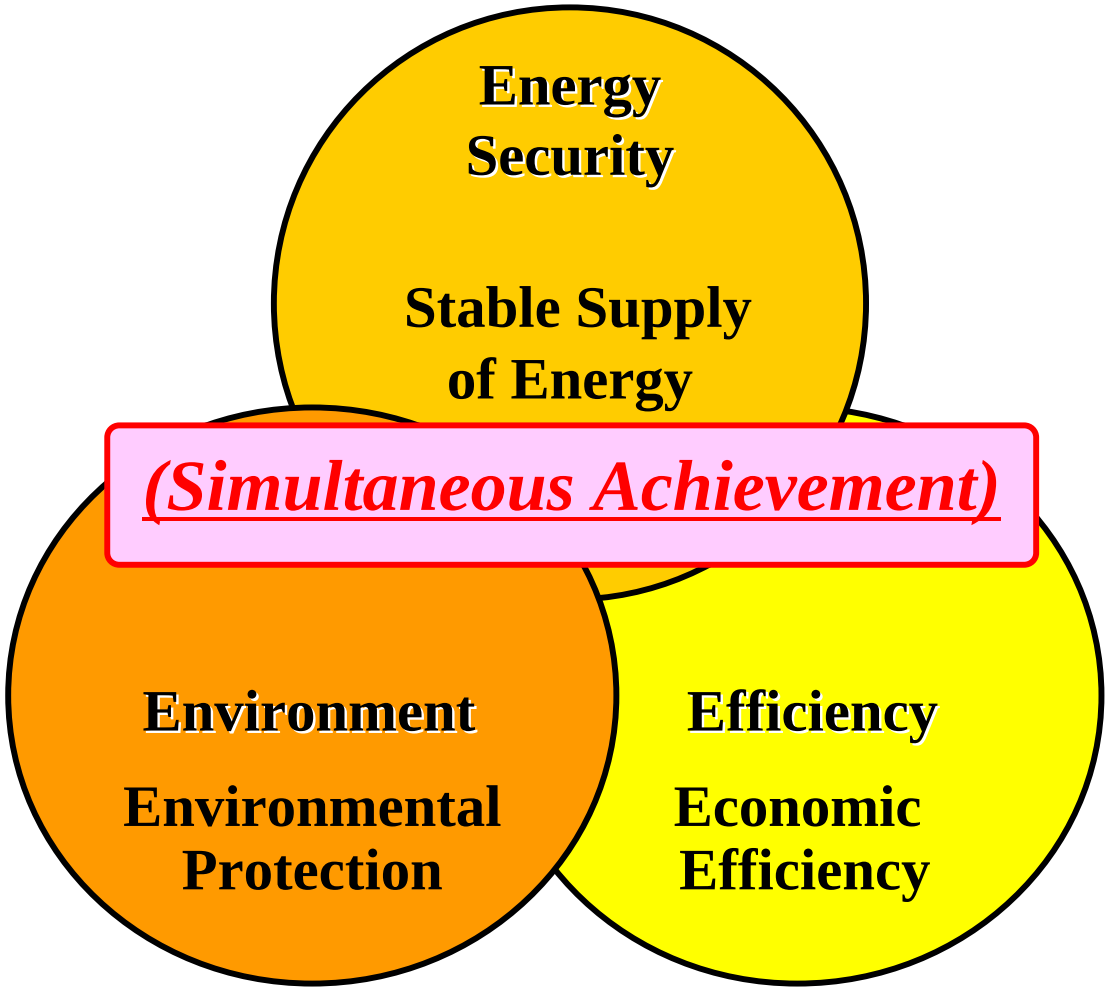
Energy Conservation Policies in Japan

May, 2004

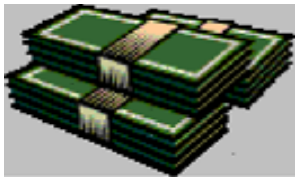
Agency of Natural Resources and Energy (ANRI)
Ministry of Economy, Trade and Industry (METI)

