.7
1997	1,219.4	23.7	41.0	34.9	19.7	49.7	1,388.4	378.6
1998	1,191.7	23.0	39.7	31.6	17.8	50.0	1,353.7	369.2
1999	1,232.8	22.6	34.0	38.7	17.4	34.1	1,379.5	376.2
2000	1,237.1	22.0	36.9	42.5	19.3	28.5	1,386.3	378.1

(source) UNFCCC

Note:

Joint Target of advanced countries and countries that have shifted to market economy ; Reduction in emission of greenhouse effect gases by 5 % at least (USA ▲7%、EU ▲8%、Canada ▲6%、Russia±0% etc.)

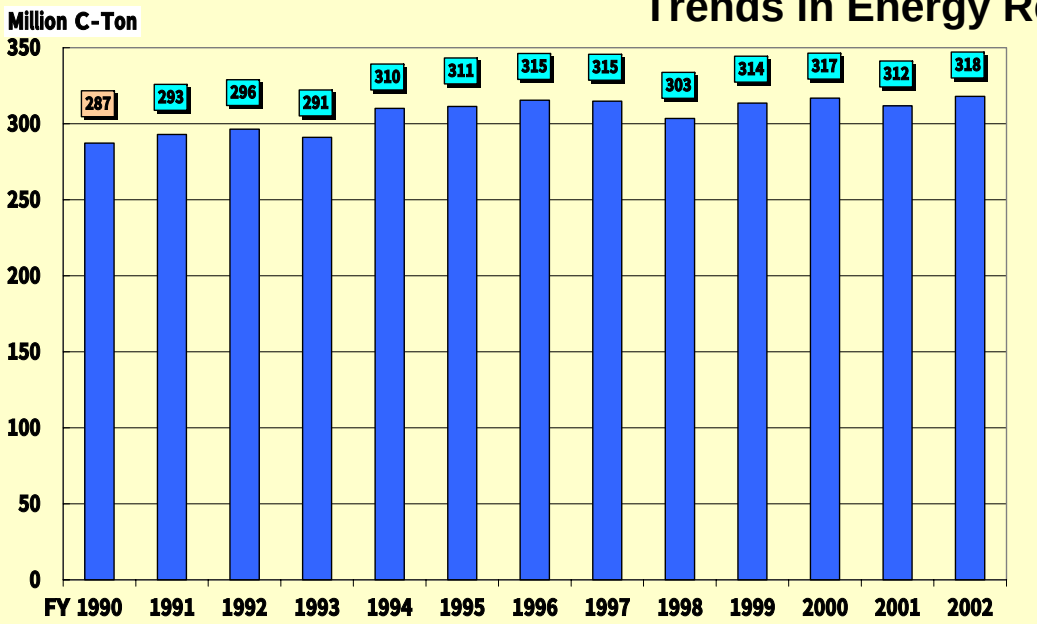
Japan's GHG Emissions

- **Current GHG Emissions**
  - Total Emissions in 1990 (Base Year) ：1,246.7 Million Tons (CO_2Equivalent)
  - Target Emissions in 2010：1,171.9 Million Tons （a) (▲6% Reduction)
  - Total Emissions in 2000：1,386.3 Million Tons （+11.2%)
- **Forecast**
  - Emissions in 2010 (Existing Measures Incorporated) ：1,320 Million Tons （+7%) (b)
  - Difference ： ▲148 Million Tons (b)-(a)
- **Additional Countermeasures are necessary**

Actions to Meet Target GHG Reduction

- **Total：▲6.0%**
- **Energy Related CO_2：±0%**
- **Non-energy related CO_2, CH_4 etc.：▲0.5%**
- **Technology Development & Conservation Efforts ：▲2.0%**
- **FCCs：+2.0%**
- **Forest Sinks：▲3.7%**
- **Emission Trading, etc.：▲1.8%**

Trends in Energy Related CO_2

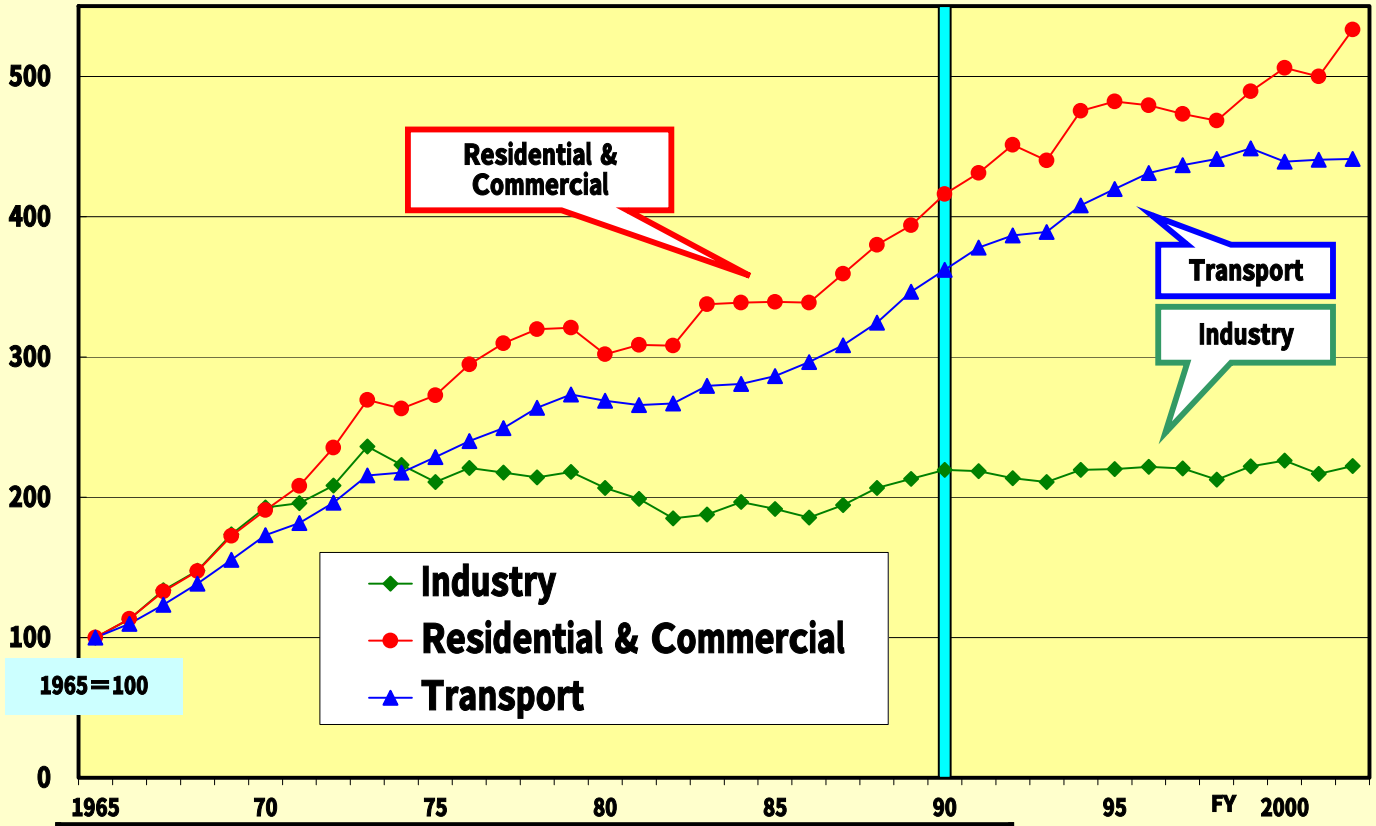


Million C-Ton

1990	287.1
1991	292.8
1992	296.4
1993	291.1
1994	310.0
1995	311.3
1996	315.3
1997	314.8
1998	303.4
1999	313.6
2000	316.9
2001	311.7
2002	317.9

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

CO_2 Emissions by Sector



1965 = 100	FY1990	FY2002
Residential & Commercial	416.0	533.3
Transport	362.1	441.0
Industry	219.5	222.3

Note:
FY (Fiscal Year) April 1～March 30

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

Outline of Energy Demand Structure

- Structure and Interpretation of Energy Balance Table
- Economic Growth and Energy Demand
- Structure of Final Energy Demand, International Comparison
- Structure of Primary Energy Supply

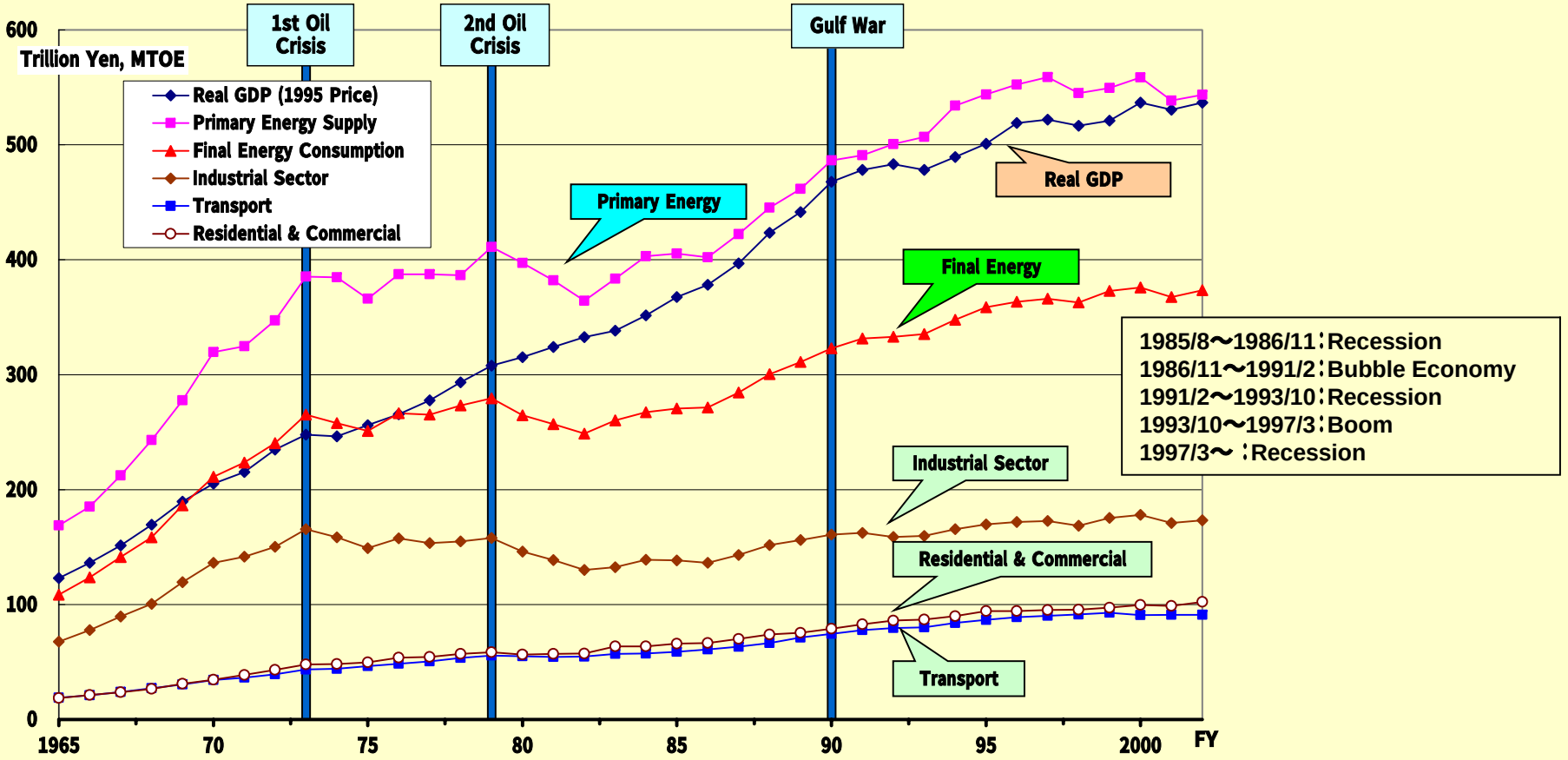
Energy Balance Table (Fiscal Year 2002)

(MTOE)

Sector \ Energy Source			A	B	C	D	E	F	G	H	I
			Coal & Coke	Crude Oil & NGL	Petroleum Products	Natural Gas & LNG	Hydro	Nuclear	Electricity	Heat, Geothermal & Others	Total
Primary Energy Supply	1	Indigenous Production	0.7	0.7		2.7	18.2	63.5		7.1	92.8
	2	Import	104.2	220.3	54.6	71.6					450.8
	3	Total Primary Energy Supply	104.9	221.0	54.6	74.3	18.2	63.5		7.1	543.6
	4	Export	-1.7		-16.7						-18.5
	5	Stock Changes		0.2	1.6						1.8
	6	Total Domestic Energy Supply	103.2	221.3	39.4	74.3	18.2	63.5		7.1	526.9
Energy Conversion & Own Use	7	Electric Utilities	-47.1	-6.2	-11.6	-49.9	-17.1	-63.2	79.3	-1.2	-117.1
	8	Petroleum Refinery		-214.4	212.8						-1.7
	9	Others	-13.4	-1.2	-14.6	3.4	-1.1	-0.2	13.8	-3.4	-16.8
	10	Own Use & Losses	-2.5	0.6	-5.9	-2.3			-9.3	1.4	-17.9
	11	Total of Transformation Sector	-63.0	-221.3	180.6	-48.9	-18.2	-63.5	83.8	-3.2	-153.5
Final Energy Consumption	12	Total Final Energy Consumption	40.2		220.1	25.4			83.8	3.9	373.5
	13	Total of Industrial Sector	39.1		86.6	9.3			35.9	2.5	173.4
	14	Agriculture, Forestry & Fisheries			9.8				0.3	0.1	10.3
	15	Mining & Construction			4.0				0.3		4.3
	16	Manufacturers Total	39.1		72.8	9.3			35.3	2.4	158.9
	17	Food and Tabacco			1.8	1.4			2.5		5.6
	18	Fibers			1.9	0.2			0.6		2.8
	19	Paper, Pulp and Printing	1.5		2.7	0.4			3.0	2.3	10.0
	20	Chemical Industries	1.2		42.9	2.0			5.5		51.5
	21	Ceramics and Cements	5.1		3.8	0.4			1.8		11.1
	22	Iron and Steel	30.3		2.4	1.4			7.0		41.1
	23	Non-Ferrous Metal	0.3		1.1	0.4			1.6		3.3
	24	Metal and Machinery	0.2		0.6	2.2			7.2		10.2
	25	Other Industries	0.6		15.7	1.0			6.0		23.3
	26	Total of Household and Commercial Sector	1.1		37.6	16.2			46.1	1.4	102.3
	27	Residential			20.3	9.7			23.5	0.7	54.3
	28	Commercial	1.1		17.2	6.5			22.6	0.7	48.1
	29	Transportation Sector			89.2				1.9		91.1
	30	Passengers			57.2				1.8		59.0
	31	Freight			32.0				0.1		32.1
	32	Non Energy			6.7						6.7

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

Relation between Energy Demand and GDP



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

- Since the energy crises, a remarkable progress has been made in the field of energy conservation, notably in the manufacturing sector, to boost efficiency of energy consumption.
- Since the latter half of the 1990 in particular, energy consumption has stayed high in contrast to the low economic growth rate.

GDP Elasticity of Energy

The Income elasticity of energy (GDP elasticity) is a convenient measure to directly see the relationship between the economic growth and the energy consumption. Energy demand of a given country is determined not only by the economic scale but also affected by a number of factors, including the industrial structure, lifestyle of the people, technological standard, climatic condition.

The GDP elasticity of energy intends to see the relationship between the energy consumption and the economic growth, while the latter is assumed to represent all these factors.

$$\text{GDP Elasticity of Energy} = \frac{\text{Growth rate of energy demand}}{\text{Growth rate of GDP}}$$

This is defined as the change in energy demand caused by the one-percent change in income. Macro analyses often use real GDP in place of income.

In case where the rate of growth of GDP is 0.9% and the elasticity to GDP is 1.2, for example, the increase in energy demand is given by: $0.9 \times 1.2 = 1.08\%$.

Energy Conservation (Macro base)

- Energy consumption per unit GDP

$$\text{Energy Intensity} = \frac{\text{Energy consumption}}{\text{GDP}} \rightarrow \text{inverse number: (energy productivity)}$$

  - Constant Intensity … Elasticity = 1
  - Increasing Intensity… Elasticity > 1
  - Decreasing Intensity … Elasticity < 1

- In order for the elasticity to be at or less than unity, the energy productivity has to be always on the increase.

- As economy of a nation matures to some extent, the increase in income is not accompanied by a large increase in energy consumption.

- Macro factors for energy conservation
  - Change in industrial structure, change in social structure (changes in lifestyle, traffic system)
  - Change in product mix
  - Change in technological intensity

GDP and Primary Energy Supply for Selected Countries

	1973-2001 Annual Growth Rate %		GDP Elasticity of Energy Consumption	Primary Energy Supply per GDP		Per-capita Primary Energy Supply	
	Real GDP (1995 Price)	Primary Energy Supply		TOE/million US$ (1995 Price)		TOE/Person	
				1973	2001	1973	2001
Japan	2.9	1.7	0.59	124	92	3.00	4.10
USA	3.1	1.0	0.32	433	253	8.19	8.00
Germany	2.0	0.1	0.07	215	130	4.28	4.26
France	2.4	1.5	0.62	184	147	3.40	4.49
UK	2.2	0.2	0.10	296	176	3.93	4.00
FSU	0.6	0.3	0.50	1,986	1,841	3.40	3.21
China	9.1	4.5	0.50	2,486	826	0.30	0.73
India	5.3	5.8	1.10	529	644	0.11	0.32
Total OECD	2.8	1.3	0.46	281	191	4.17	4.69
Total Non-OECD	3.8	2.9	0.76	687	558	0.56	0.76
EU 15	2.3	0.9	0.40	215	150	3.35	3.96
ASEAN 7	5.8	6.9	1.18	287	398	0.17	0.65
Total World	2.9	1.9	0.63	344	263	1.40	1.49

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

- The GDP elasticity of energy is getting smaller in many developed countries, while in other countries the energy elasticity exceeds unity, except for China which has a small elasticity.
- In China, the energy unit consumption used to be very high (in 1973 in particular). China therefore had good room for energy conservation.

International Comparison of Energy Intensity

	Energy Intensity (Primary Energy Supply per unit Real GDP, 1995 Price)				
	1973		2001		Rate of Change 2001/1973 %
	TOE/million US$ (1995 Price)	Japan = 100	TOE/million US$ (1995 Price)	Japan = 100	
Japan	123.7	100.0	92.2	100.0	-25.4
USA	433.5	350.4	253.1	274.3	-41.6
Germany	214.7	173.6	129.9	140.8	-39.5
France	184.2	148.9	147.4	159.8	-20.0
UK	295.9	239.1	176.0	190.8	-40.5
FSU	1,986.0	1,605.3	1,840.6	1,995.4	-7.3
China	2,486.0	2,009.5	826.3	895.8	-66.8
India	529.4	427.9	643.7	697.8	21.6
Total OECD	281.1	227.2	191.2	207.2	-32.0
Total Non-OECD	686.8	555.1	558.4	605.4	-18.7
EU 15	214.8	173.6	150.2	162.8	-30.1
ASEAN 7	287.0	232.0	398.4	431.9	38.8
Total World	344.0	278.1	262.8	284.9	-23.6

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

Japan's Final Energy Consumption by Sector

	1965F	1973F	1980F	1990F	2002F
Final Energy Consumption (MTOE)	108.5	265.2	264.5	322.9	373.5
Industrial Sector	67.9	165.7	146.1	160.8	173.4
Residential & Commercial	18.7	48.0	56.5	78.9	102.3
Transportation Sector	19.1	43.4	55.0	74.4	91.1
Real GDP (1995 Price, Billion Yen)	123,072	247,709	315,175	467,913	536,609
IIP (Indices of Industrial Production)	22.3	58.0	67.4	101.1	93.1
Steel Production (×1,000 Tons)	41,296	120,017	107,386	111,710	109,789
Number of Households (×1,000)	25,520	32,628	36,347	41,797	49,261
Number of Automobiles (×1,000 Units)	7,325	25,142	37,901	57,648	73,480

	Annual Average Growth rate %				Share				
	1965-73	1973-80	1980-90	90-2002	1965F	1973F	1980F	1990F	2002F
Final Energy Consumption	11.8	0.0	2.0	1.2	100.0	100.0	100.0	100.0	100.0
Industrial Sector (incl. Non-Energy)	11.8	-1.8	1.0	0.6	65.2	65.5	57.8	52.5	48.2
Residential & Commercial	12.5	2.4	3.4	2.2	17.2	18.1	21.4	24.4	27.4
Transportation Sector	10.8	3.4	3.1	1.7	17.6	16.4	20.8	23.0	24.4
Real GDP (1995 Price)	9.1	3.5	4.0	1.1					
IIP (Indices of Industrial Production)	12.7	2.2	4.1	-0.7					
Steel Production	14.3	-1.6	0.4	-0.1					
Number of Households	3.1	1.6	1.4	1.4					
Number of Automobiles	16.7	6.0	4.3	2.0					

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

- During the high-growth period before the first Oil Crisis, the final energy consumption increased almost uniformly in all sectors.
- After the first Oil Crisis, the industrial structure shifted to a high-value added one and energy conservation technologies made remarkable progresses.
- As a result, the share of the industrial sector declined while the residential & commercial sector increased the share.
- After 1990, the low economic growth and low IIP held down industrial consumption of energy, while the consumption by the residential & commercial sector and transportation sector increased.