Principle of Japan's Energy Policy



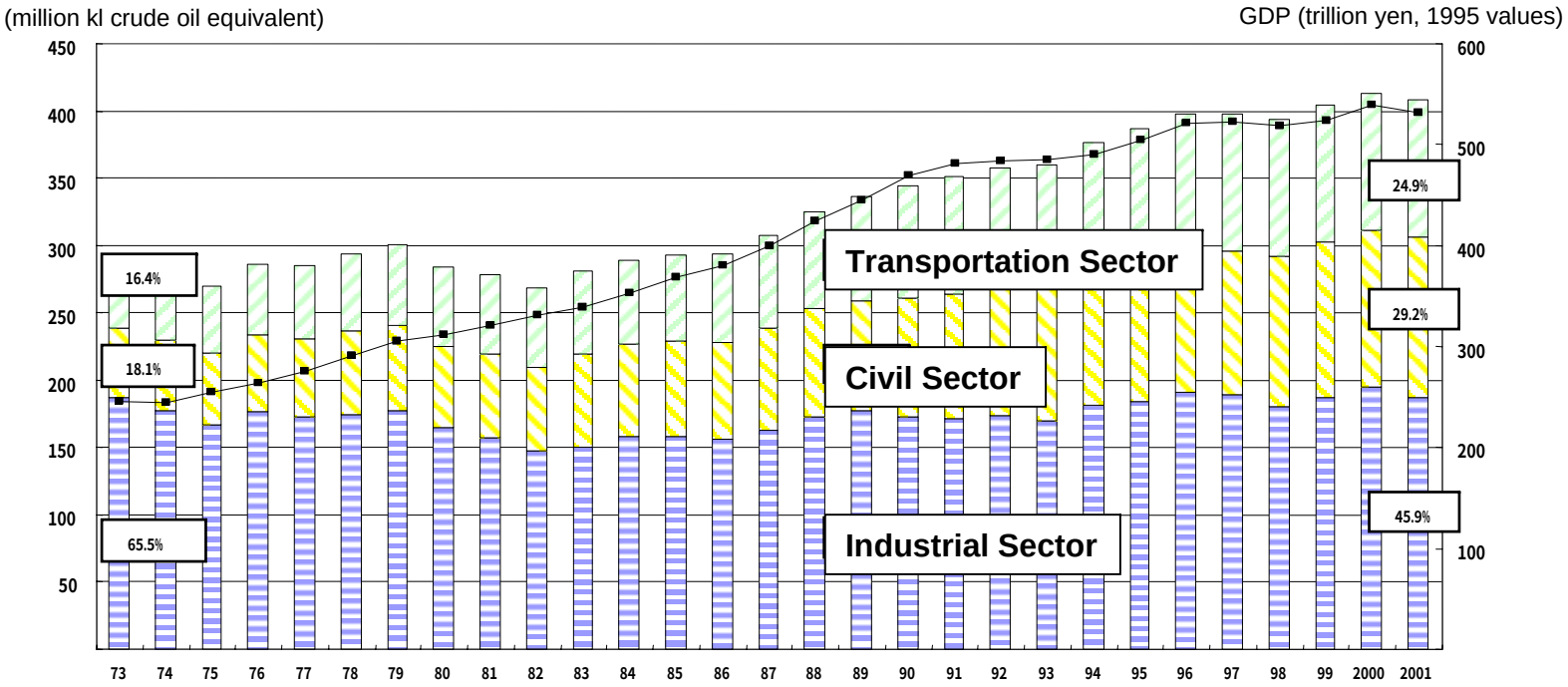
- Contents -

Transition of Final Energy Consumption (1)

	FY1973	FY1990	FY2001
Industrial sector	 100	 97	 100
Civil sector	 100	 164	 231
Transportation sector	 100	 171	 217
(Reference) GDP	 100	 190	 216

Transition of Final Energy Consumption (2)

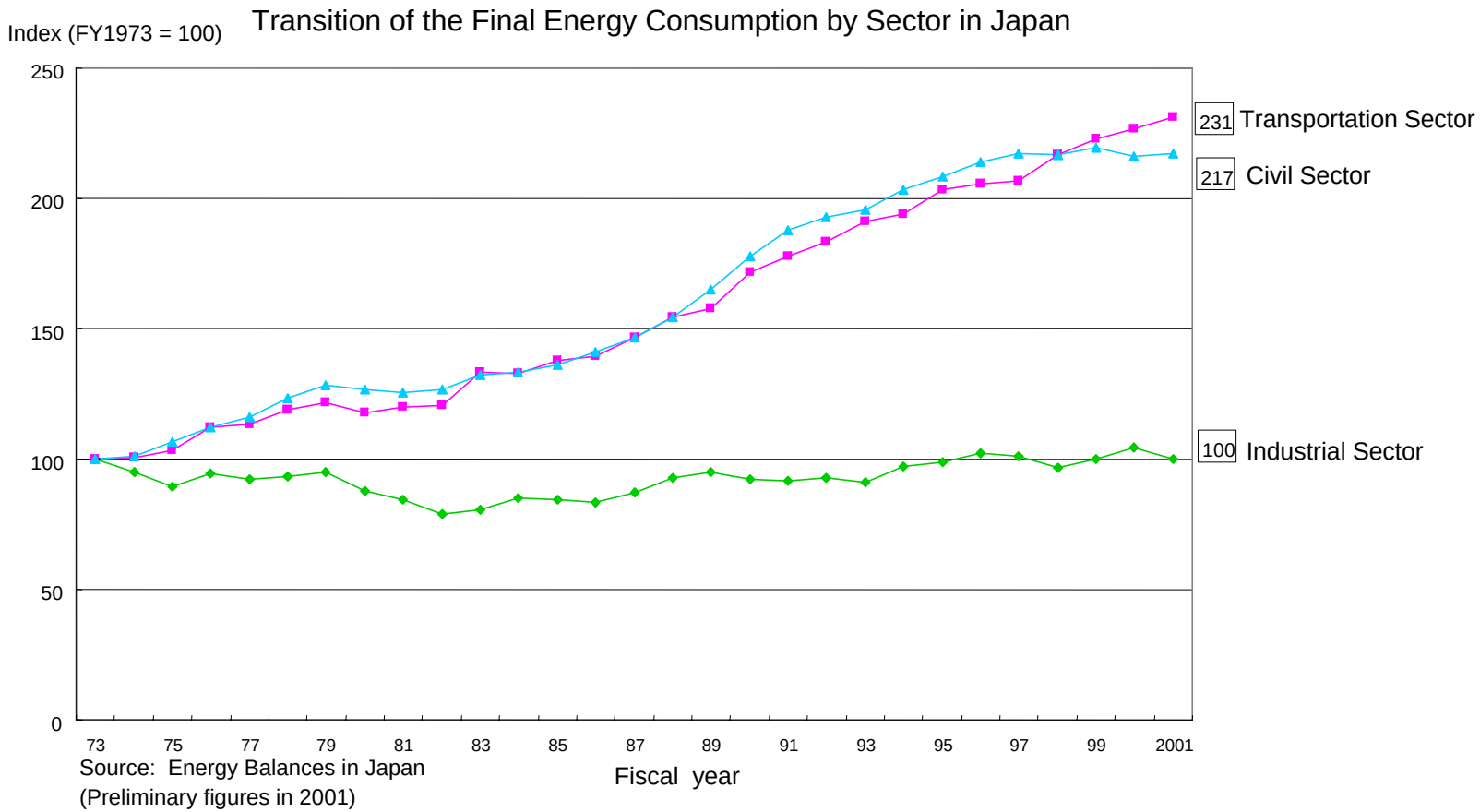
Transition of Japan's Final Energy Consumption and Actual GDP



Source: General Energy Statistics

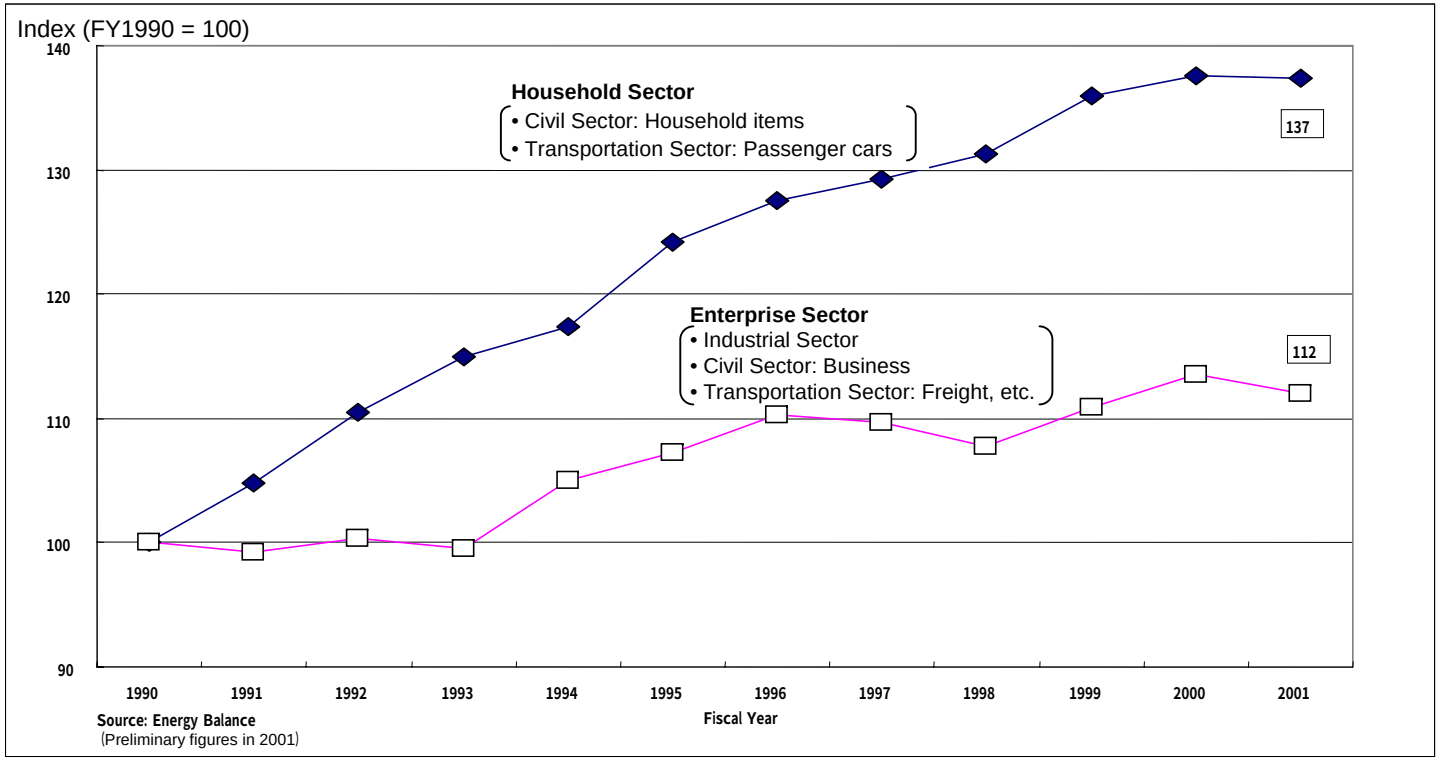
- **Japan's final energy consumption has consistently increased since the mid 1980s, excluding the year-on-year decrease in FY1998 and FY 2001.**
- **The ratios of industrial, civil and transportation sectors have shifted from 4:1:1 (oil crisis) to 2:1.5:1 (2001).**