International Comparison of Final Energy Demand Structure

		1973		2001		Growth Rate %
		MTOE	Share %	MTOE	Share %	1973-2001
Japan	Industry	131	56.0	123	36.0	▲ 0.2
	Residential & Commercial	52	22.1	114	33.3	2.9
	Transport	43	18.2	96	28.1	2.9
	Non-Energy	9	3.8	9	2.5	▲ 0.1
	Total	234	100.0	342	100.0	1.4
USA	Industry	438	33.1	404	26.2	▲ 0.3
	Residential & Commercial	420	31.7	461	29.9	0.3
	Transport	420	31.7	609	39.5	1.3
	Non-Energy	45	3.4	67	4.3	1.5
	Total	1,323	100.0	1,541	100.0	0.5
Germany	Industry	98	39.5	73	29.8	▲ 1.0
	Residential & Commercial	101	40.9	102	41.5	0.0
	Transport	40	16.1	66	26.8	1.8
	Non-Energy	8	3.4	5	2.0	▲ 1.9
	Total	247	100.0	246	100.0	▲ 0.0
UK	Industry	61	41.2	40	24.6	▲ 1.5
	Residential & Commercial	51	34.8	66	40.7	0.9
	Transport	31	21.1	52	32.5	1.9
	Non-Energy	5	3.1	4	2.4	▲ 0.6
	Total	147	100.0	161	100.0	0.3
France	Industry	48	34.9	46	26.2	▲ 0.2
	Residential & Commercial	55	40.1	70	40.3	0.8
	Transport	27	19.6	53	30.6	2.4
	Non-Energy	8	5.5	5	2.7	▲ 1.6
	Total	138	100.0	174	100.0	0.8

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

- **In Japan consumption used to be larger in the industrial sector and smaller in the residential & commercial sector than the United States and European countries.**
- **Recently, the share of the industrial sector is nearing that of the United States and European countries. (40 percent in Japan and less than 30 percent in the United States and European countries in 2001)**

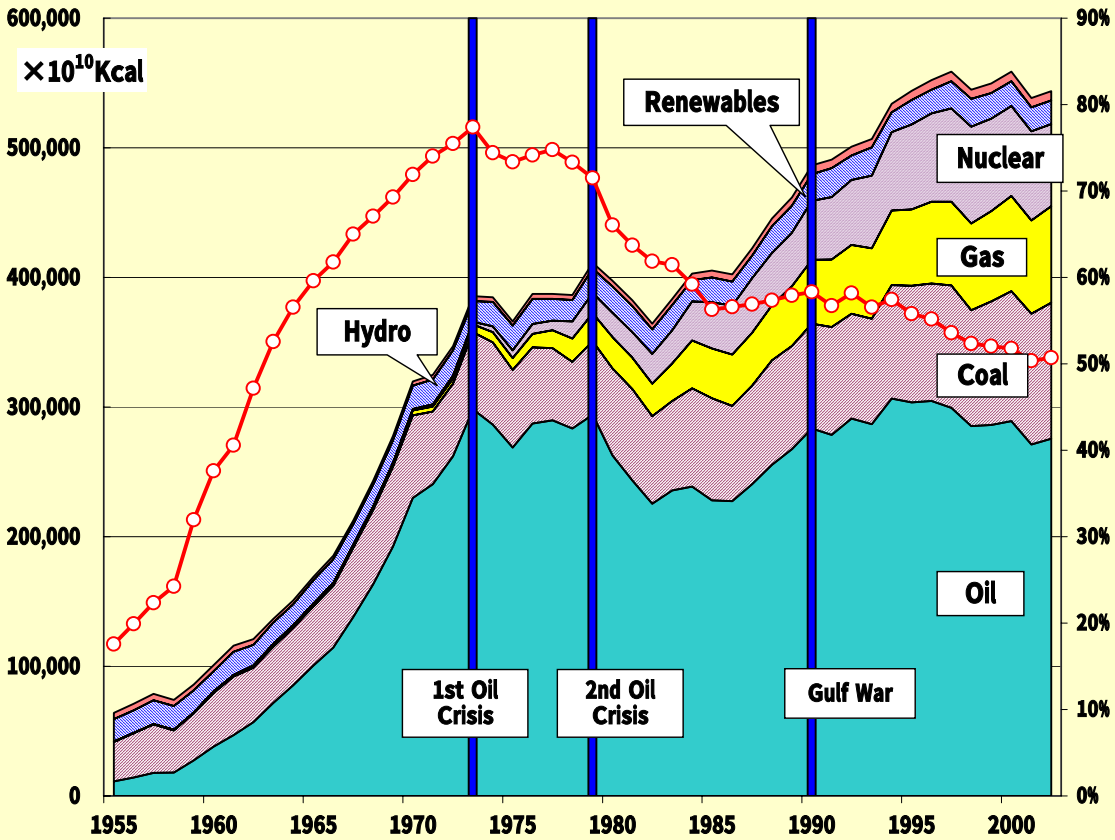
Final Energy Consumption Per-capita

		1973		2001	
		MTOE	TOE/Person	MTOE	TOE/Person
Japan	Industry	131	1.2	123	1.0
	Residential & Commercial	52	0.5	114	0.9
	Transport	43	0.4	96	0.8
	Non-Energy	9	0.1	9	0.1
	Total	234	2.2	342	2.7
USA	Industry	438	2.1	404	1.4
	Residential & Commercial	420	2.0	461	1.6
	Transport	420	2.0	609	2.1
	Non-Energy	45	0.2	67	0.2
	Total	1,323	6.2	1,541	5.4
Germany	Industry	98	1.2	73	0.9
	Residential & Commercial	101	1.3	102	1.2
	Transport	40	0.5	66	0.8
	Non-Energy	8	0.1	5	0.1
	Total	247	3.1	246	3.0
UK	Industry	61	1.1	40	0.7
	Residential & Commercial	51	0.9	66	1.1
	Transport	31	0.6	52	0.9
	Non-Energy	5	0.1	4	0.1
	Total	147	2.6	161	2.7
France	Industry	48	0.9	46	0.8
	Residential & Commercial	55	1.1	70	1.2
	Transport	27	0.5	53	0.9
	Non-Energy	8	0.1	5	0.1
	Total	138	2.6	174	2.9
Non-OECD	Industry	456	0.2	1,008	0.2
	Residential & Commercial	460	0.2	814	0.2
	Transport	236	0.1	574	0.1
	Non-Energy	42	0.0	73	0.0
	Total	1,194	0.4	2,468	0.5

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

- **USA is outstanding in per-capita energy demand. Since USA is an automobile-centered society, the consumption in the transportation sector is larger than other countries.**
- **Among three European countries, Germany consumes a little more energy than others. This is because Germany has a greater share of the manufacturing industry and colder than other countries.**
- **The energy demand in Non-OECD countries is small in all sectors. Their energy demand is expected to increase in keeping pace with their economic development, accompanied by increasing numbers of cars and upgrading of living standards.**

Structure of Primary Energy Supply



Supply security requirements

- Reduction of dependence on oil, diversification of energy sources
- Increase self-sufficiency rate of energy supply

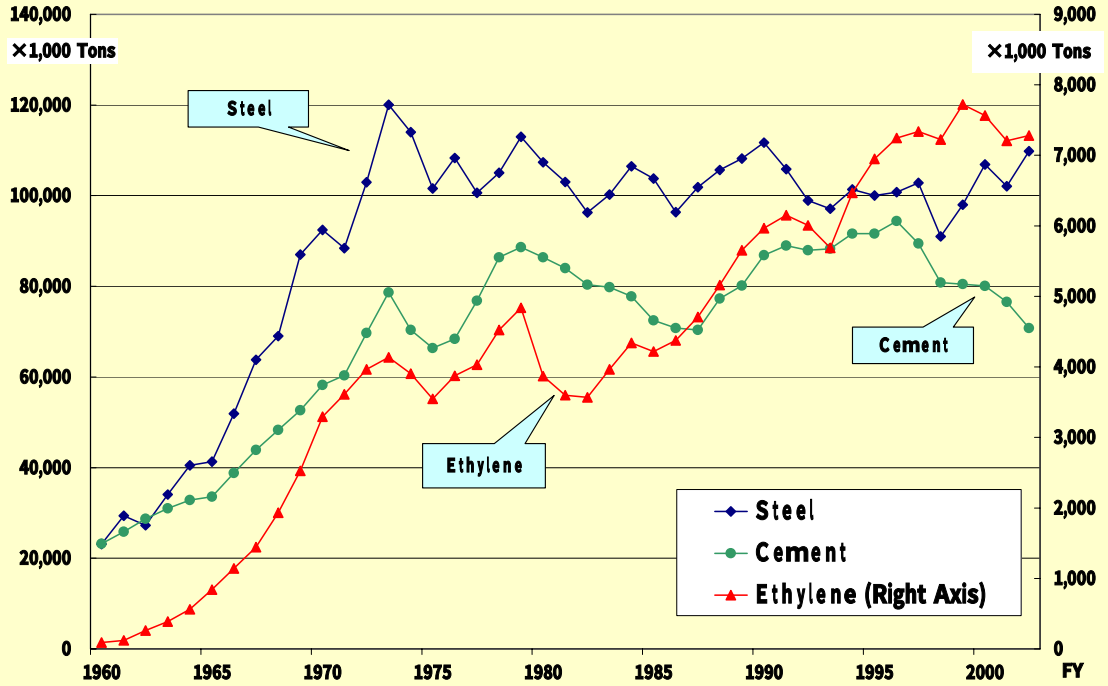
- In the total primary energy supply, oil has been decreasing, coal has remained almost unchanged, and gas and nuclear energy have been increasing.
- Notwithstanding, oil accounts for more than half the total supply, being the most important of all the primary energy supply.

Energy Consumption by Sector

Energy Consumption in the Industrial Sector

- Industrial Structural Change and Energy Consumption
- Energy Intensity

Japan's production of Basic Materials



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

■Share of Energy Intensive Industries

	1973	1980	1990	2002
Share of Energy Intensive Industries in the Manufacturing Industry	78.4	74.6	72.1	71.6
Share of Energy Intensive Industries in the Final Energy Consumption	45.4	37.5	31.9	30.5

■The material industries account for about 70 to 80 percent of the total energy consumption of the manufacturing industry.

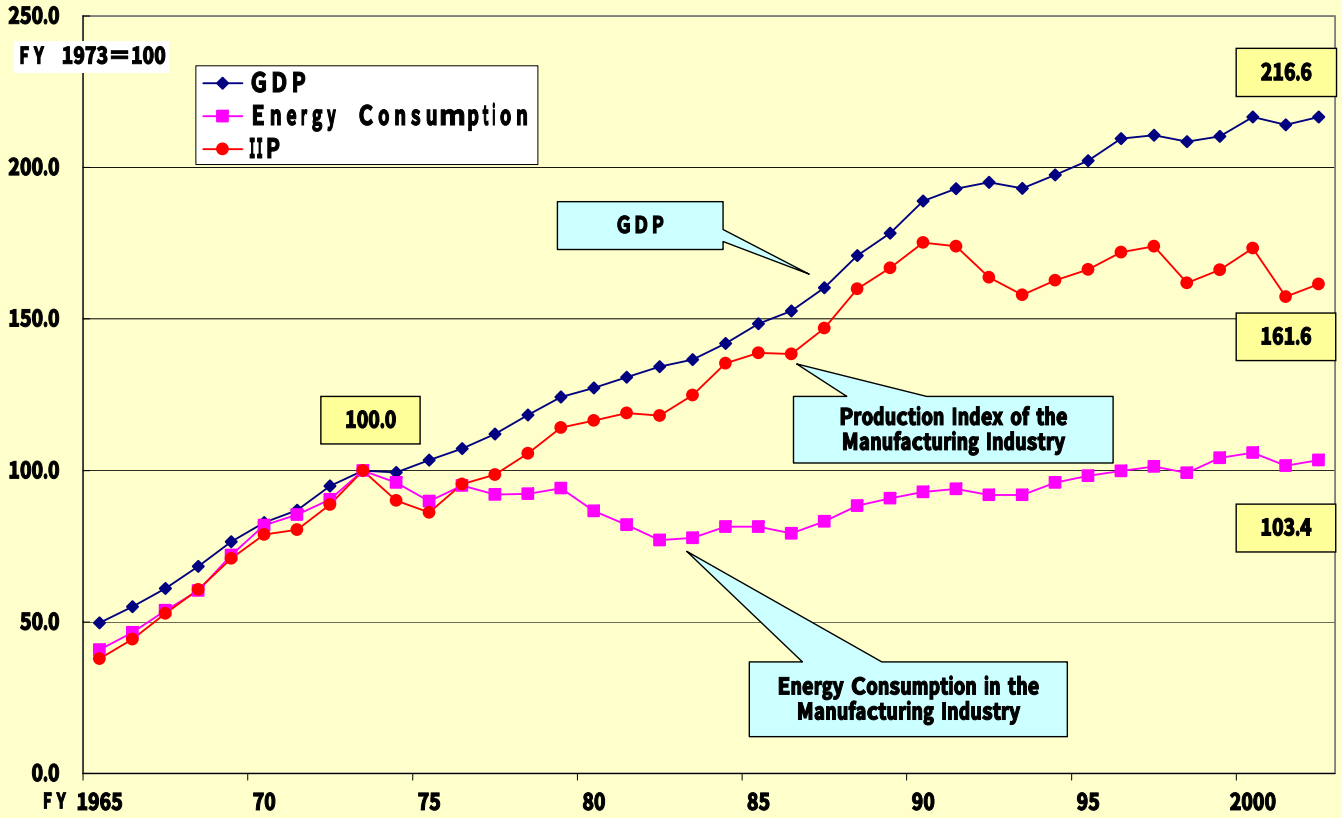
■Around 1973, the energy intensive industries (iron &steel, paper & pulp, ceramics & cement, chemical) represented about half the final energy demand.

■Thereafter, their shares declined and presently their shares are about 30 percent of the total.

●**In Japan, the basic material industry has a larger proportion compared with the United States and the European countries.**

●**Nevertheless, energy consumption per unit GDP is one of the best in the world, thanks greatly to energy conservation.**

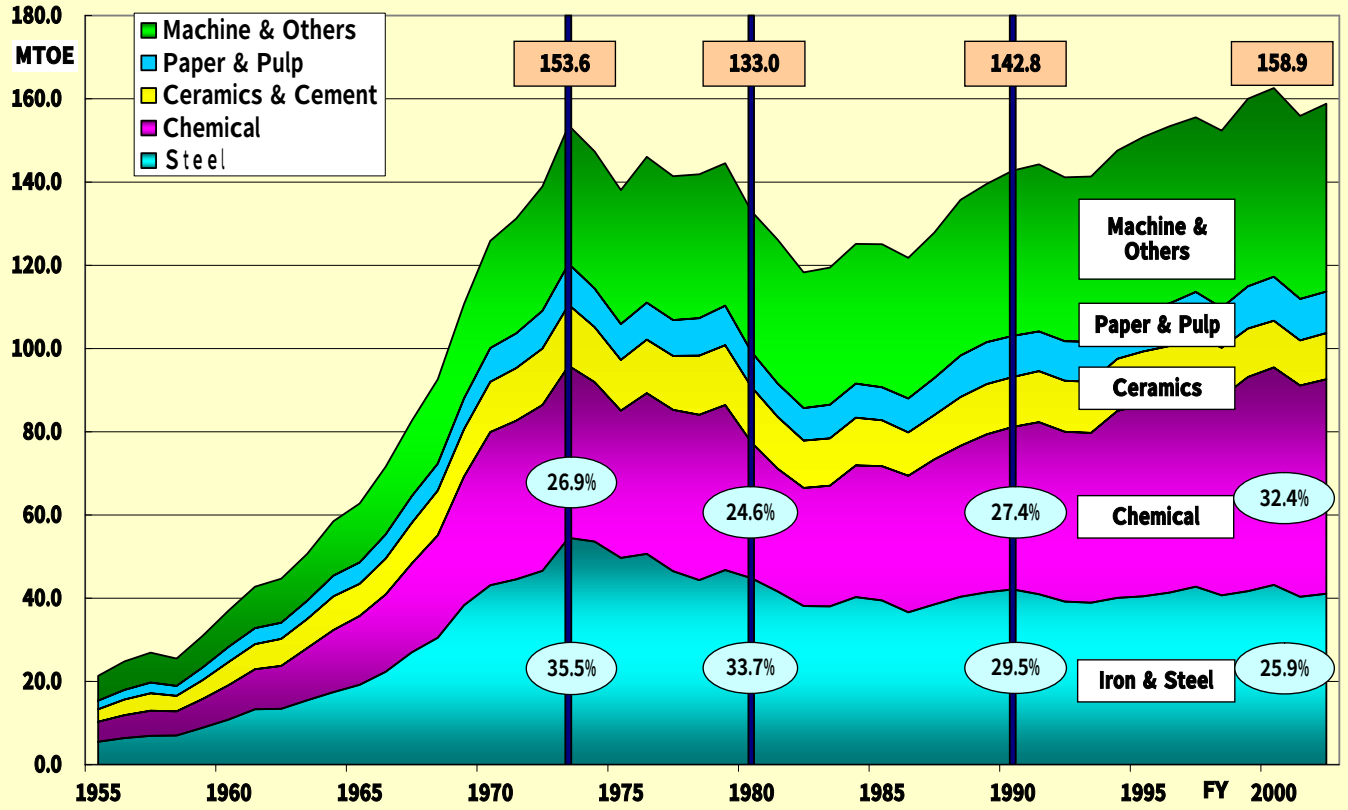
Energy Consumption in the Manufacturing Industry



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

- **Japan's economy doubled in scale over a period from 1973 to 2002; however, the energy consumption in the manufacturing industry remained unchanged.**
- **The major reasons for the decreasing rate of industrial energy consumption vis-à-vis GDP are decreasing energy intensity (promotion of energy conservation) and changing industrial structure toward a high-value added industrial structure.**

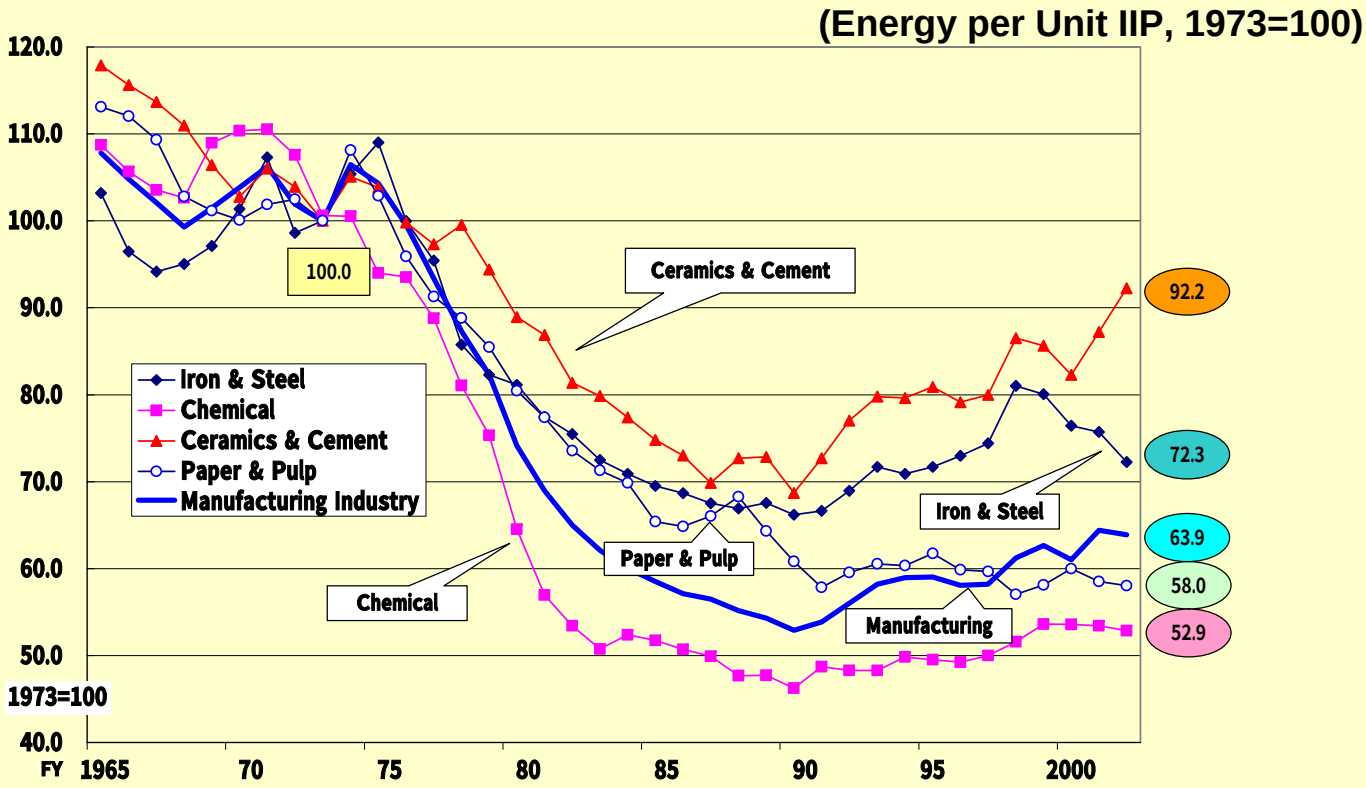
Energy Consumption by type of Manufacturing



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

- The manufacturing industry keenly promoted energy conservation since the first oil crisis of 1973.
- The energy consumption took an upward turn from the middle of the 1980s and, consequently, the present level is about the same as that of 1973.
- The iron and steel industry consumed energy most in 1973, but now the chemical industry is the largest one.

Changes in Energy Intensity



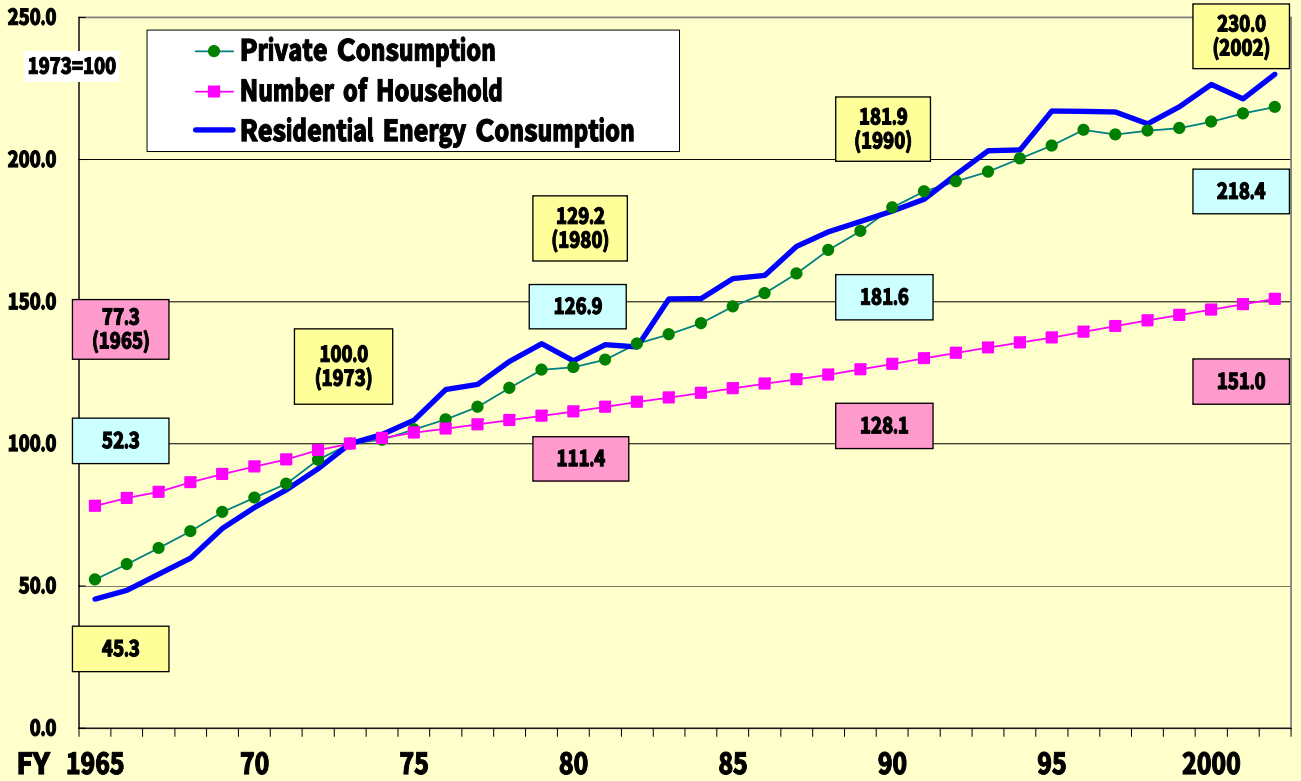
(Source) IEEJ, EDMC. Handbook of Energy & Economic Statistics in Japan 2004

- **The energy consumption per IIP of the total manufacturing industry declined from 100 of 1973 as base year to 53 in 1990. In recent years, this figure is increasing a little.**
- **This decline was brought about not only by the energy conservation in narrower meaning (technical energy conservation) but by changes within the industries of product mixes towards making high value added products.**

Energy Consumption in the Residential Sector

- Number of Households and Energy Consumption by End-Use
- Lifestyle and Energy Consumption
- Penetration of Electrical Appliances and Energy Consumption (Energy Conservation)

Energy Consumption in the Residential Sector



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

- **The growth of residential energy consumption declined as a result of the two oil crises in 1973 and 1979. Notwithstanding, the residential energy consumption is now more than twice that in 1973.**
- **It may be noted from the figure that the sector consumption is intimately linked with private consumption.**

(Note) Private Consumption : Goods and services used by households or private not-for-profit organizations. The market value of all goods and services, including durable products, purchased or received as income in kind by house- holds and non-profit institutions.

Income and Energy Consumption

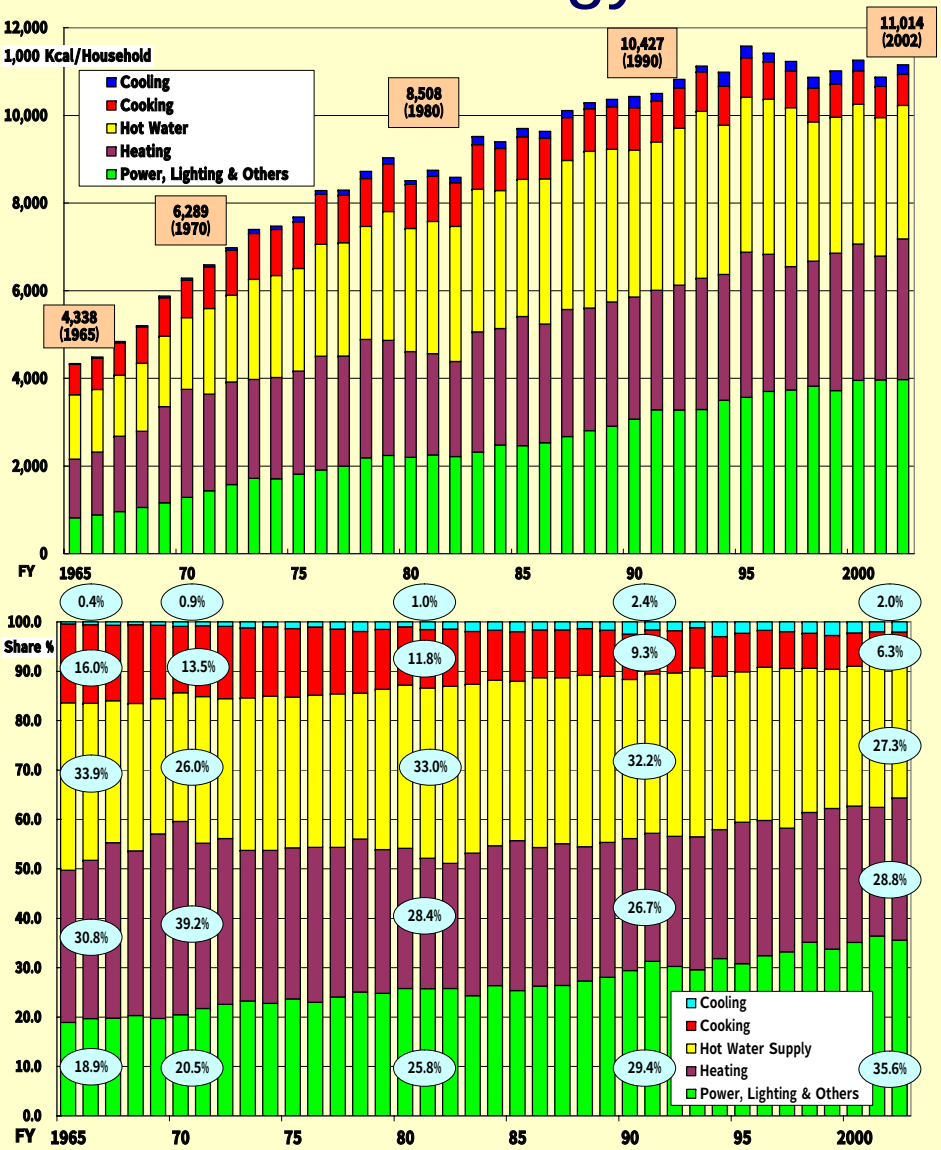
	1965F	1973F	1980F	1990F	2002F
Residential Energy Consumption (MTOE)	10.7	23.6	30.5	42.9	54.3
Private Consumption (Real, Billion Yen)	71,240	136,209	172,978	249,477	297,486
Number of Households (×1,000)	25,520	32,628	36,347	41,797	49,261
Energy Consumption per Household (TOE)	419	723	839	1,026	1,101
Private Consumption per Household (×10,000Yen)	279	417	476	597	604

	Annual Average Growth rate %			
	1965-73	1973-80	1980-90	90-2002
Residential Energy Consumption (a)	10.4	3.3	4.4	2.0
Private Consumption (Real, 1995=100)(b)	8.4	3.0	4.7	1.5
Number of Households	3.1	1.6	1.4	1.4
Energy Consumption per Household	7.1	1.9	2.5	0.6
Private Consumption per Household	5.2	1.7	2.9	0.1
Income Elasticity of Energy (a)/(b)	1.23	1.07	0.93	1.34

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

- The residential energy consumption exhibits steady growth as a result of steady increases in household number and in energy intensity associated with the income rise.

Residential Energy Consumption by End-Use



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

- **The share of the power and lighting has increased with penetration of household electric appliances and with upgrading of lifestyles.**
- **Likewise, air-conditioning is becoming very common and this increases the consumption for heating and cooling.**
- **The cooking energy is decreasing as the habit of eating out becomes common and the retort food is accepted.**

(10^3Kcal/Household)

	Cooling	Heating	Hot Water	Cooking	Power, Lighting	Total
1965	17	1,338	1,470	693	819	4,338
70	54	2,463	1,636	849	1,287	6,289
80	83	2,414	2,810	1,004	2,196	8,508
90	252	2,787	3,356	965	3,068	10,427
2002	223	3,209	3,049	703	3,971	11,155
1965	0.4	30.8	33.9	16.0	18.9	100.0
70	0.9	39.2	26.0	13.5	20.5	100.0
80	1.0	28.4	33.0	11.8	25.8	100.0
90	2.4	26.7	32.2	9.3	29.4	100.0
2002	2.0	28.8	27.3	6.3	35.6	100.0

Energy Consumption by End-Use and by Source

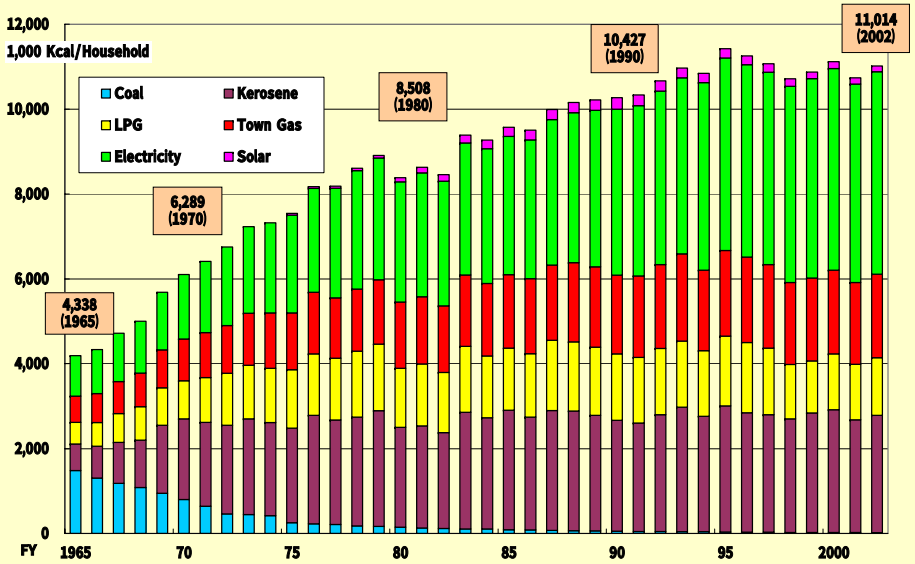
(FY2002)

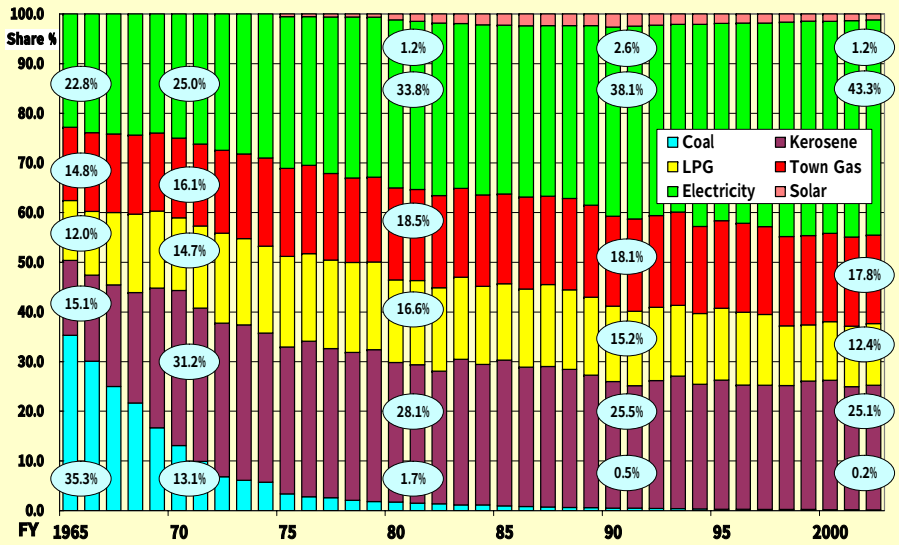
	Heating	Cooling	Hot Water	Cooking	Power etc.	Total	Share %
Electricity	312	223	167	160	3,971	4,833	(43.3)
Town Gas	599	0	1,071	318	0	1,989	(17.8)
LPG	216	0	969	194	0	1,380	(12.4)
Kerosene	2,080	0	692	28	0	2,799	(25.1)
Coal etc.	2	0	15	3	0	19	(0.2)
Solar	0	0	135	0	0	135	(1.2)
Total	3,209	223	3,049	703	3,971	11,155	(100.0)
Share %	(28.8)	(2.0)	(27.3)	(6.3)	(35.6)	(100.0)	

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

- **The energy source varies greatly depending upon the use.**
- **For heating, kerosene is the most important, particularly in colder areas like Hokkaido, while for cooling and power, electricity is used almost exclusively.**

Residential Energy Consumption by Energy Source





- **The increasing penetration of household electric appliances and increasing demand for power and lighting and heat, spreading use of heat pumps account for increasing share of electric power.**

(×1,000 TOE)

	Coal	Kerosene	LPG	Town Gas	Electricity	Solar Heat	Total
1965	3,776	1,614	1,288	1,580	2,438	-	10,696
70	2,404	5,717	2,686	2,943	4,579	-	18,329
80	529	8,565	5,065	5,649	10,313	365	30,486
90	222	10,925	6,526	7,764	16,353	1,124	42,914
2002	94	13,615	6,710	9,673	23,507	657	54,255
1965	35.3	15.1	12.0	14.8	22.8	0.0	100.0
70	13.1	31.2	14.7	16.1	25.0	0.0	100.0
80	1.7	28.1	16.6	18.5	33.8	1.2	100.0
90	0.5	25.5	15.2	18.1	38.1	2.6	100.0
2002	0.2	25.1	12.4	17.8	43.3	1.2	100.0

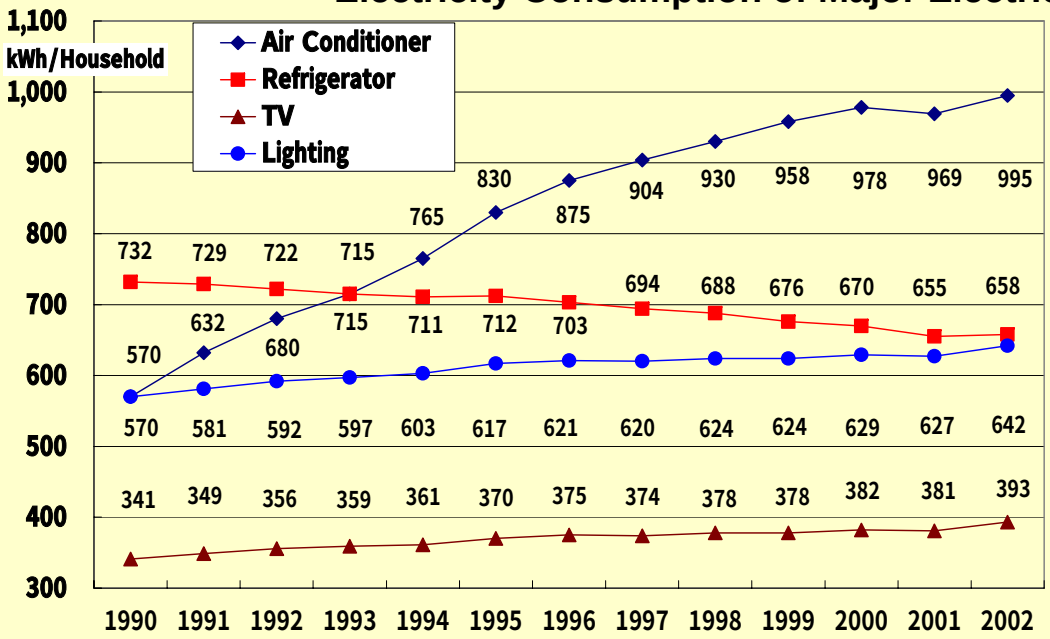
(Source) IEEJ, EDMC. Handbook of Energy & Economic Statistics in Japan 2004

Penetration of Electrical Appliances

Diffusion Rates of Household Electric Appliances

	Appliances	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999	2000	2001	2002
Diffusion Rate %	Oil Stove	45.8	82.0	89.5	91.3	84.0	75.3	66.1	65.7	61.2	60.4	60.4	58.9	**57.7**	**56.7**
	Air Conditioner	2.0	7.7	19.5	41.2	54.6	68.1	77.2	79.3	81.9	84.4	86.2	86.2	**87.2**	**88.8**
	Refrigerator	61.6	91.2	96.1	99.2	98.4	98.9	98.4	98.7	98.1	98.4	98.0	98.4	**98.4**	**98.9**
	Colour TV Set	1.6	42.3	93.7	98.5	98.9	99.3	99.1	99.2	99.2	98.9	99.0	99.2	**99.3**	**99.4**
Number of Holding per 100 Households	Oil Stove	–	109.2	157.1	174.9	161.0	145.6	118.2	117.7	107.4	105.8	105.0	101.0	**100.6**	**96.3**
	Air Conditioner	–	8.8	24.8	57.9	88.0	126.5	166.1	179.3	191.7	200.7	207.6	217.4	**229.9**	**245.4**
	Refrigerator	–	94.4	108.9	115.2	114.3	119.4	119.4	120.5	120.7	120.7	121.6	121.4	**124.8**	**126.3**
	Colour TV Set	–	43.5	117.2	150.9	174.7	201.3	215.1	219.8	224.6	224.0	226.2	230.6	**235.0**	**237.8**

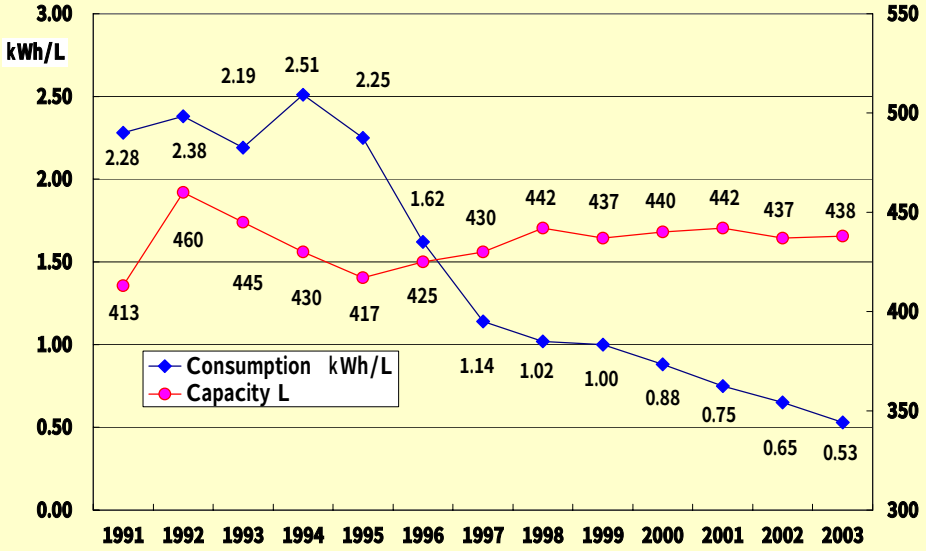
Electricity Consumption of Major Electric Appliances



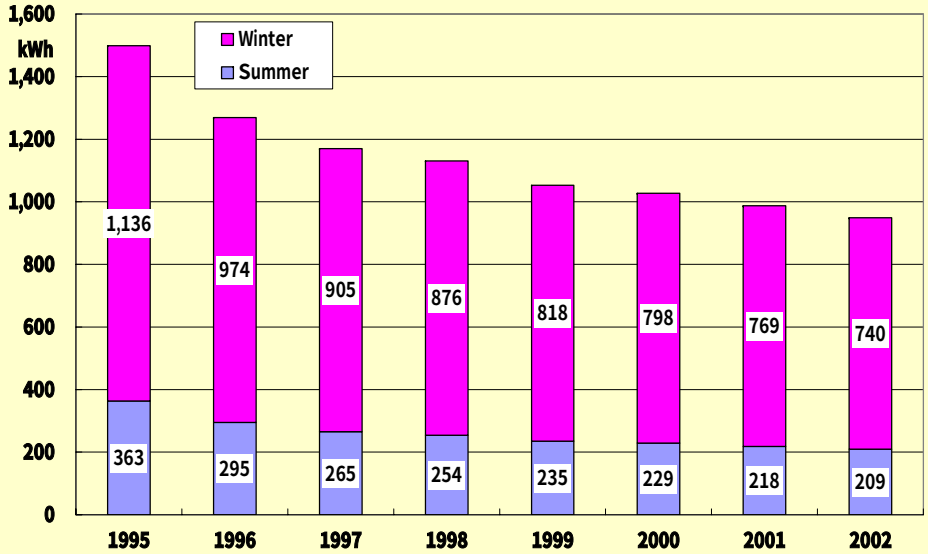
- **The diffusion of household electric appliances is spectacular in Japan.**
- **Many households own more than one color TV set and air-conditioner (including cooler).**

Diffusion Rate ; Number of Households which has the appliance / Total Number of Households

Improvement of Efficiency



Electricity Consumption of Refrigerator



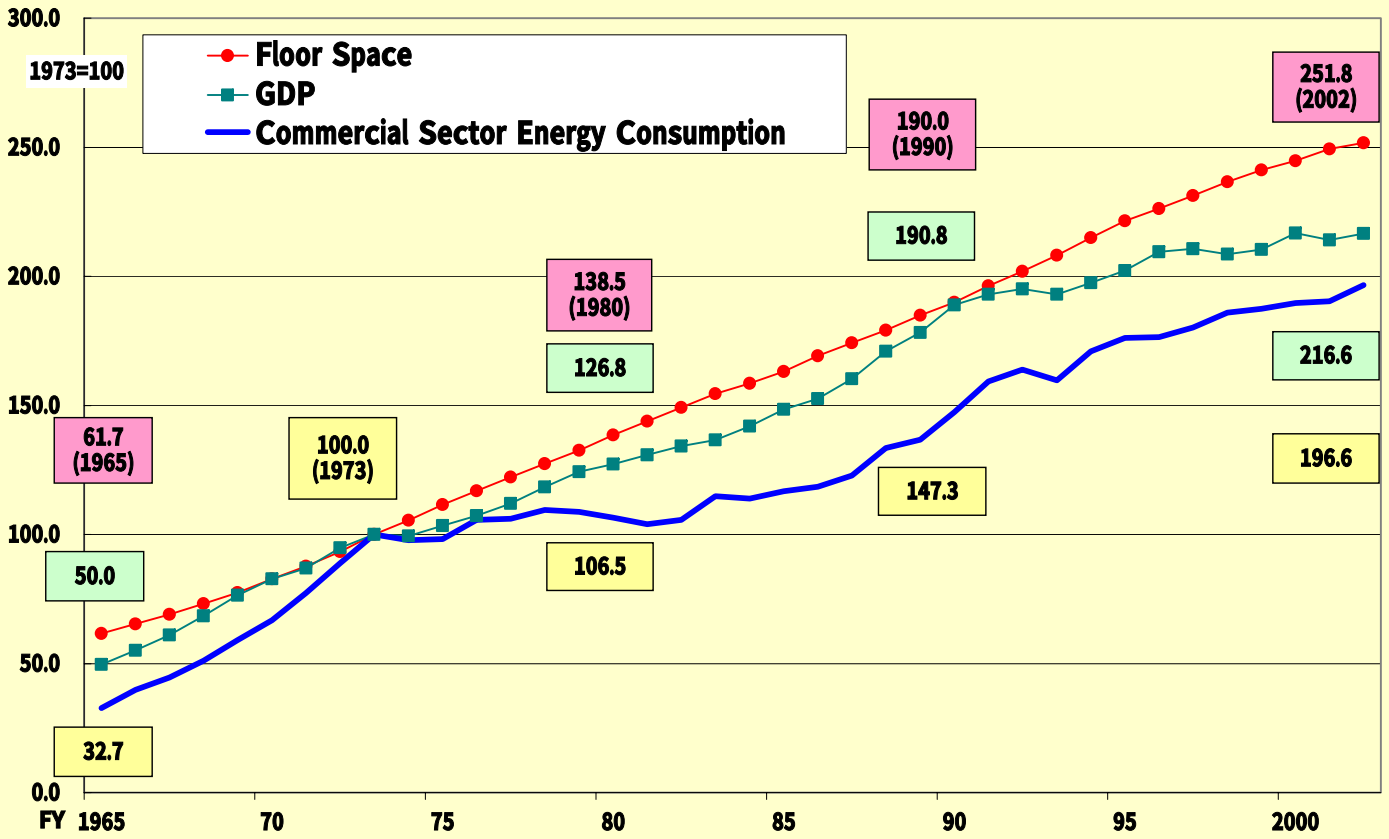
Electricity Consumption of Air Conditioner (2.8kW Class)

- **Improvement of efficiency of major appliances**
  - Refrigerator ： 1981 2.76 kWh/Year･L（236L) → 2003 0.53 kWh/Year･L（438L)
  - TV set : 1990 227 kWh/Year → 2003 175 kWh/Year (23% reduction)
  - air-conditioner (2.8kW）：1995 363 kWh/Season → 2002 209 kWh/Season (42% reduction)

Energy Consumption in the Commercial Sector

- Scope of the Commercial Sector, Trends of Floor Space
- Energy Consumption by Business Type
- Energy Consumption by End-Use
- Energy Consumption by Energy Source

Energy Consumption in the Commercial Sector



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

- The floor space used by the commercial sector has increased almost at the same rate as the GDP growth rate.
- While on the other hand, energy demand by the commercial sector remained almost unchanged from the first energy crisis to the bubble economy.
- Since the bubble economy, the energy demand has steadily increased, despite the staggering economy.