Transition of Final Energy Consumption by Sector



- The amount of final energy consumption in the industrial sector has remained generally steady since the oil crisis.
- On the other hand, those of the civil and transportation sectors have increased significantly.

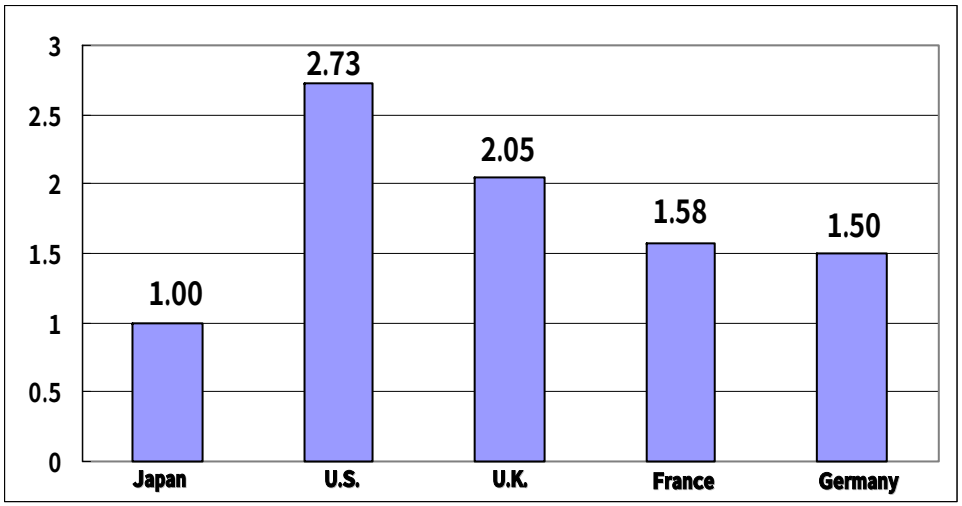
Transition of Final Energy Consumption in the Household & Corporate Sectors



- In comparison with the enterprise sector, energy demands are increasing at a higher rate in the household sector*, where every citizen represents a contributing factor.

* The figures for the household sector represent the amount of energy consumed in the course of daily living plus the amount of energy consumption associated with the use of household cars.

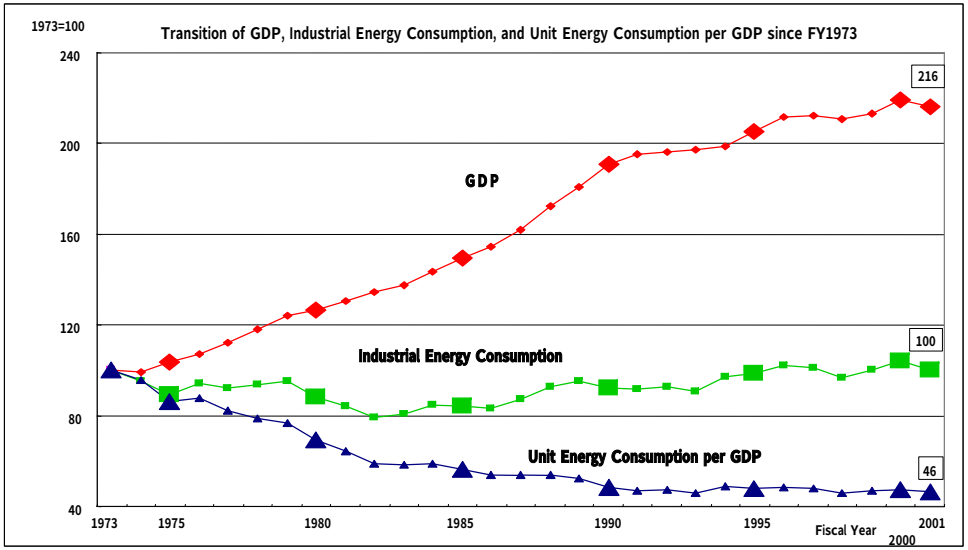
Comparison of Energy Consumption against GDP by Country

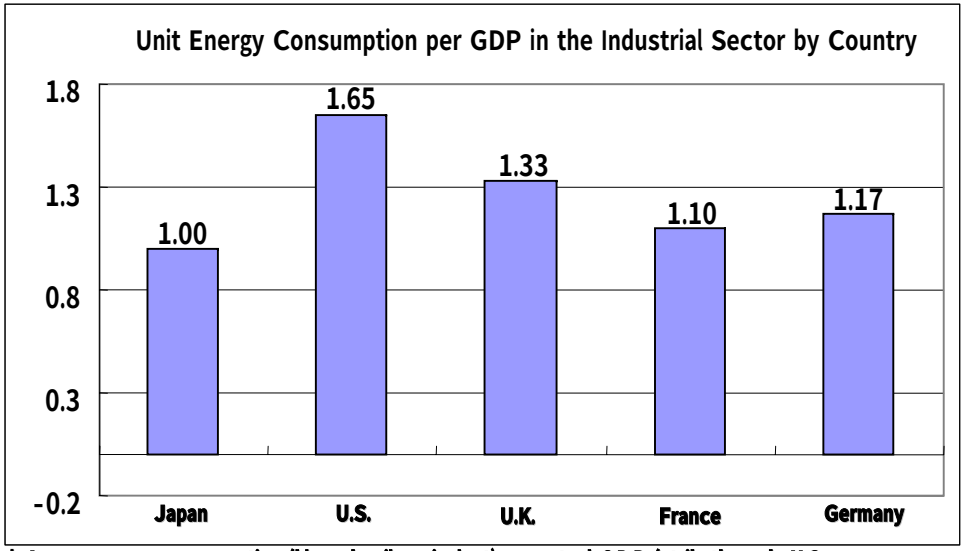


- Japan has a low rate of unit energy consumption per GDP compared to other industrialized countries.

* Japan's energy consumption (kl crude oil equivalent) per actual GDP (U.S. dollars at 1995 value) (based on 2000 actual figures) is set at 1.
（Source） Compiled by the Agency of Natural Resources and Energy from its energy and economic statistics.