Commercial Floor Space and Energy Consumption

	1965F	1973F	1980F	1990F	2002F
Commercial Sector Energy Consumption (MTOE)	8.0	24.4	26.0	36.0	48.0
Total Floor Area (Million m^2)	417	676	936	1284	1702
Unit Consumption per Floor Area (TOE/m^2)	0.019	0.036	0.028	0.028	0.028
Real GDP (1995 Price, Billion Yen)	123,072	247,709	315,175	467,913	536,609

	Annual Average Growth rate %			
	1965-73	1973-80	1980-90	90-2002
Commercial Sector Energy Consumption	15.0	0.8	4.2	2.4
Total Floor Area	6.2	4.2	4.0	2.4
Unit Consumption per Floor Area	8.2	-3.2	0.1	0.1
Real GDP (1995 Price)	9.1	3.5	4.0	1.1
Elasticity of Total Floor Area to GDP	0.68	1.19	1.00	2.07

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

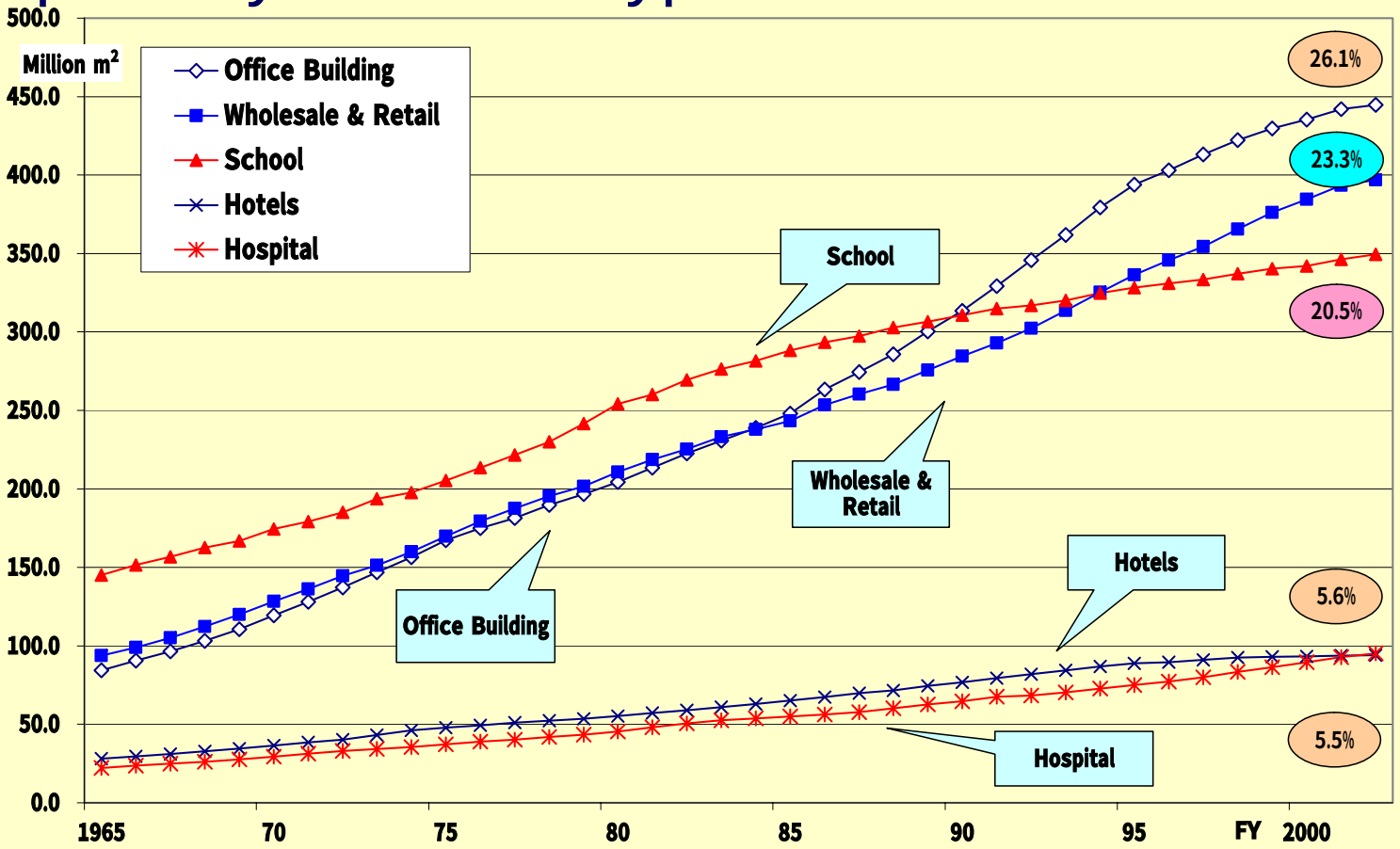
- The energy consumption per floor space dropped sharply after the first oil crisis.
- It began to level off or to slightly increase in the latter half of the 1980s.

(Note) The commercial sector indicates “commercial and service sectors” including shops, office buildings, hospitals, various schools and welfare facilities.

The administrative portion of the industrial sector such as head office buildings is included but electricity and gas utility and transportation business are excluded.

The transportation for own businesses, taxies and buses for example, is excluded.

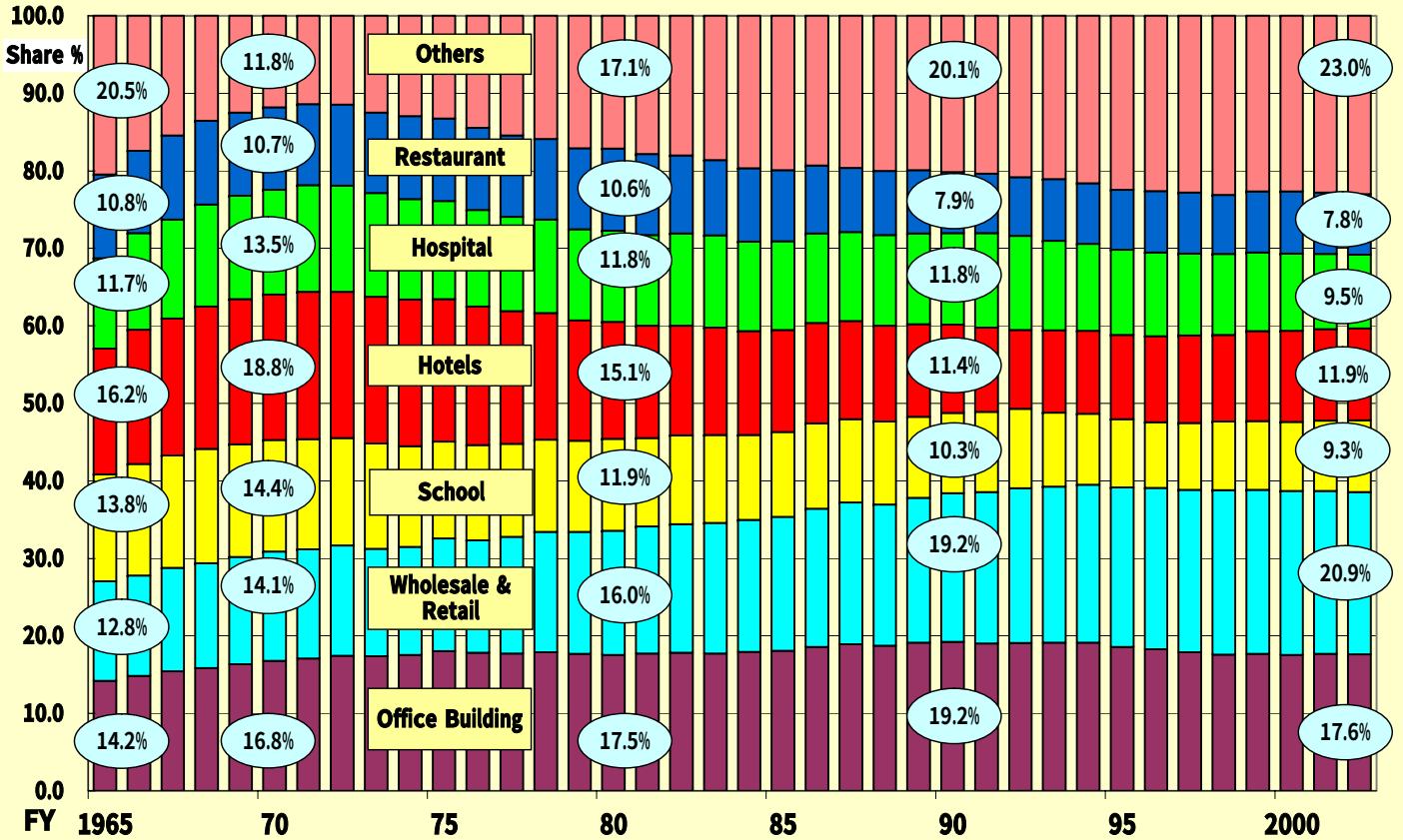
Floor Space by Business type



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

- The office building, whole sale and retail, school accounts for about 70 percent of the total business floor space.
- Since 1985, the rate of increase of the floor space of the office building, wholesale and retail has been increasing while that for the school has been decreasing.

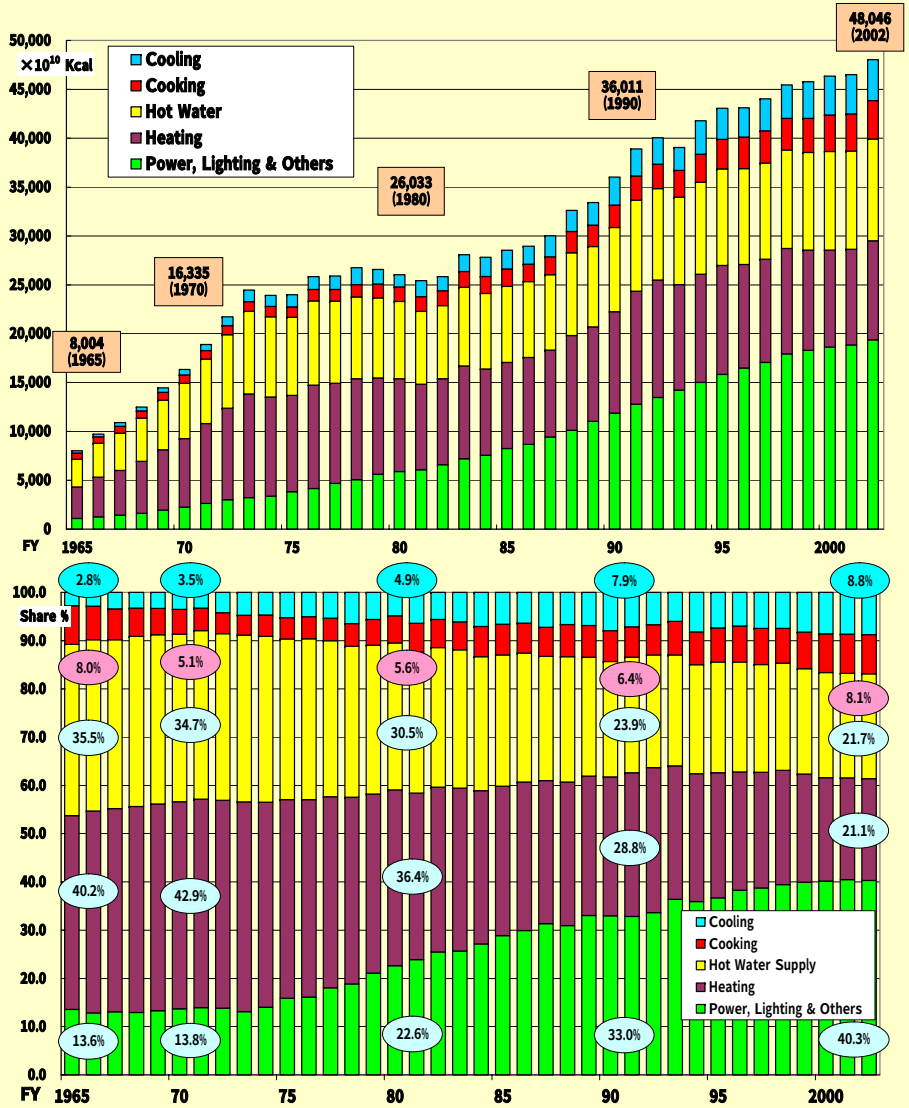
Share of Energy Consumption by Business type



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

- Formerly, the hotel and office building accounted for the greater part of the energy consumption.
- Recently, however, the wholesale and retail rank first at 21 percent in 2002.
- Also, the other service industries such as welfare facilities are increasing their shares.
- The school shows a declining share, 9 percent in 2002, because their floor area is not increasing fast enough.

Energy Consumption by type



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

- **The energy intensity for power and lighting has steadily increased reflecting the computerization and increasing office floors, reaching 40 percent in fiscal 2001.**
- **By contrast, the energy intensity for heating and hot water supply has decreasing, as a result of advancement of energy conservation (use of more efficient equipment) and improving thermal insulation of buildings.**

(×1,000 TOE)

	Cooling	Heating	Hot Water	Cooking	Power, Lighting	Total
1965	221	3,214	2,838	643	1,088	8,004
70	573	7,007	5,673	836	2,246	16,335
80	1,263	9,486	7,931	1,460	5,893	26,033
90	2,855	10,372	8,605	2,302	11,878	36,011
2002	4,206	10,139	10,421	3,911	19,369	48,046
1965	2.8	40.2	35.5	8.0	13.6	100.0
70	3.5	42.9	34.7	5.1	13.8	100.0
80	4.9	36.4	30.5	5.6	22.6	100.0
90	7.9	28.8	23.9	6.4	33.0	100.0
2002	8.8	21.1	21.7	8.1	40.3	100.0

Energy Consumption by End-Use and by Source

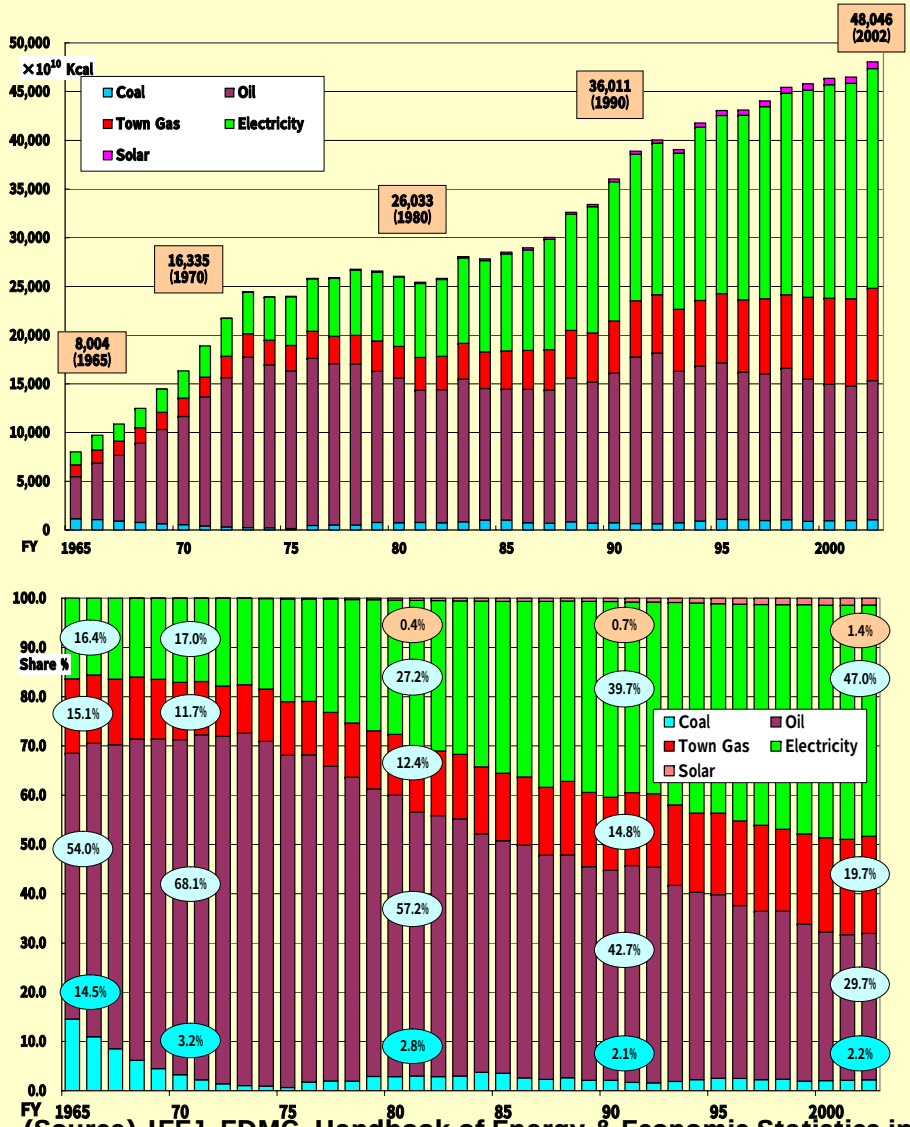
(FY2002) (10^3kcal/m^2、%)

	Heating	Cooling	Hot Water	Cooking	Power etc.	Total	Share %
Electricity	4.6	14.2	0.0	0.0	113.8	132.6	(47.0)
Town Gas, LPG	6.3	7.0	20.8	21.6	0.0	55.6	(19.7)
Oil	47.7	3.5	32.7	0.0	0.0	83.8	(29.7)
Coal etc.	1.0	0.0	3.8	1.4	0.0	6.2	(2.2)
Solar	0.0	0.0	3.9	0.0	0.0	3.9	(1.4)
Total	59.6	24.7	61.2	23.0	113.8	282.3	(100.0)
Share %	(21.1)	(8.7)	(21.7)	(8.1)	(40.3)	(100.0)	

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

- Petroleum accounts for about 80% in the heating use and for about 53% in the hot water supply use.
- Electricity represents 100% in the power and lighting use, about 57% in the cooling use, and somewhat less than 8% in the heating use.
- Gas accounts for more than 90% in the cooking use and about 30% in the hot water supply and about 28% in the cooling uses.

Consumption by type of Energy



- The consumption of electricity and gas has been steadily increasing, reflecting the increasing demand for power and lighting.
- The share of electricity has increased to 47.0 %. The share of gas has increased to 19.7 %, reflecting the demand for cooling.
- By contrast, the share of petroleum has declined to 29.7 %, accompanying declining share of heating and hot water supply, and conversion of energy from petroleum to electricity and gas.

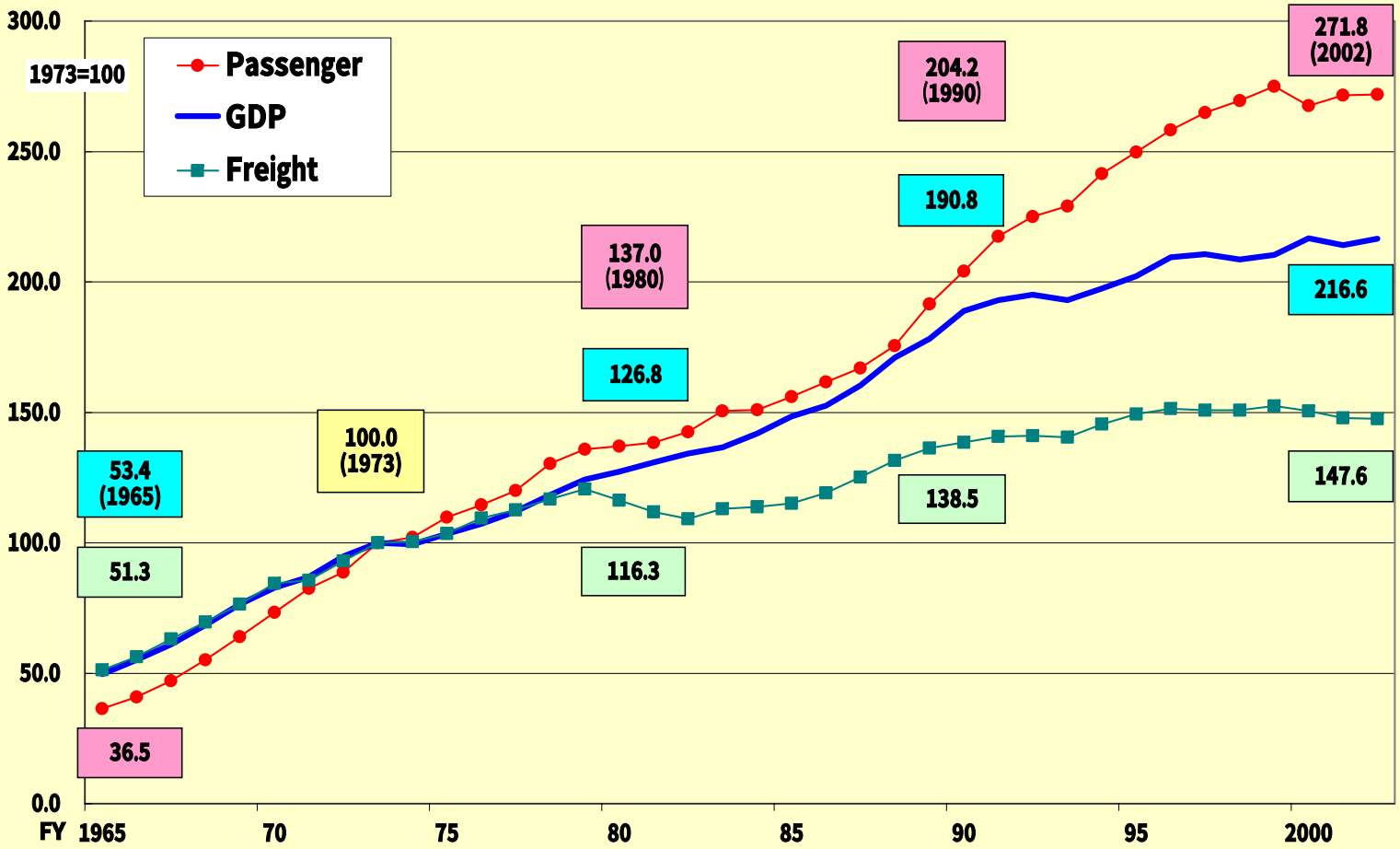
	Coal	Oil	Town Gas	Electricity	Solar Heat	Total
1965	1,163	4,320	1,209	1,312	0	8,004
70	525	11,119	1,904	2,782	5	16,335
80	736	14,884	3,224	7,082	107	26,033
90	745	15,363	5,342	14,301	260	36,011
2002	1,060	14,271	9,472	22,572	671	48,046
1965	14.5	54.0	15.1	16.4	0.0	100.0
70	3.2	68.1	11.7	17.0	0.0	100.0
80	2.8	57.2	12.4	27.2	0.4	100.0
90	2.1	42.7	14.8	39.7	0.7	100.0
2002	2.2	29.7	19.7	47.0	1.4	100.0

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

Energy Consumption in the Transportation Sector

- Economic Activity and Transportation Demand, Energy Consumption
- Transportation Demand and Shares by Transportation Mode
- Energy Demand and Shares by Mode
- Energy Intensity (Energy Consumption per Transportation Demand)
- Vehicle Stock

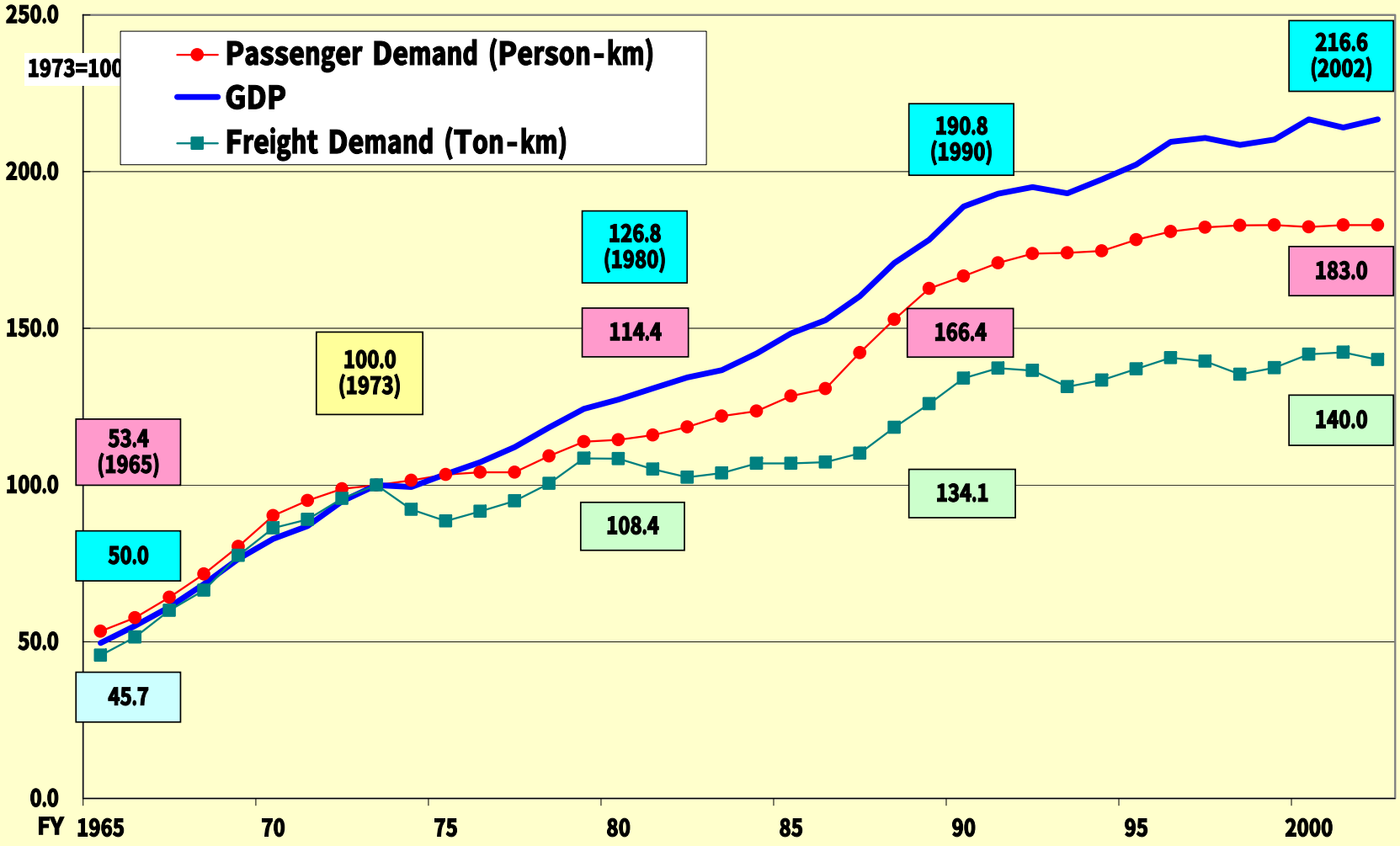
Energy Consumption in the Transportation Sector



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

- **The energy consumption in the passenger transportation sector has increased at a rate outpacing the GDP growth rate.**

Transportation Demand in the Transportation Sector



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

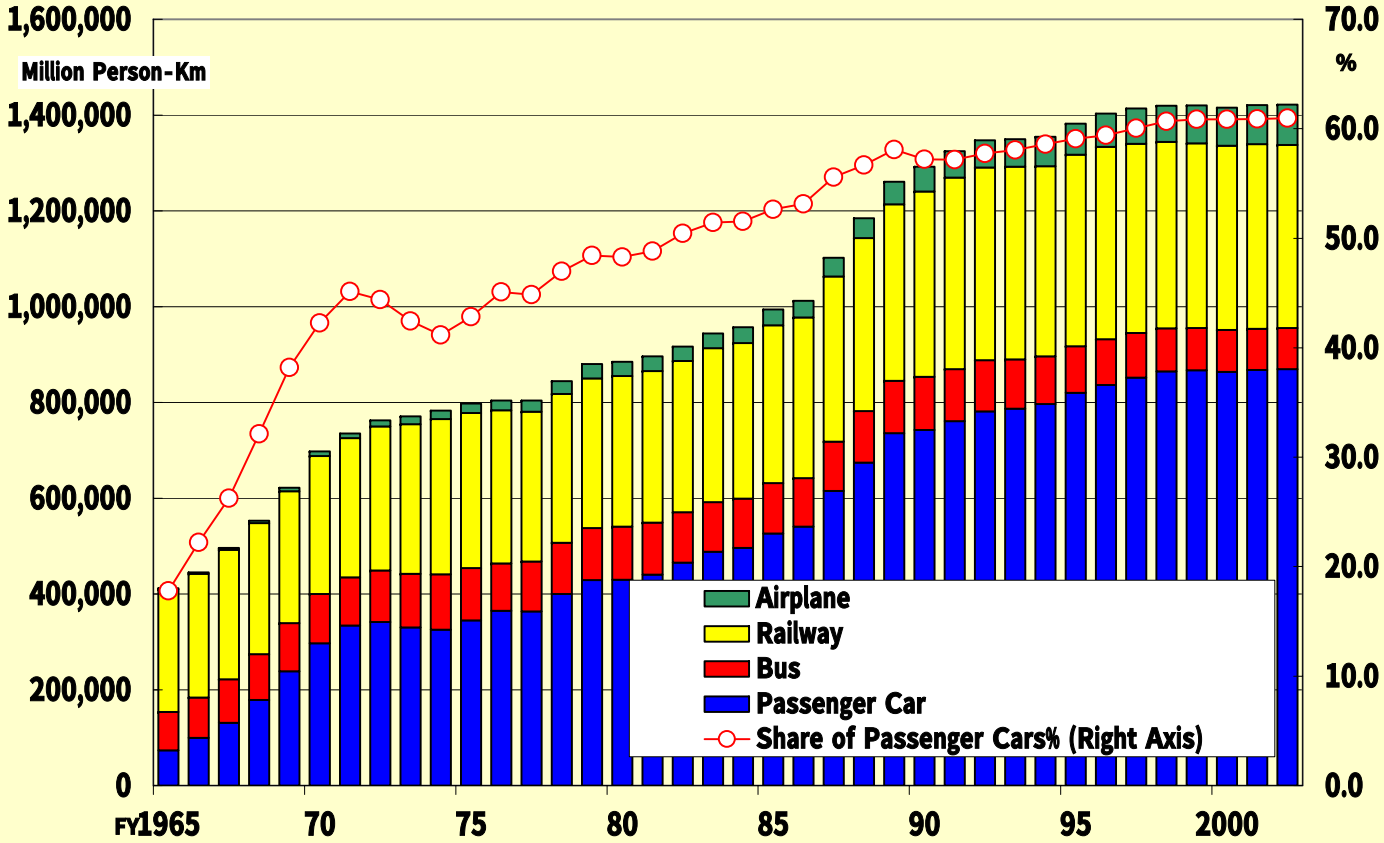
Transportation Demand and Energy Consumption

	1965F	1973F	1980F	1990F	2002F
Transportation Demand					
Passenger (Million Person-km)	415,827	778,808	891,073	1,296,324	1,425,347
Freight (Million Ton-km)	186,421	407,805	441,872	546,785	570,733
Total Energy Consumption (MTOE)	19.1	43.4	55.0	74.4	91.1
Passenger	7.9	21.7	29.7	44.3	59.0
Freight	11.1	21.7	25.3	30.1	32.1
Real GDP (1995 Price, Billion Yen)	123,072	247,709	315,175	467,913	536,609

	Annual Average Growth rate %			
	1965-73	1973-80	1980-90	90-2002
Transportation Demand				
Passenger (Person-km) (a)	8.2	1.7	4.8	0.8
Freight (Ton-km) (b)	10.3	1.0	2.7	0.4
Total Energy Consumption	10.8	3.0	3.8	1.7
Passenger	13.4	4.0	5.1	2.4
Freight	8.7	1.9	2.2	0.5
Real GDP (1995 Price) (c)	9.1	3.5	4.0	1.1
Elasticity of Passenger Transportation Demand to GDP (a) / (c)	0.89	0.48	1.19	0.69
Elasticity of Freight Transportation Demand to GDP (b) / (c)	1.13	0.29	0.67	0.31

- The passenger transportation has been steadily growing. The freight transportation tends to be affected by business activities and changes in industrial structure.
- The elasticity of transportation to GDP (growth rate of transportation/GDP growth rate) varies with time. It may be noted that variation is greater in freight transportation.

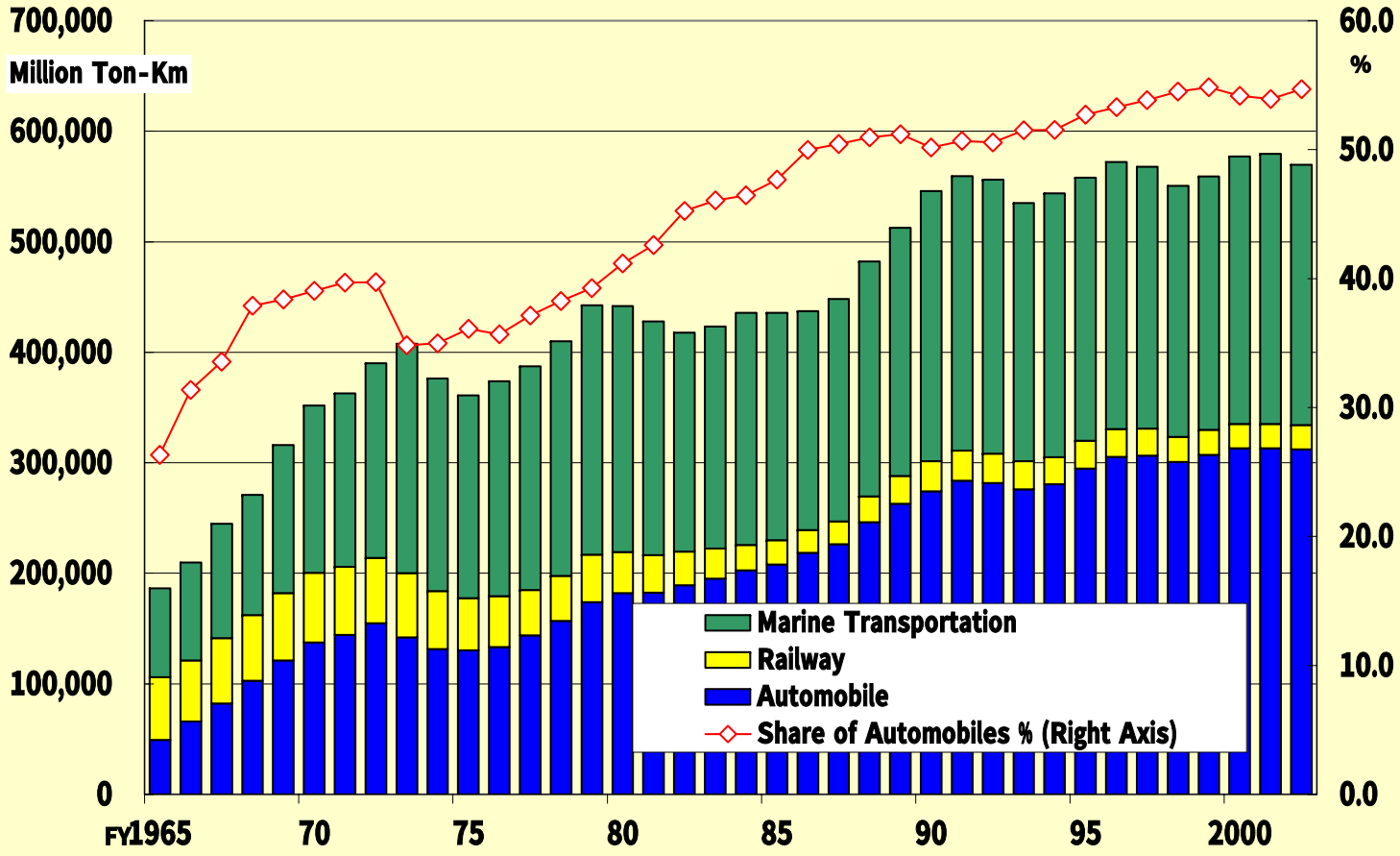
Passenger Transportation Demand and Shares by Transportation Mode



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

- **The demand for transportation by automobiles has steadily increased to over 60 percent of the total, while that for railroad has declined.**

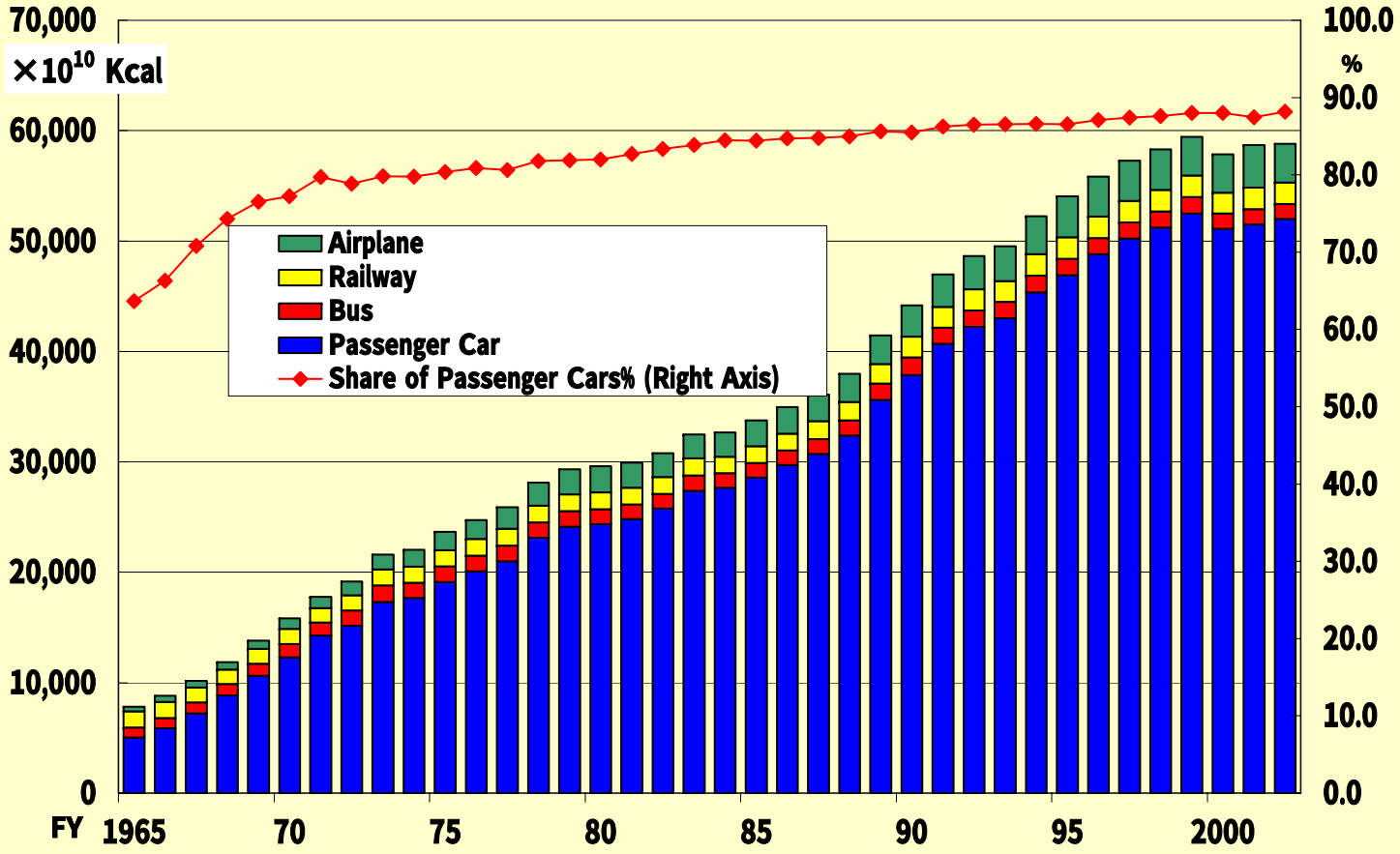
Freight Transportation Demand and Shares by Transportation Mode



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

- The demand for transportation by automobile and marine jointly represent more than 90% of the total demand. The share of the railroad transportation has been declining.

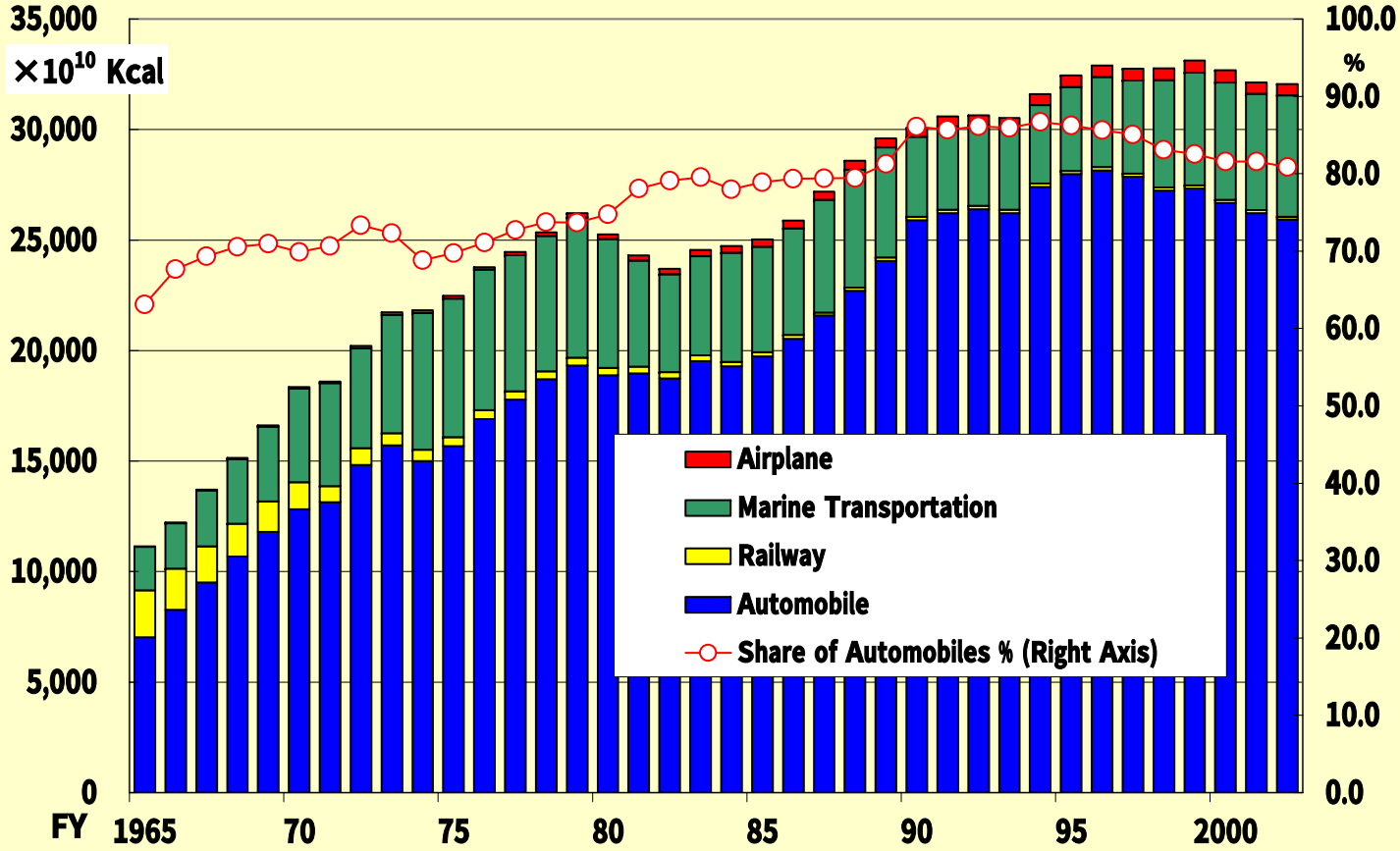
Energy Demand for Passenger and Shares by Transportation Mode



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

- The energy demand for passenger cars has steadily increased to nearly 90 % recently, along with the progress of motorization.

Energy Demand for Freight and Shares by Transportation Mode



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

- **The energy demand for automobiles has leveled off since 1990. Transportation by automobile and marine transportation jointly account for most of the energy demand.**

Energy Intensity (Energy Consumption per Transportation Demand)

Kcal/Person・Km

Passenger	Passenger Car	Bus	Railway	Marine	Aviation	Average
1965	681	113	57	191	1,507	190
1970	414	116	48	220	1,026	227
1980	567	122	48	214	795	334
1990	510	145	48	202	550	342
2002	587	158	50	529	473	413

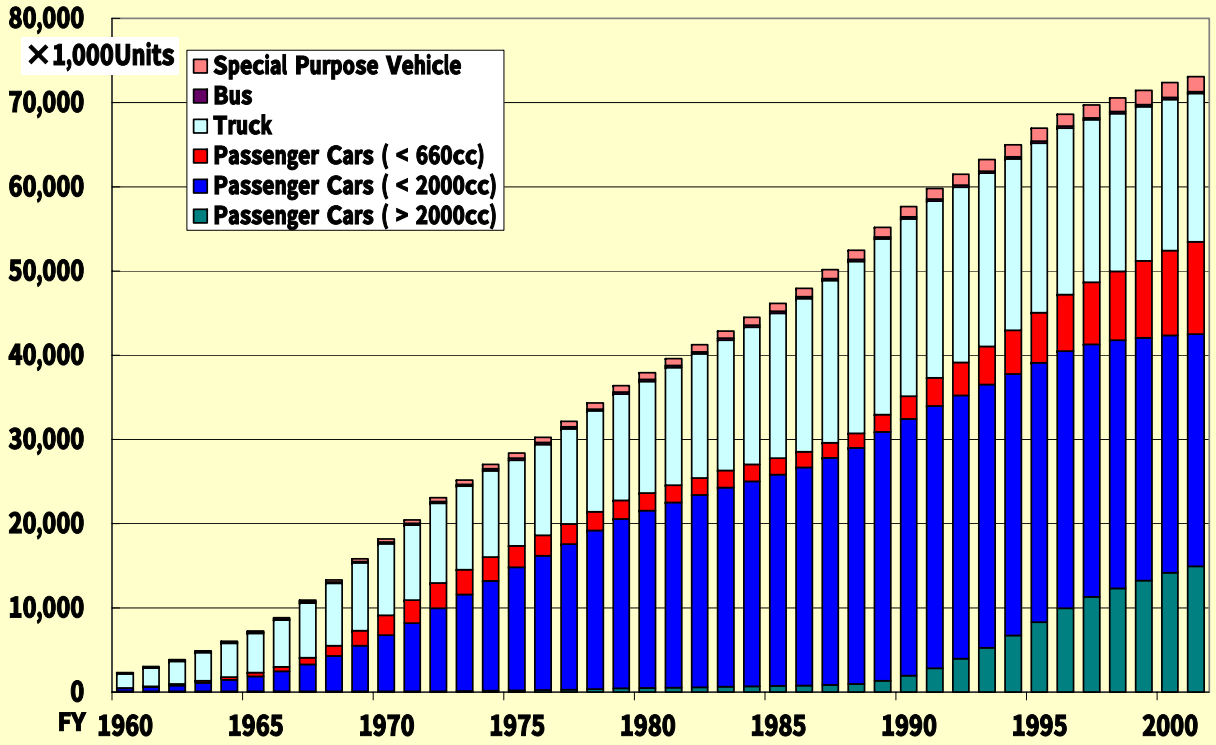
- The energy intensity of aircraft transportation is by far the largest, and that of railroad transportation is small.