Transition of Energy Consumption in the Industrial Sector



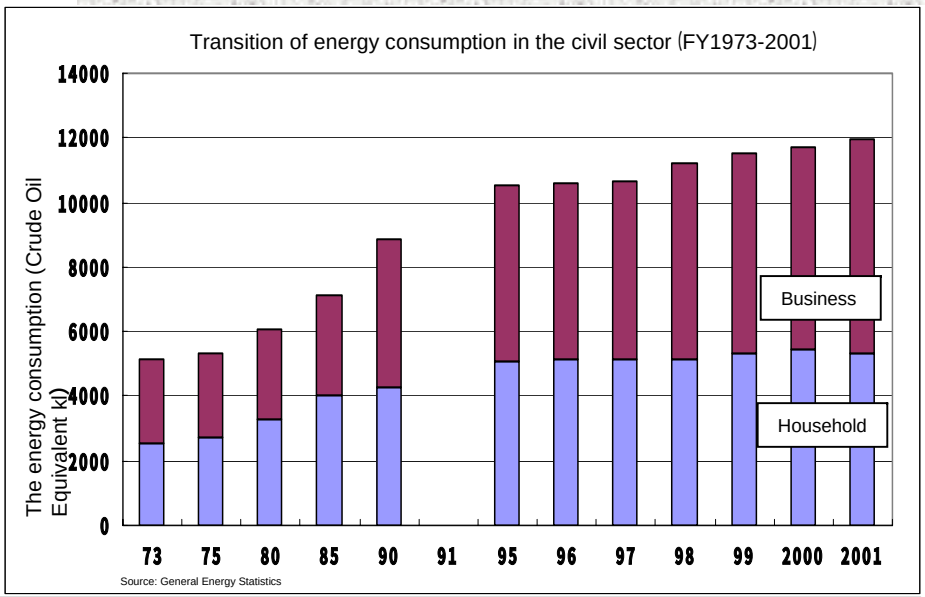


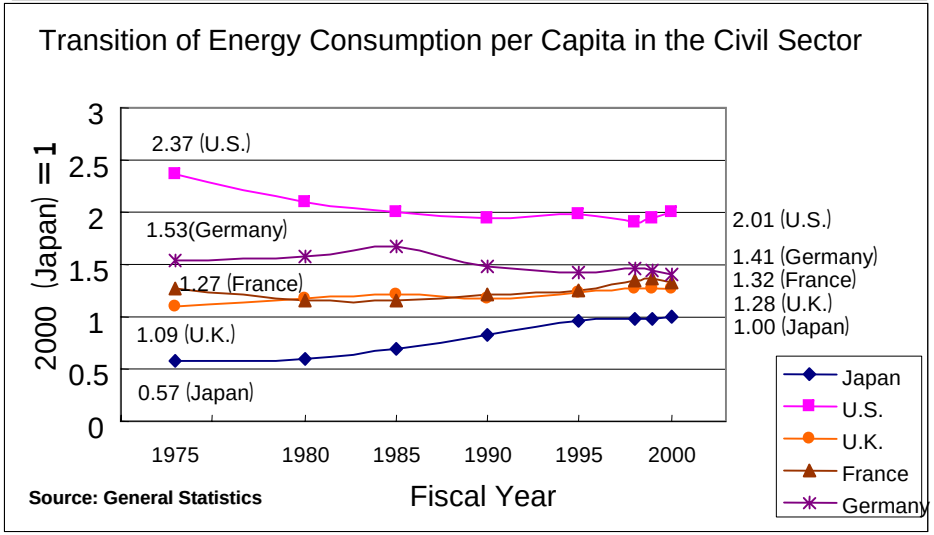
* Japan's energy consumption (kl crude oil equivalent) per actual GDP (strikethrough: U.S. dollar at 1995 value) (based on 2000 actual figures) is set at 1.

Source: Complied by the Agency of Natural Resources and Energy from its energy and economic statistics.

- Since the oil crisis, the overall manufacturing outputs have increased while the unit energy consumption per output has decreased.
- Consequently, final energy consumption has remained steady.
- Japan's unit energy consumption in the industrial sector is at a low level.

Transition of Energy Consumption in the Civil Sector





- The energy consumption in the civil sector has been consistently on the upward trend.

- The energy consumption per capita in the civil sector is lower in Japan than in other major industrialized countries, but its margin is being narrowed.

The Efficiency Improvement of Machinery / Equipment in the Household Sector (1)