Kcal/Ton・Km

Freight	Automobiles	Railway	Marine	Aviation	Average
1965	1,433	375	244	9,544	598
1970	933	193	281	8,960	522
1980	1,038	86	263	7,631	572
1990	944	60	148	5,180	550
2002	830	61	232	5,216	561

- The aircraft transportation, which is the fastest, is by far the largest.

Vehicle Stock by Type and by Size



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

- The numbers of passenger cars and automobiles driven by gasoline are increasing. The numbers of trucks and automobiles driven by diesel fuel are decreasing recently.
- The larger passenger cars became more popular during the 1970s. In the 1990s, the light motor vehicles increased again reflecting the sluggish economy.

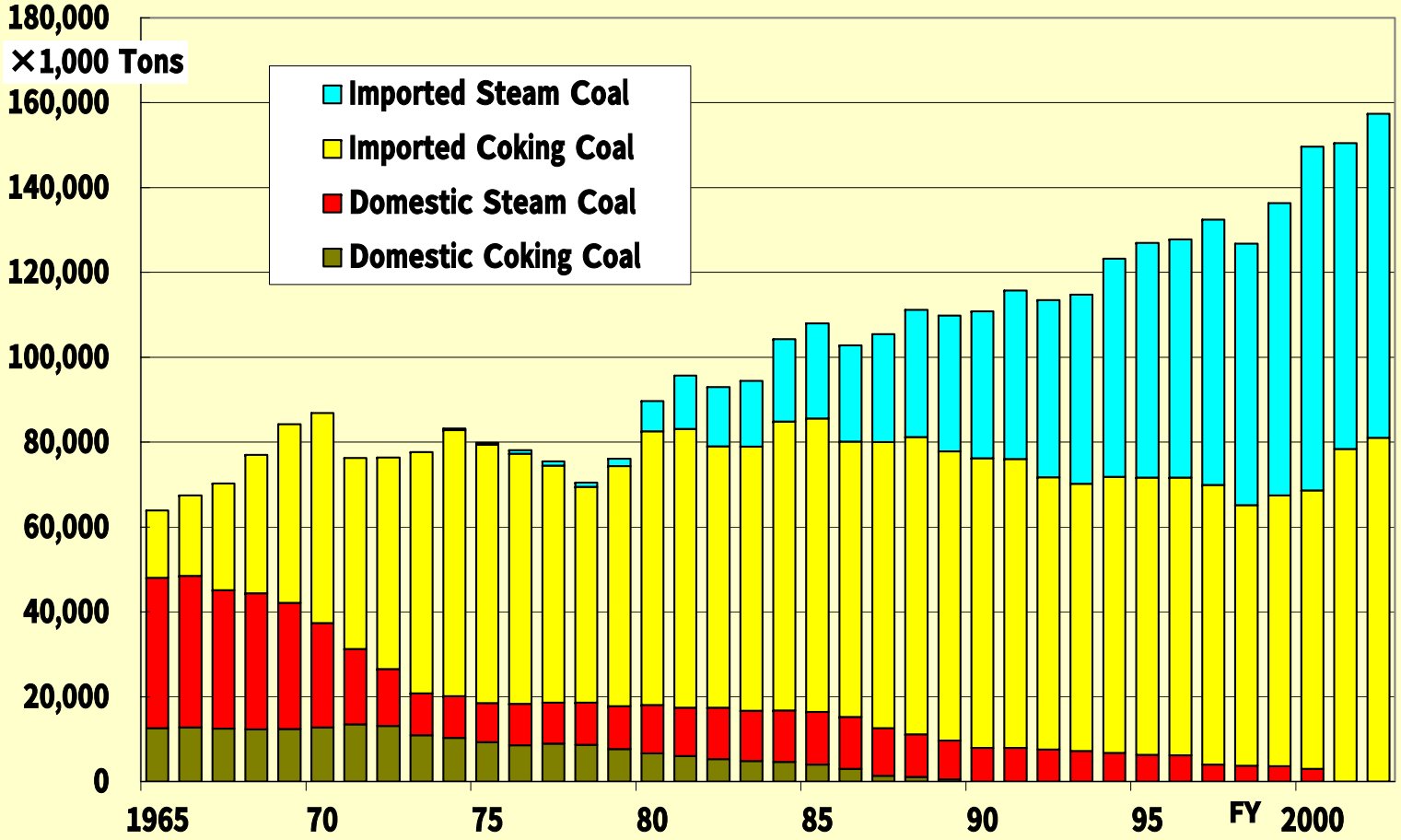
Share of Gasoline Vehicles %

	1965	1973	1980	1990	2001
Passenger Cars	96.3	98.4	97.3	90.6	92.2
Trucks	92.0	86.0	79.3	72.1	66.8
Total	91.5	91.7	89.0	81.9	84.2

Energy Supply and Demand by Source

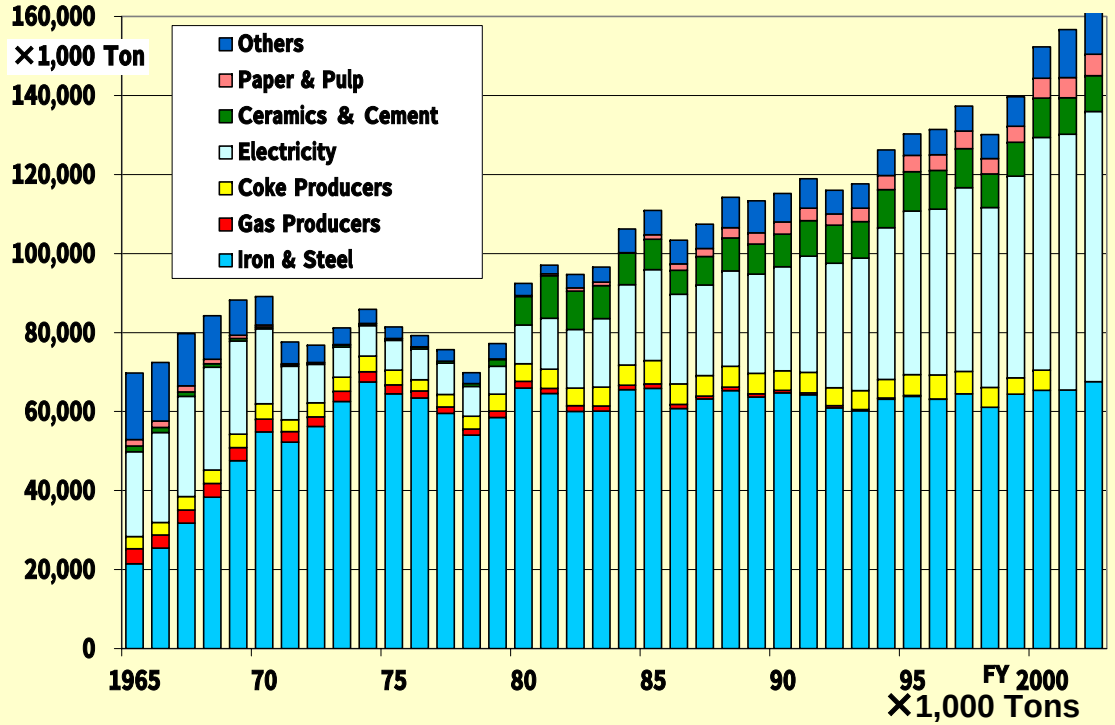
- Supply and Demand of Coal
- Supply and Demand of Oil
- Supply and Demand of Town Gas
- Supply and Demand of Electric Power
- Issues for the Future

Coal Supply by Type of Coal



- The supply of steam coal has been increasing. Though very little in total supply, the supply of anthracite has been increasing.
- Domestic production of coal peaked in 1961 at 55,410 thousand tons. In Mar. 2002, last coal mine was closed and Japan's domestic coal mine is used only for engineers training now.

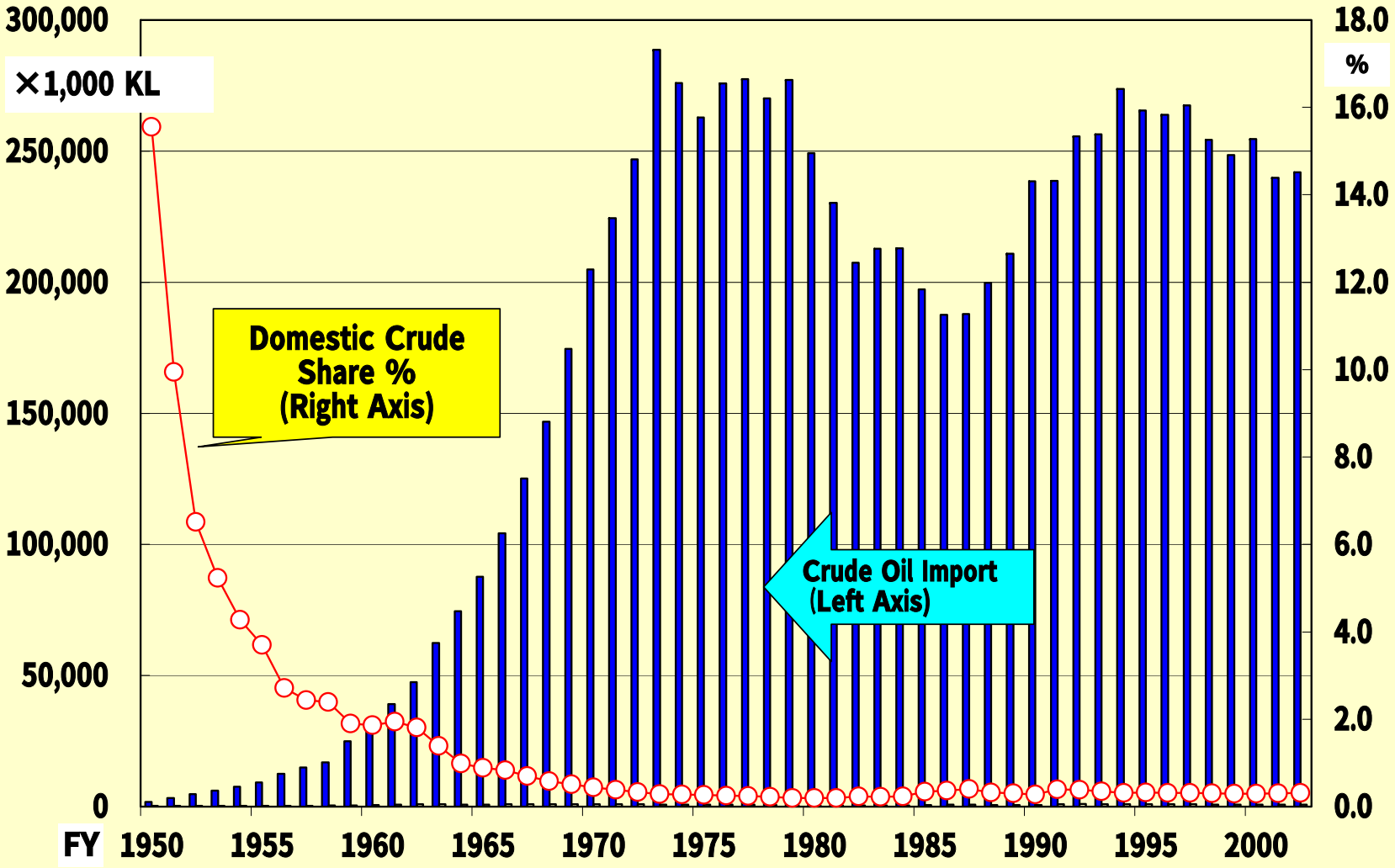
Coal Demand by Major Coal Consumer



	Iron & Steel	Gas Producers	Coke Producers	Electricity	Ceramics & Cement	Paper & Pulp	Others	Total
1965	21,458	3,838	3,073	21,423	1,461	1,670	16,852	69,775
70	54,821	3,269	3,901	18,952	464	484	7,223	89,114
80	65,969	1,653	4,473	9,818	7,202	274	3,016	92,405
90	64,712	703	4,943	26,284	8,286	3,031	7,211	115,170
2002	67,571	-	-	68,377	9,097	5,358	12,274	162,678
1965	30.8	5.5	4.4	30.7	2.1	2.4	24.2	100.0
70	61.5	3.7	4.4	21.3	0.5	0.5	8.1	100.0
80	71.4	1.8	4.8	10.6	7.8	0.3	3.3	100.0
90	56.2	0.6	4.3	22.8	7.2	2.6	6.3	100.0
2002	41.5	0.0	0.0	42.0	5.6	3.3	7.5	100.0

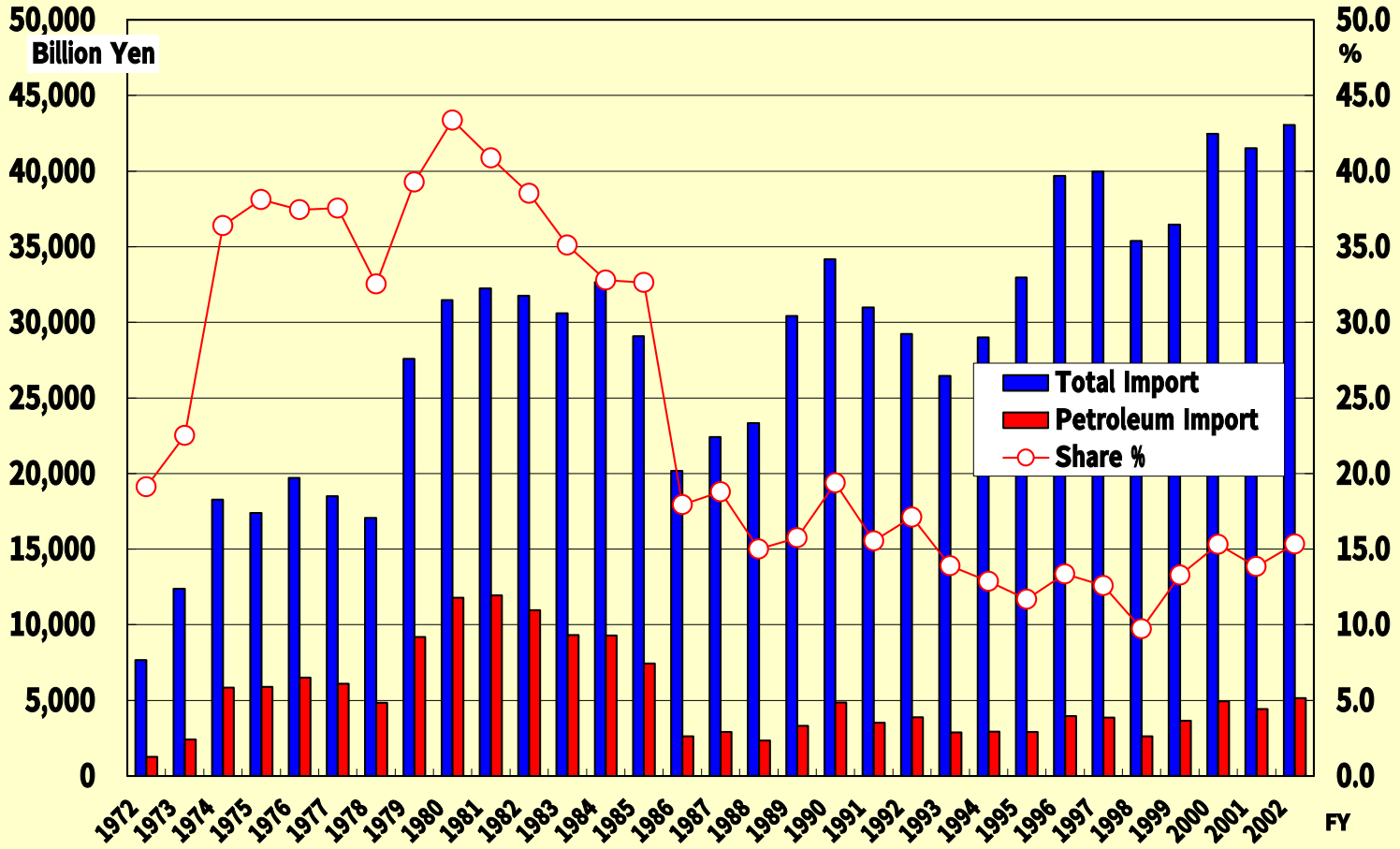
- **Consumption of coal in Japan has been increasing since fiscal 1978 and came close to 163 million tons in fiscal 2002.**
- **The consumption by the iron and steel industry, the largest consumer, has remained almost unchanged recently**
- **However, there is a conspicuous increase in the demand by the electric power utility industry.**

Domestic Production and Import of Crude Oil



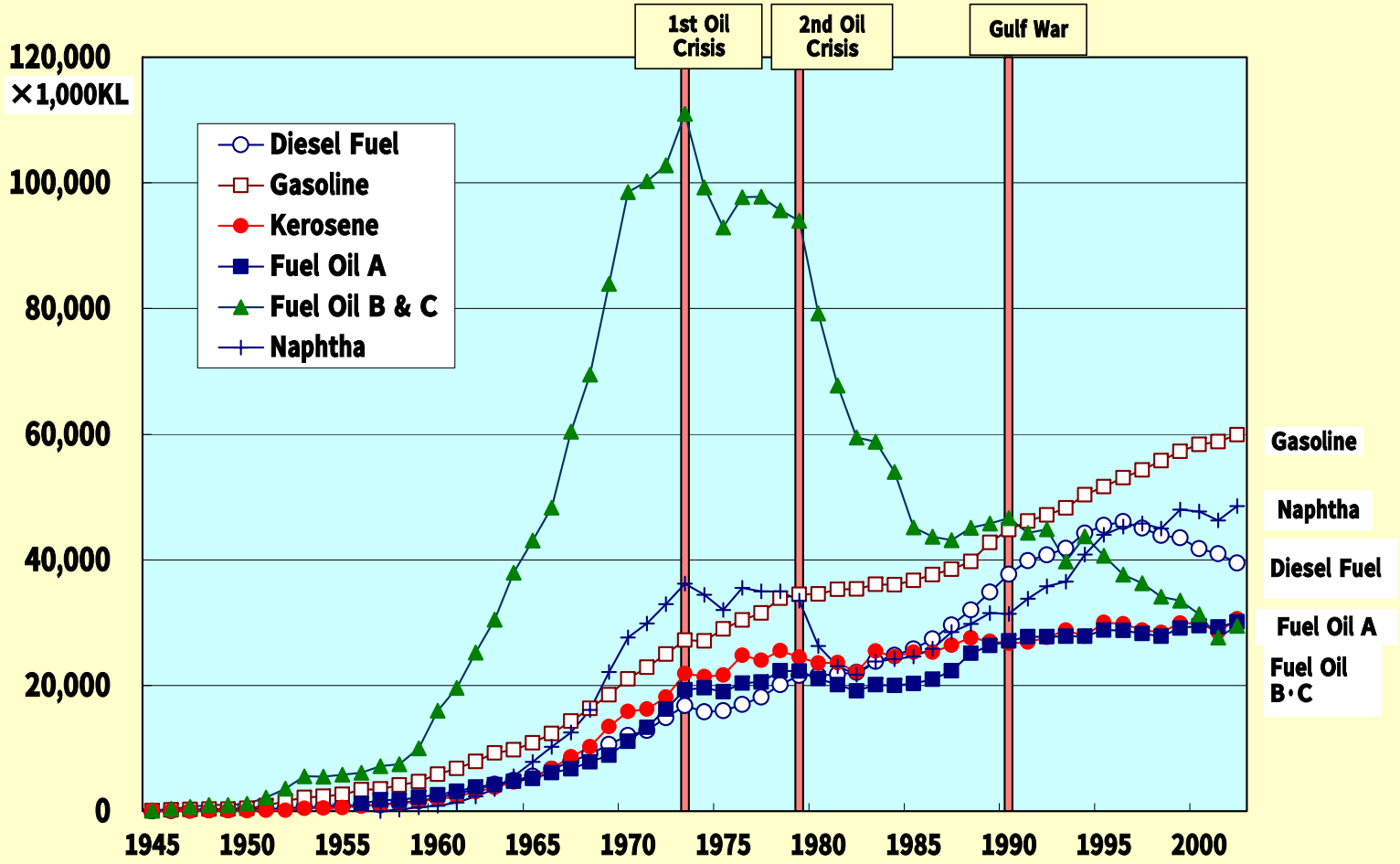
- The rate of self-sufficiency of petroleum supply of Japan is 0.3 percent in fiscal 2002 (756,000 KL).

Petroleum Import Accounts



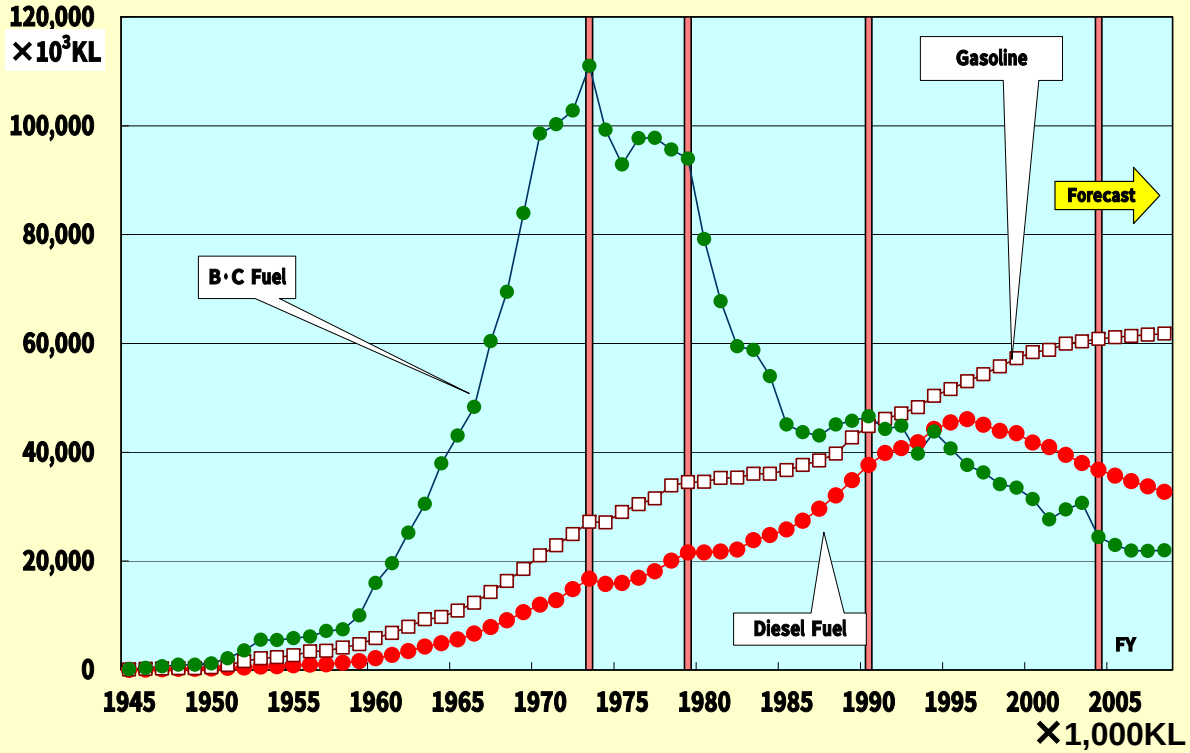
	1973	1980	1990	2000	2002
Yen/US$ Exchange Rate	274.38	218.52	138.23	109.95	121.98
Crude Oil CIF Price $/BBL	4.75	34.62	23.34	28.37	27.40
Crude Oil CIF Price Yen/KL	8,329	47,508	20,297	19,617	21,026

Sales of Petroleum Products by Fuel



- Since the latter half of the 1980s, use of alternate energy and energy conservation have been promoted.
- As a result, sale of heavy fuel oil (Fuel Oil B, C) has declined and that of such distillate fuels as gasoline, kerosene and diesel fuel has increased.

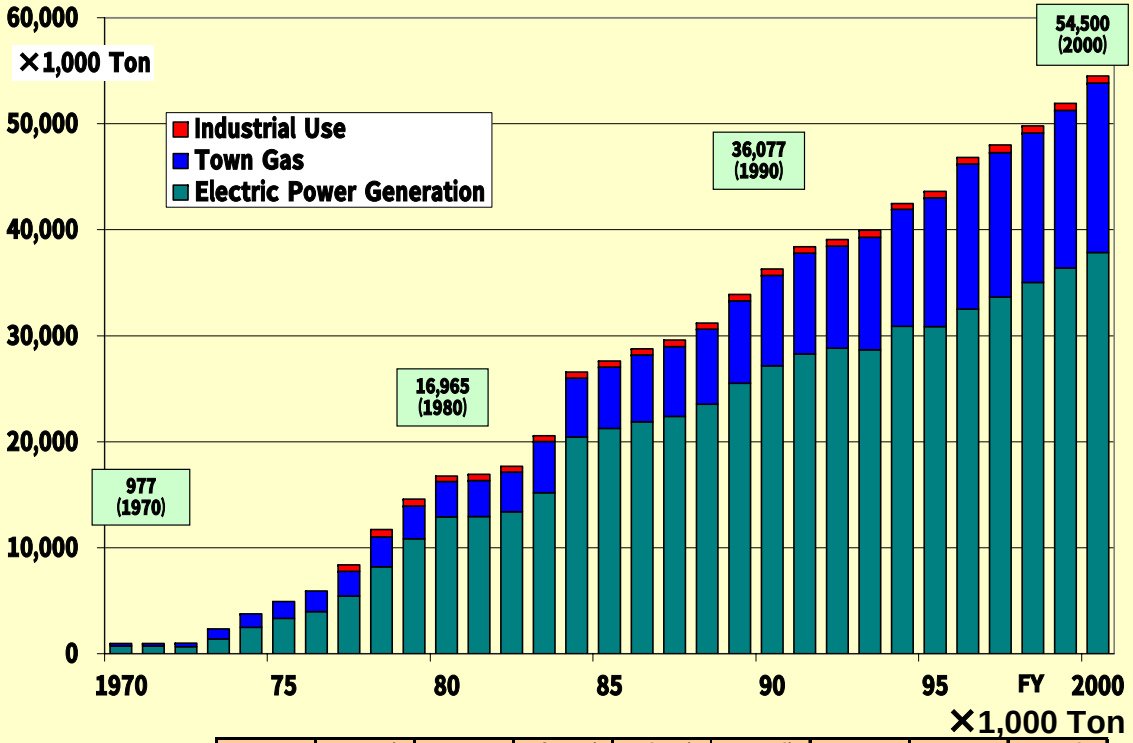
Demand Forecast of Petroleum Products



	FY2002	FY2003 Preliminary	Forecast					Growth Rates %	Share %	
			FY2004	FY2005	FY2006	FY2007	FY2008	2003/2008	2003	2008
Gasoline	59,917	60,347	60,835	61,146	61,369	61,633	61,786	0.5	25.0	27.1
Naphtha	48,585	48,563	48,460	47,491	47,461	47,338	47,447	▲ 0.5	20.1	20.8
Jet Fuel	4,605	4,542	4,590	4,620	4,647	4,681	4,689	0.6	1.9	2.1
Kerosene	30,626	29,119	29,588	29,490	29,427	29,468	29,285	0.1	12.1	12.8
Diesel Fuel	39,498	37,986	36,753	35,711	34,699	33,707	32,694	▲ 3.0	15.7	14.3
Fuel Oil A	30,137	30,142	30,299	30,333	30,326	30,279	30,233	0.1	12.5	13.3
Fuel Oil B & C	29,517	30,704	24,456	22,916	21,938	21,849	21,978	▲ 6.5	12.7	9.6
For Power Generation Use	10,843	12,948	7,241	5,839	5,140	5,317	5,695	▲ 15.1	5.4	2.5
Others	18,674	17,756	17,215	17,077	16,798	16,532	16,283	▲ 1.7	7.4	7.1
Fuel Oil Total	59,654	60,846	54,755	53,249	52,264	52,128	52,211	▲ 3.0	25.2	22.9
Total Demand	242,884	241,403	234,981	231,707	229,866	228,955	228,112	▲ 1.1	100.0	100.0

(source) METI, Mar. 2004

LNG Demand by Use

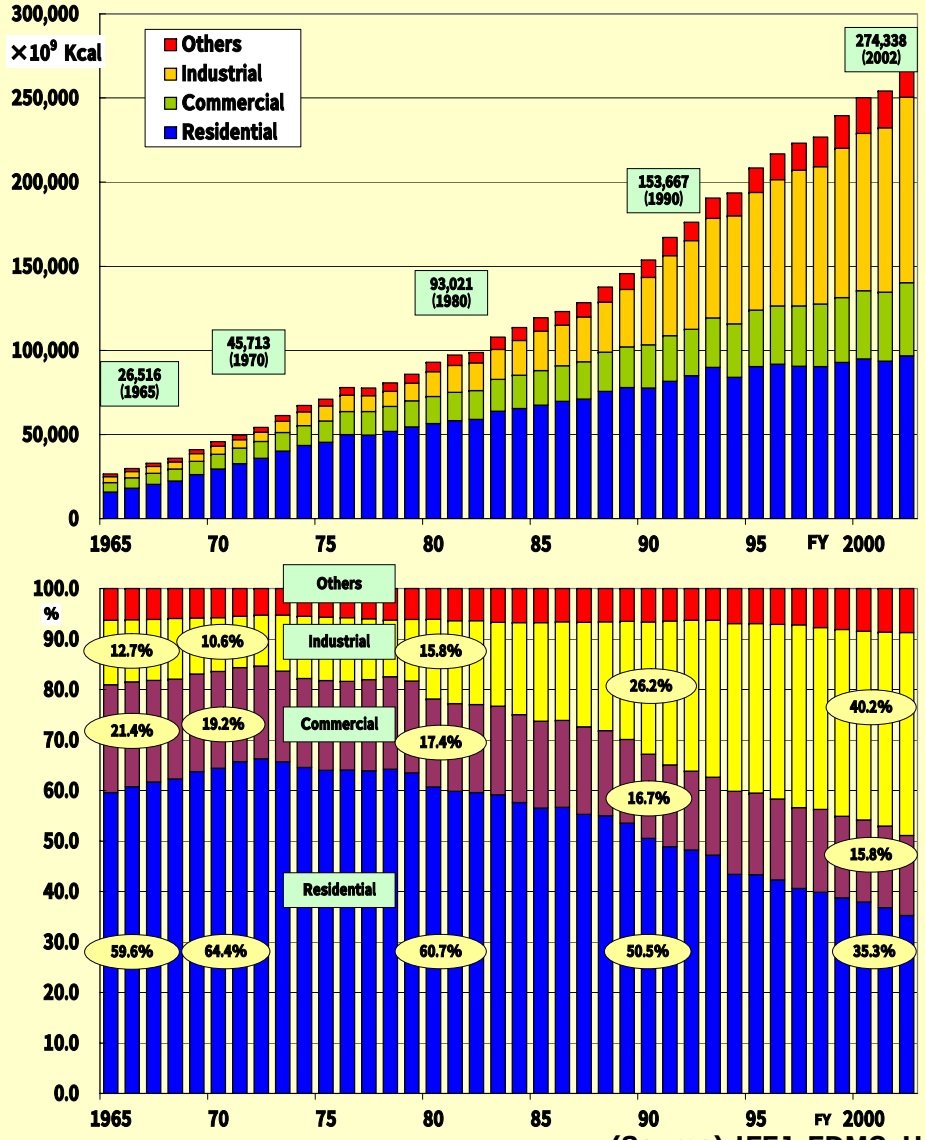


	U.S.	Brunei	UAE	Indonesia	Malaysia	Australia	Qatar	Oman	Total
1969	182	-	-	-	-	-	-	-	182
73	989	1,375	-	-	-	-	-	-	2,364
80	872	5,418	2,001	8,674	-	-	-	-	16,965
90	982	5,254	2,272	17,609	6,775	3,185	-	-	36,077
2000	1,260	5,715	4,802	18,123	10,923	7,154	6,000	123	54,100
2002	1,253	6,011	4,633	17,522	10,881	7,212	6,640	867	55,018
1969	100.0								100.0
73	41.8	58.2							100.0
80	5.1	31.9	11.8	51.1					100.0
90	2.7	14.6	6.3	48.8	18.8	8.8			100.0
2000	2.3	10.6	8.9	33.5	20.2	13.2	11.1	0.2	100.0
2002	2.3	10.9	8.4	31.8	19.8	13.1	12.1	1.6	100.0

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

- The demand for natural gas in Japan is met almost entirely by the imported LNG. The imported LNG is consumed almost entirely for electric power generation, about 70 percent, and for city gas, about 30 percent.
- In FY 2002, Japan imported 55.0million tons of LNG. About 70 percent of imported natural gas comes from Indonesia, Malaysia and Brunei, accounting respectively for 31.8, 19.8 and 10.9percent.

Sale of Town Gas by Use



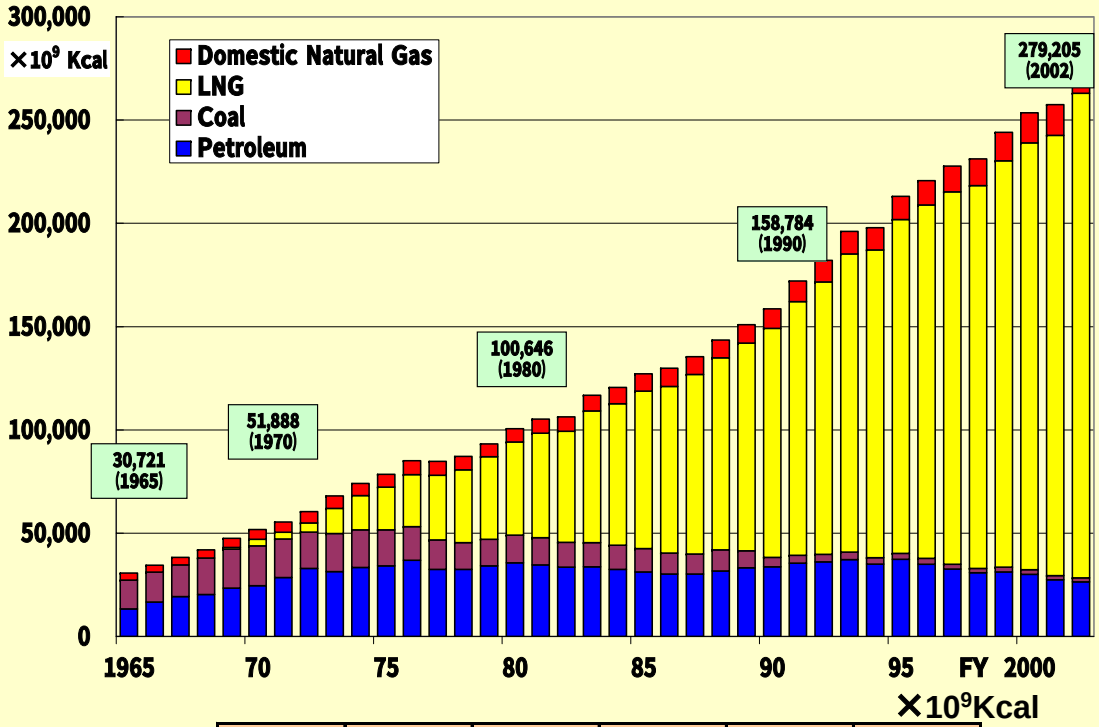
- Regarding the ratios of sales by use, the industrial consumption has increased to 40 % while that for household use has decreased in relative terms to less than 40%.
- There are 229city gas enterprises operating in Japan. Of these gas enterprises, the major four companies jointly occupy 78% of the sale and 68% of the consumer households. Regarding area, city gas supply covers only 5% of the entire area of Japan.

×10⁹Kcal

	Residential	Commercial	Industry	Others	Total
1965	15,799	5,671	3,377	1,669	26,516
70	29,432	8,779	4,862	2,641	45,713
80	56,492	16,164	14,690	5,676	93,021
90	77,638	25,619	40,195	10,215	153,667
2000	94,912	40,612	93,443	21,206	250,173
2002	96,727	43,458	110,229	23,924	274,338
1965	59.6	21.4	12.7	6.3	100.0
70	64.4	19.2	10.6	5.8	100.0
80	60.7	17.4	15.8	6.1	100.0
90	50.5	16.7	26.2	6.6	100.0
2000	37.9	16.2	37.4	8.5	100.0
2002	35.3	15.8	40.2	8.7	100.0

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

Production and Purchase of Town Gas by Sources

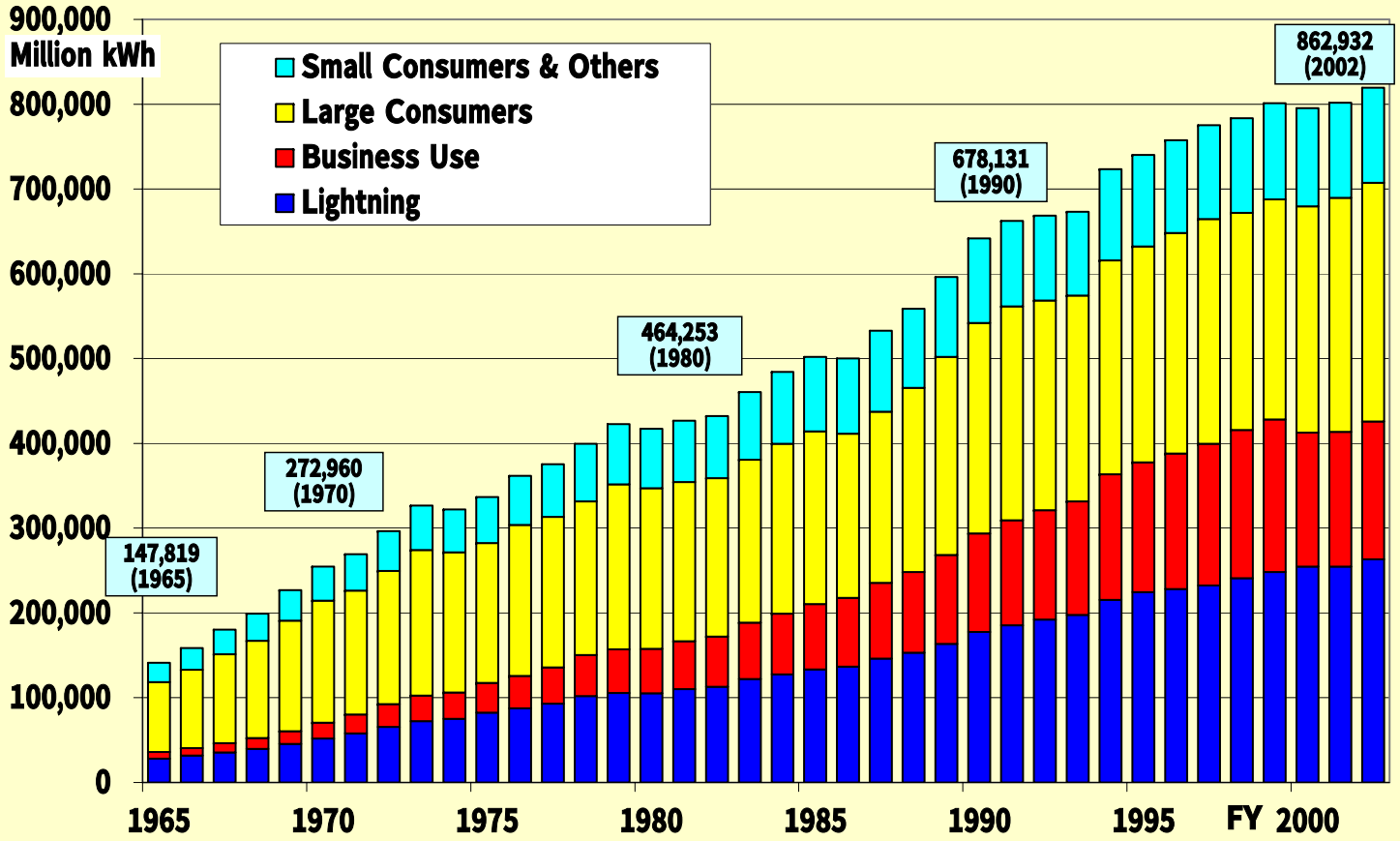


	Oil	Coal	LNG	Domestic Gas	Others	Total
1965	13,424	13,985	-	3,274	39	30,721
70	24,668	19,295	3,144	4,697	84	51,888
80	35,696	13,383	45,101	6,379	87	100,646
90	33,695	4,581	110,900	9,478	130	158,784
2000	30,130	2,287	206,467	14,581	7	253,472
2002	26,493	1,882	234,632	16,191	8	279,205
1965	43.7	45.5		10.7	0.1	100.0
70	47.5	37.2	6.1	9.1	0.2	100.0
80	35.5	13.3	44.8	6.3	0.1	100.0
90	21.2	2.9	69.8	6.0	0.1	100.0
2000	11.9	0.9	81.5	5.8	0.0	100.0
2002	9.5	0.7	84.0	5.8	0.0	100.0

- **The raw material for the production of city gas has shifted at first from coal to petroleum and then from petroleum to LNG.**
- **Now, LNG accounts for 84 percent of the raw material.**

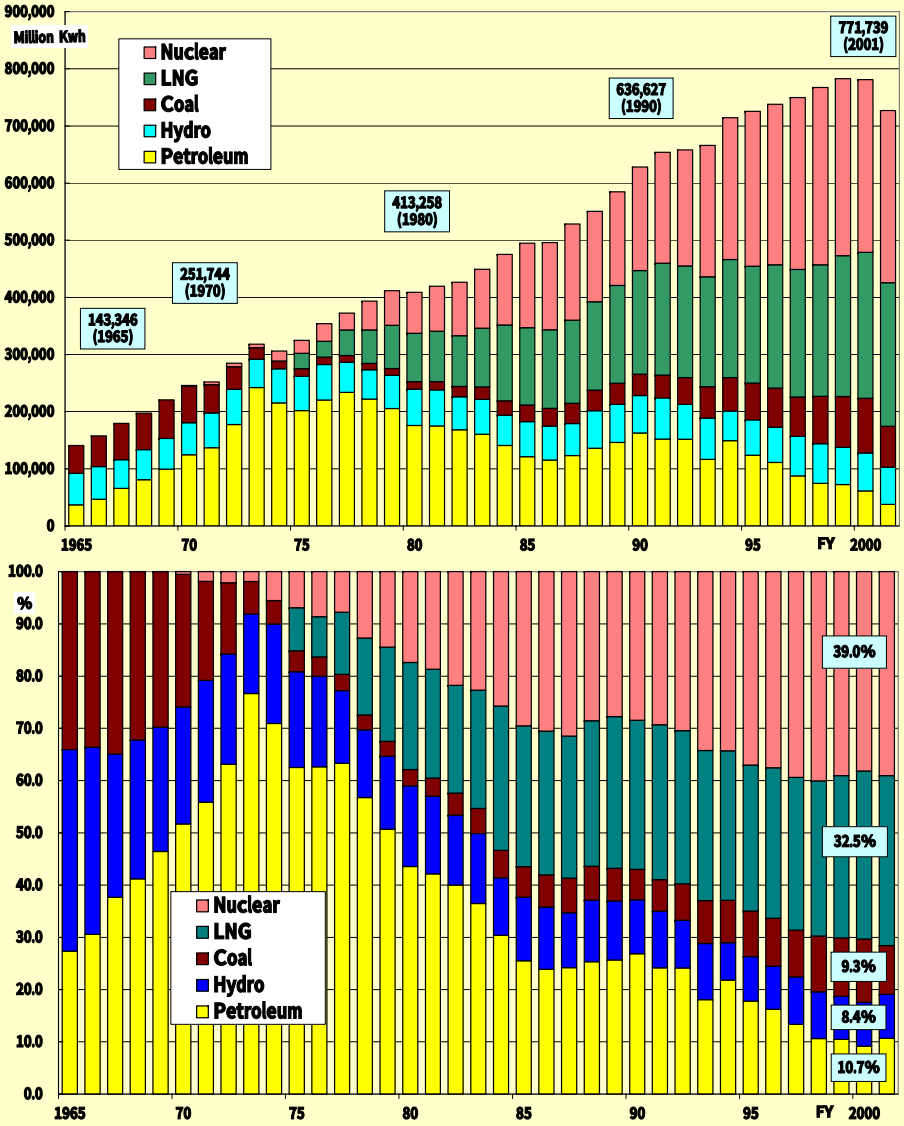
(Source) IEEJ, EDMC. Handbook of Energy & Economic Statistics in Japan 2004

Electric Power Demand by Sector



- The demand for electricity has grown steadily at a rate greater than that of final total energy consumption.
- While energy conservation has been promoted and efficiencies of electricity-using facilities have been improved, further penetration of household electric appliances and office automation equipment have contributed to the growth of electric power demand.