<Refrigerator>

Change in energy conservation performance for fridge / freezer

Annual Power Consumption per litter

1981年 **2.76** kWh/ℓ

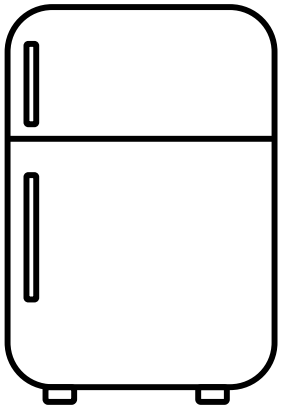
1991年 **2.28** kWh/ℓ

2001年 **0.75** kWh/ℓ

Fridge Size

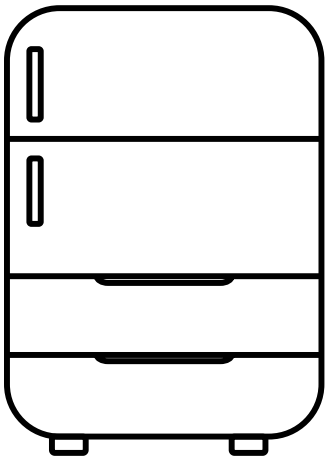
1981

236ℓ



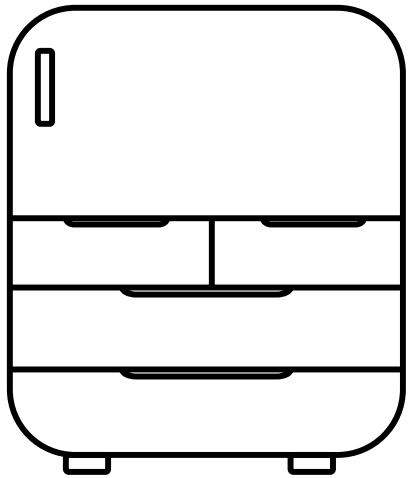
1991

413ℓ



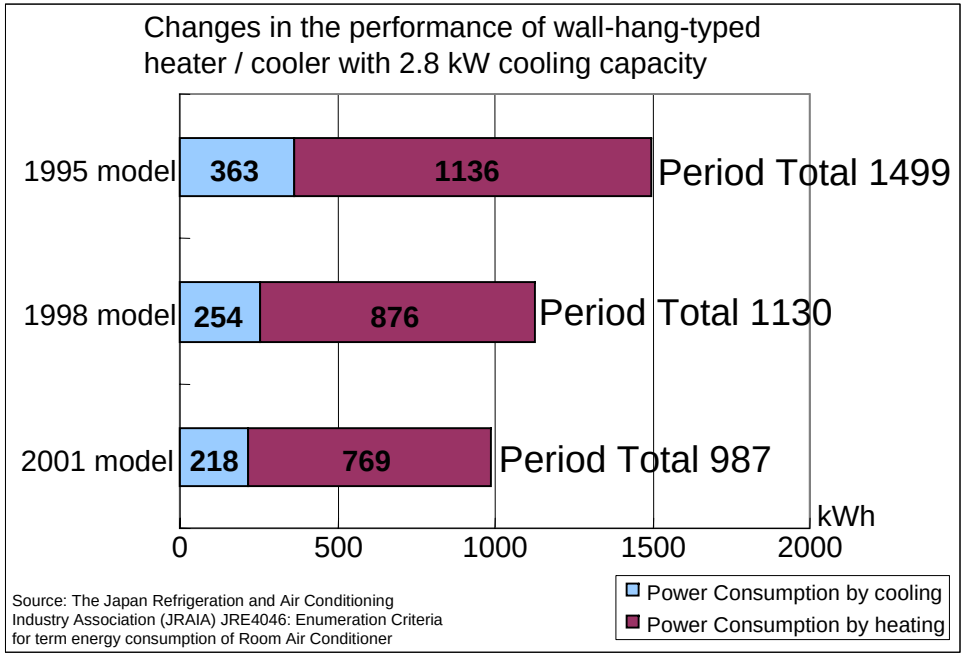
2001

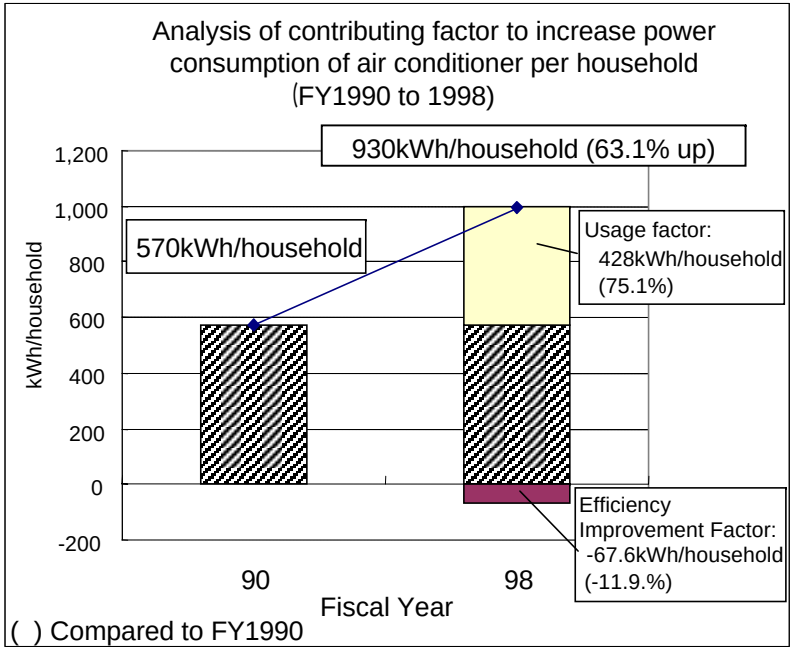
442ℓ



The Efficiency Improvement of Machinery / Equipment in the Household Sector (2)