Electric Power Generation by Source

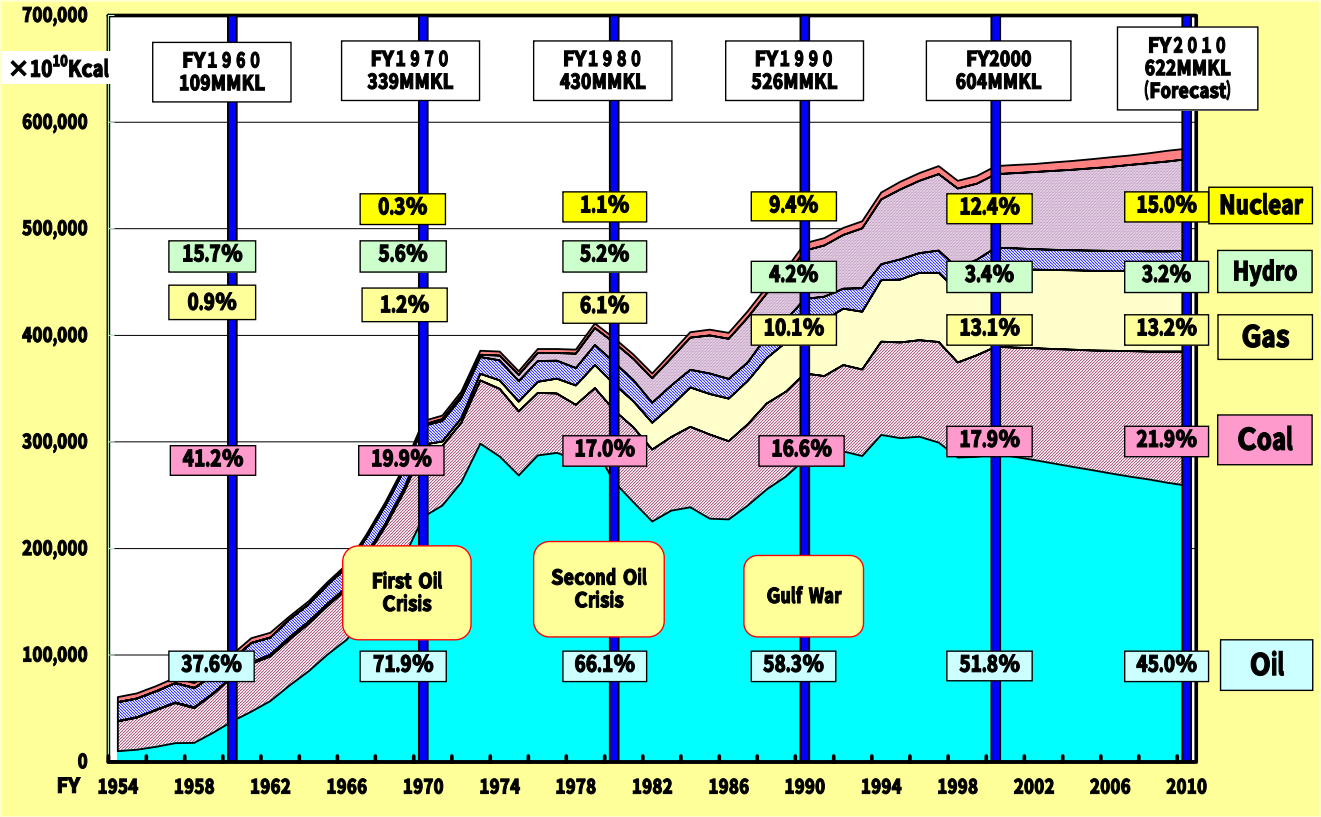


- **The total electric power generated by the top nine electric utility companies indicates that the oil-burning power generation had increased in ratio until fiscal 1973 (74%).**
- **Since the first energy crisis, the oil-burning power generation has been steadily declining. By contrast, nuclear power generation and LNG-burning power generation have been increasing since then.**

Key factors for the future

- Economic growth, final demand structure, industrial structure (international trade structure, technical structure), IT revolution
- Social factor (aging population, privatism, social advancement of women, increase of nuclear family households, etc.)
- Environment
- Energy conservation technology (technological advancement, economic incentive)
- Energy price, Energy security (energy diversification, promotion of nuclear power plant)
- Energy policy (promotion of energy conservation, tax system, deregulation, environmental regulation)

Forecast of Primary Energy Supply



(source) Advisory Committee for Natural Resources and Energy (ACNRE)
Long-term Energy Supply-Demand Outlook (July, 2001)

■Requirements from environmental conservation

- Reduction of fossil fuel use (introduction of nuclear power and new energy)
- Reduction of carbon emission in the use of fossil fuel (shift to natural gas)

Total Primary Energy Supply

(Unit：Million KL of Oil Equivalent)

FY	1990		1999		2010			
					Base Case		Target Case	
Total Primary Energy	526		593		622		about 602	
By Energy		Share		Share		Share		Share
Oil	307	58.3%	308	52.0%	280	45.0%	about 271	about 45%
Coal	87	16.6%	103	17.4%	136	21.9%	about 114	about 19%
Natural Gas	53	10.1%	75	12.7%	82	13.2%	about 83	about 14%
Nuclear	49	9.4%	77	13.0%	93	15.0%	93	about 15%
Renewable Total	29	5.6%	29	4.9%	30	4.8%	40	about 7%
Hydro	22	4.2%	21	3.6%	20	3.2%	20	about 3%
Geothermal	1	0.1%	1	0.2%	1	0.2%	1	about 0.2%
New Energy etc.	7	1.3%	7	1.1%	10	1.6%	20	about 3%

CO_2 Emission from Fuel Combustion

(Unit：Million t-C)

FY / Items	1990	1999	2010	
			Base Case	Target Case
CO_2 Emissions from Fuel Combustion (growth rate over FY1990 records)	287	313 (8.9%)	307 (6.9%)	about 287

(source) Advisory Committee for Natural Resources and Energy (ACNRE)
Long-term Energy Supply-Demand Outlook (July, 2001)

Final Energy Consumption

(Unit：Million KL of Oil Equivalent)

FY / Sector	1990		1999		2010			
					Base Case		Target case	
		Share		Share		Share		Share
Industrial	183	52.5%	197	49.0%	187	45.8%	about 185	about 46%
Residential & Commercial	85	24.4%	105	26.1%	126	30.8%	about 120	about 30%
Residential	46	13.3%	55	13.8%	60	14.7%	about 58	about 14%
Commercial	39	11.2%	50	12.3%	66	16.1%	about 63	about 16%
Transport	80	23.0%	100	24.9%	96	23.4%	about 94	about 24%
Passenger Cars	39	11.0%	53	13.2%	51	12.5%	about 50	about 12%
Freight etc.	42	12.0%	47	11.7%	45	10.9%	about 45	about 11%
Total	349	100.0%	402	100.0%	409	100.0%	about 400	100.0%

(source) Advisory Committee for Natural Resources and Energy (ACNRE)
Long-term Energy Supply-Demand Outlook (July, 2001)

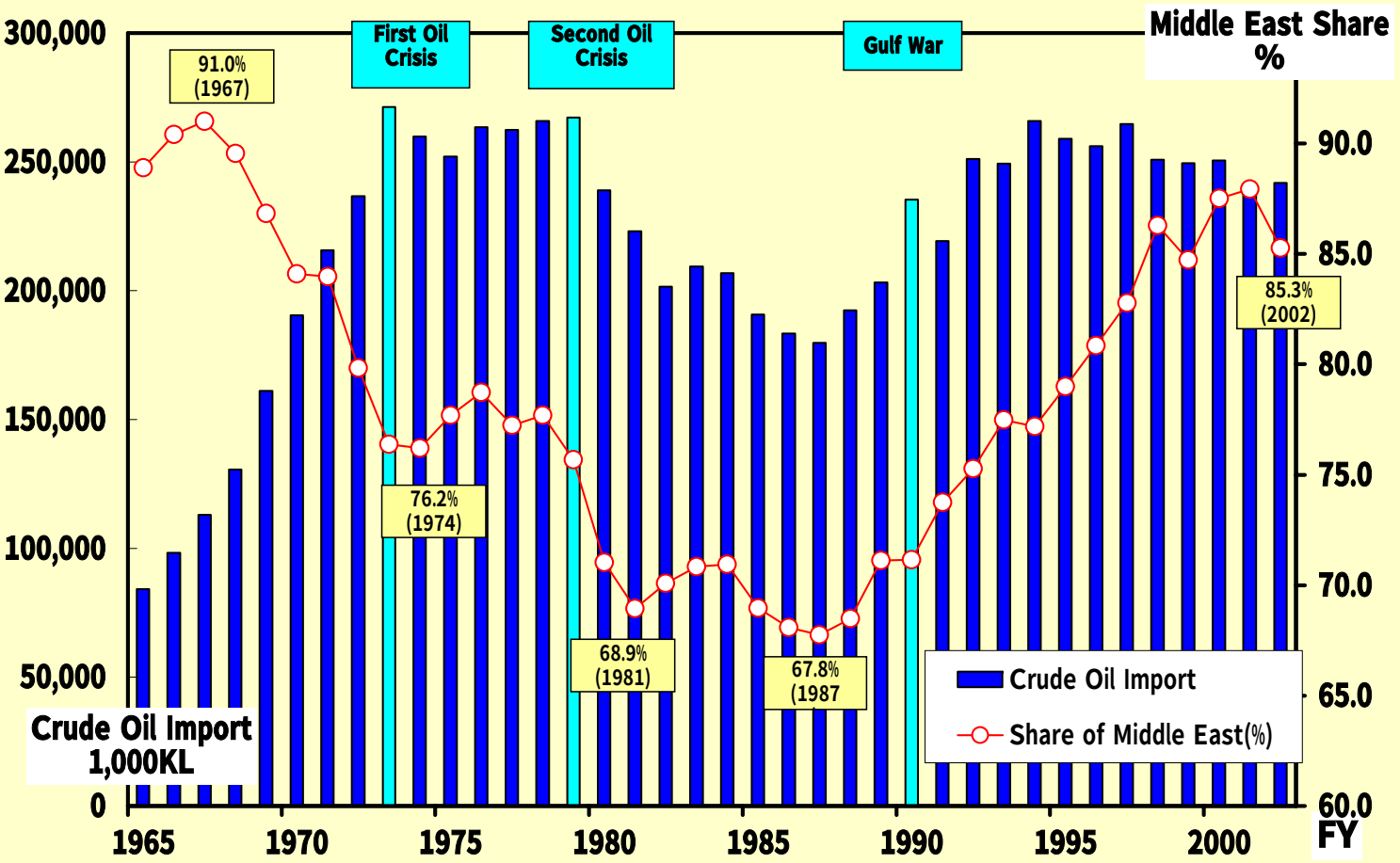
Power Generation Capacity

at the end of Fiscal Year (Electric Utilities) (UNIT：10MW)

FY	1990		1999		2010			
					Base Case		Target Case	
Total	17,212		22,410		26,657		25,288~27,229	
Power Sources		Share %		Share %		Share %		Share %
Thermal	10,408	60.5	13,434	59.9	15,343	57.6	14,670~16,220	57.0~59.6
Coal	1,223	7.1	2,488	11.1	44,101	6.5	3,155~4,413	12.3~16.2
LNG	3,839	22.3	5,677	25.3	6,702	25.1	6,606~6,696	24.6~26.1
Oil & Others	5,347	31.1	5,270	23.5	4,231	15.9	4,908~5,111	18.8~19.4
Nuclear	3,148	18.3	4,492	20.0	6,185	23.2	5,755~6,185	22.7~24.1
Hydro	3,632	21.1	4,433	19.8	5,071	19.0	4,810	17.7~19.0
General	1,931	11.2	2,002	8.9	2,070	7.8	2,069	7.6~8.2
Pumped	1,701	9.9	2,431	10.8	3,001	11.3	2,741	10.1~10.8
Geothermal	24	0.1	52	0.2	59	0.2	54	0.2

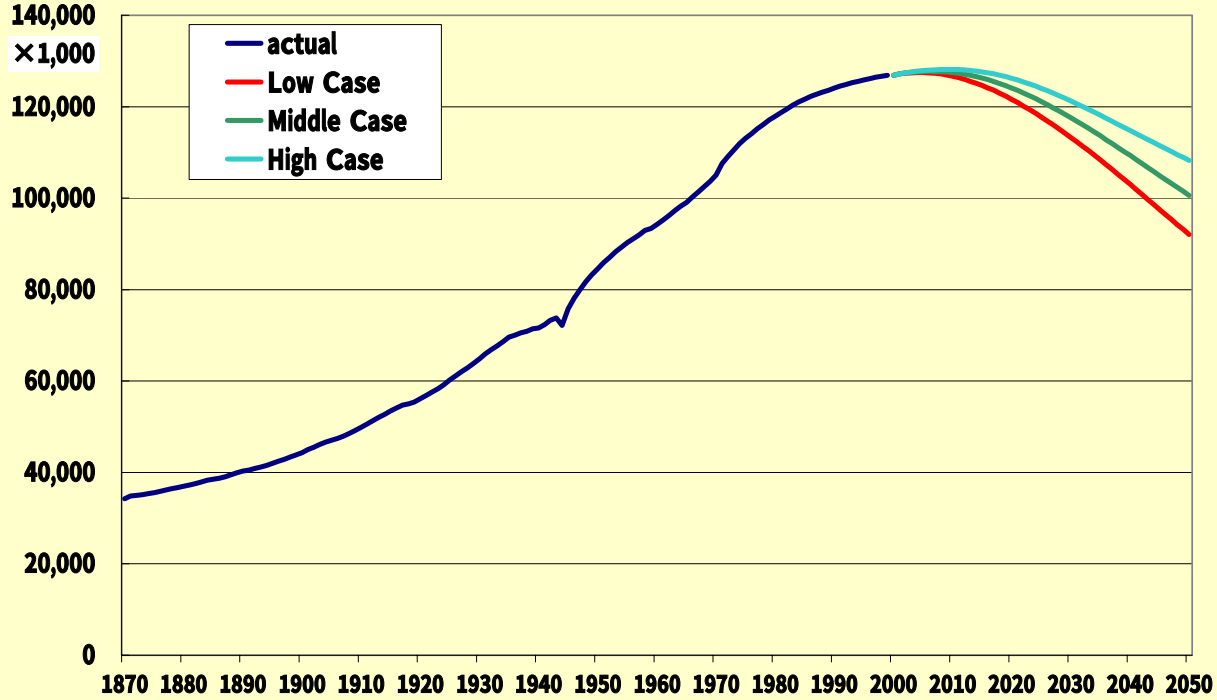
(source) Advisory Committee for Natural Resources and Energy (ACNRE)
Long-term Energy Supply-Demand Outlook (July, 2001)

Dependence on the Middle East Crude Oil



- The dependence on the Middle East once became lower than 70% in the 1980s. Thereafter, the dependence on the Middle East has kept increasing during the 1990s.
- Today, the dependence on the Middle East is higher than that at the time of the first energy crisis, of 76.2%.

Population Projections for Japan

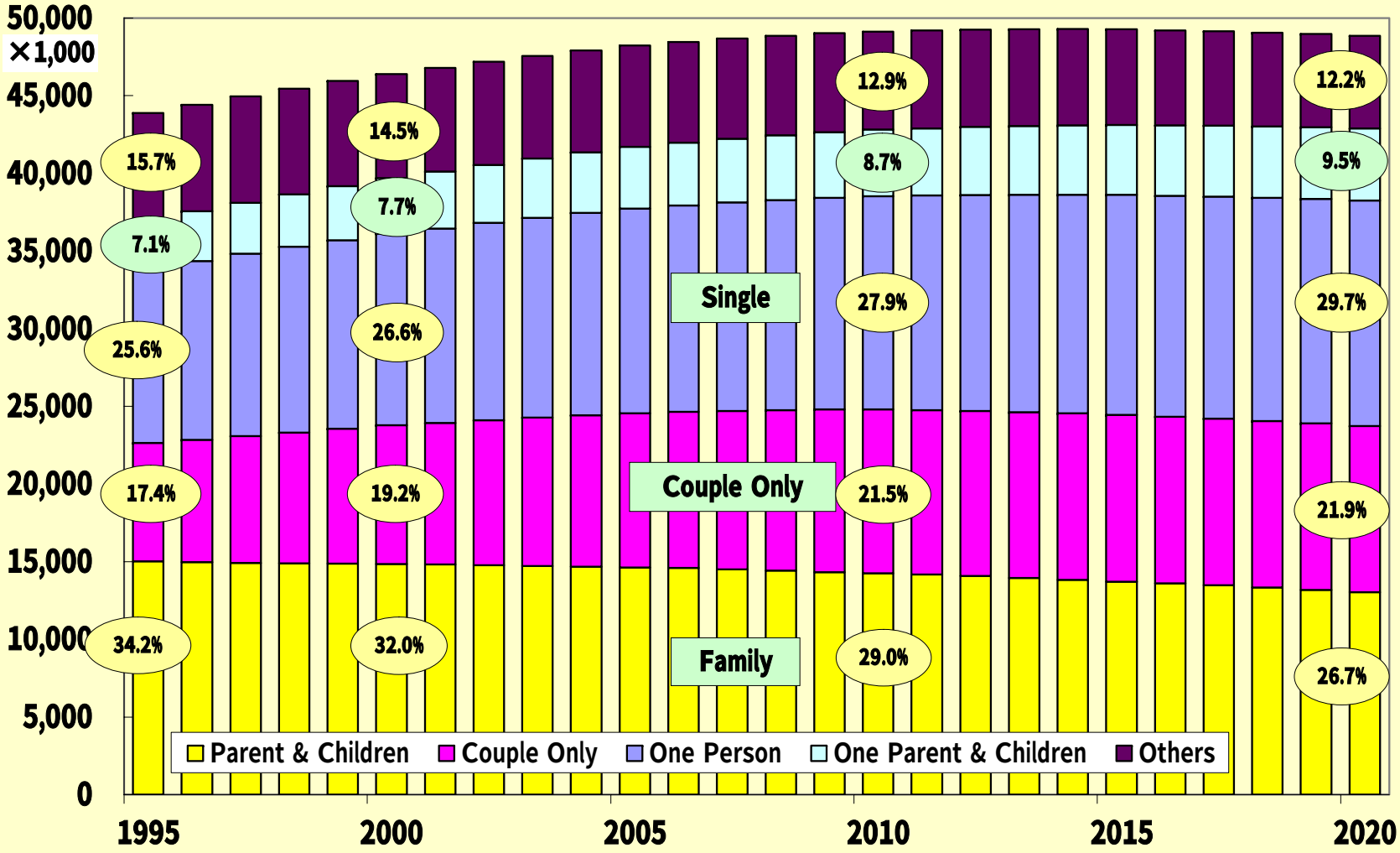


	2000	2005	2010	2015	2020	2025	2030
Population （×1,000）	126,926	127,708	127,473	126,266	124,107	121,136	117,580
Working Population （×1,000）	67,723	67,592	67,090	65,824	64,309	62,841	60,819
Population above Age 65 (×1,000)	22,041	25,392	28,735	32,772	34,559	34,726	34,770
Households （×1,000)	47,420	49,411	50,313	50,541	50,284	49,668	48,722

Note : Population will peak in 2007 (127.733 Million), Working population was peak in 1997 (67.938 Million)

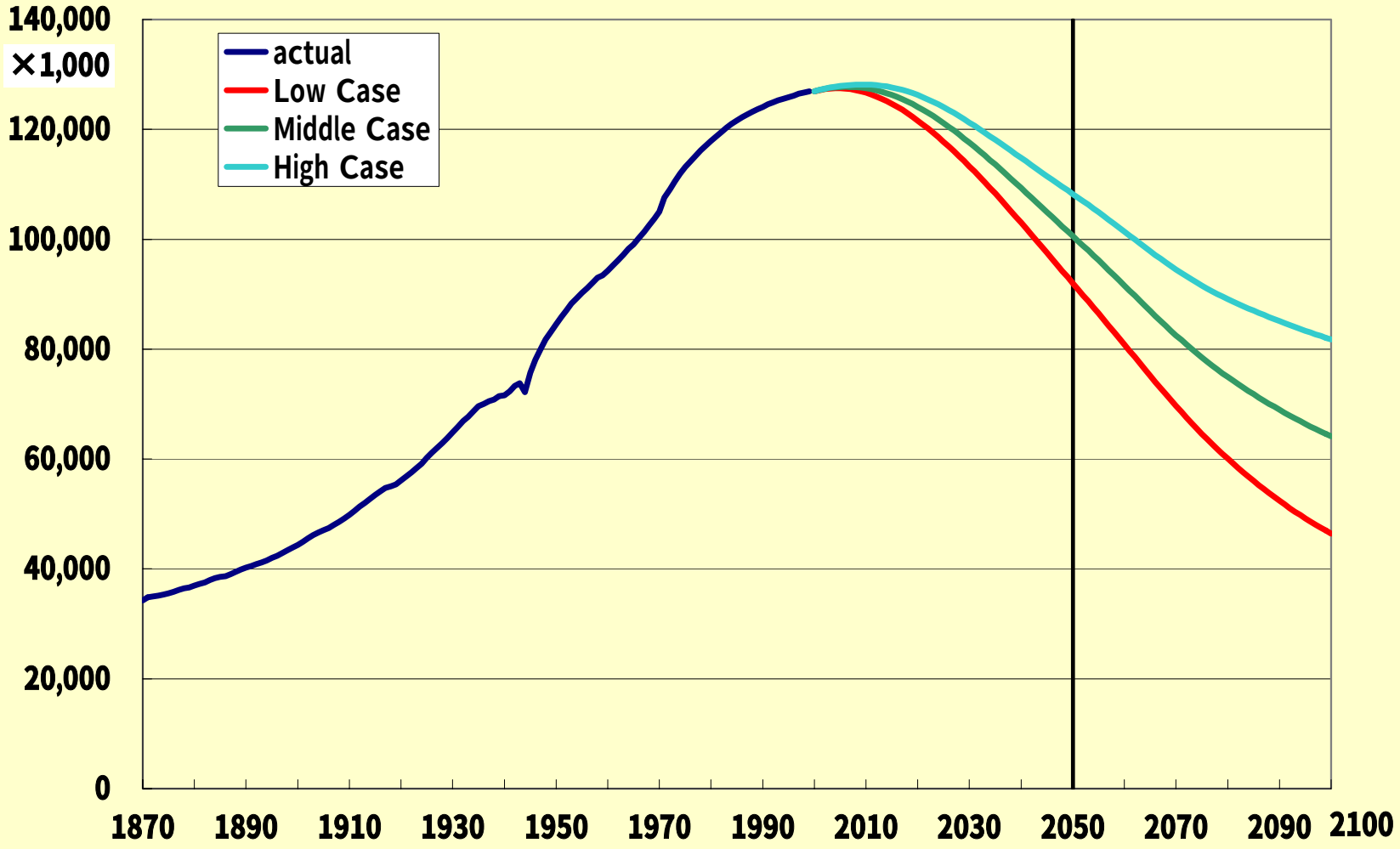
(source) National Institute of Population and Social Security Research (Oct. 2003)

Household Projections for Japan



(source) National Institute of Population and Social Security Research

Long-range Population Projections



(source) National Institute of Population and Social Security Research

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