<Air Conditioner>

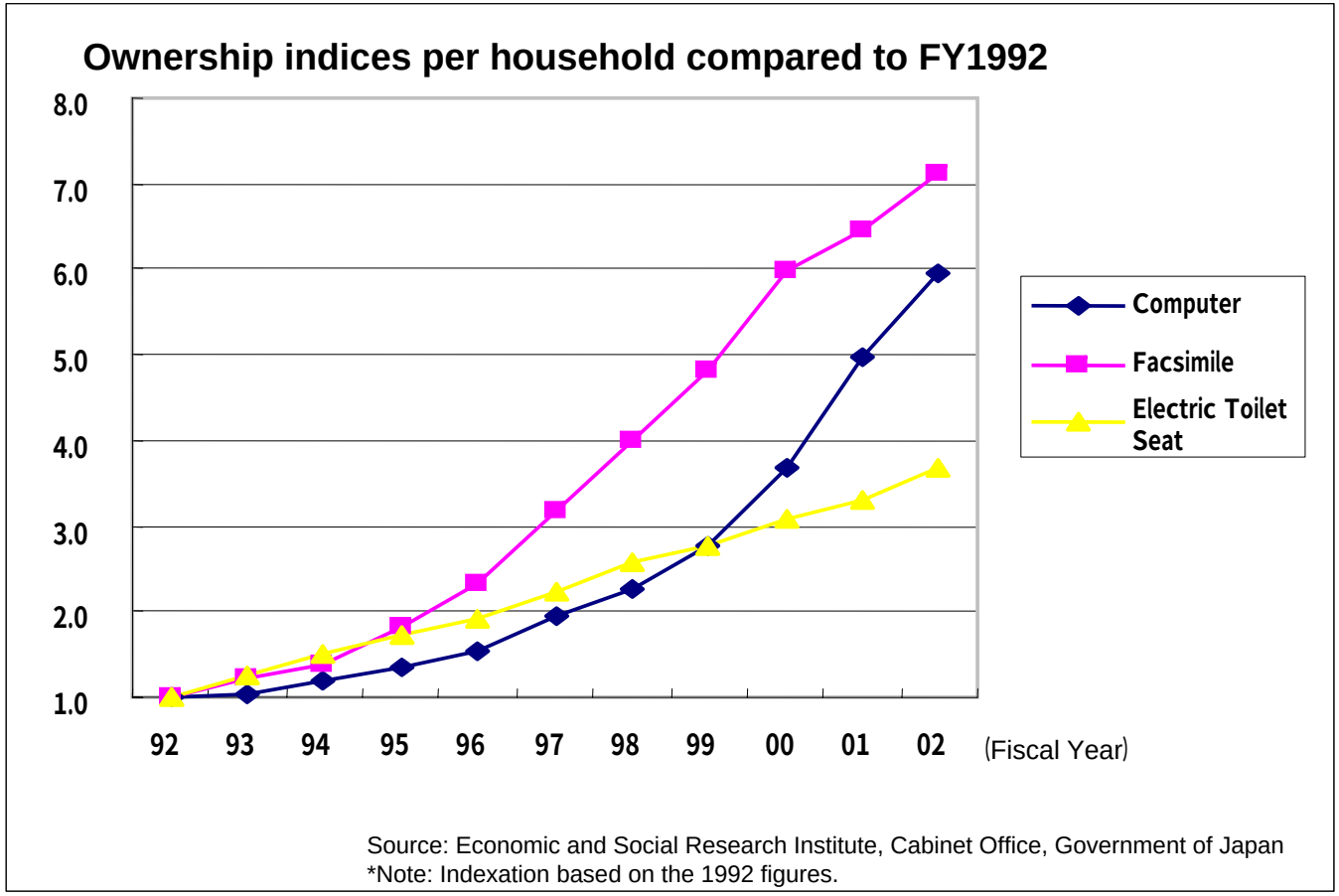




Source: Complied by Agency of Natural Resources and Energy

- The power efficiency of air conditioners has been significantly improved, but the power consumption per household has been increasing due to longer-hour use and operating conditions.

Home Appliances More Commonly Owned in the 1990s

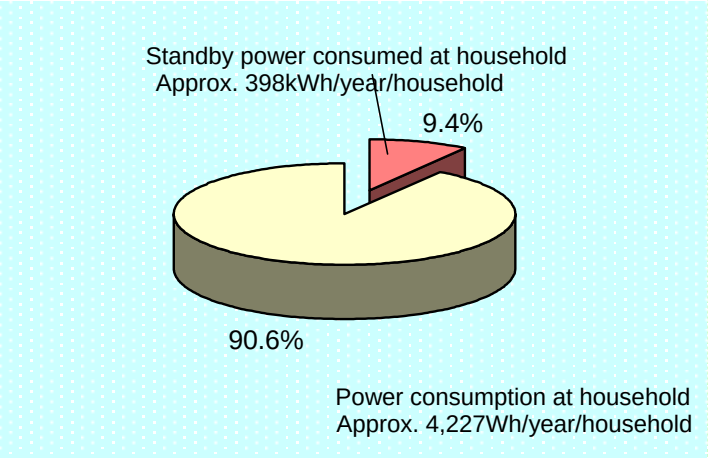


Source: Economic and Social Research Institute, Cabinet Office, Government of Japan
*Note: Indexation based on the 1992 figures.

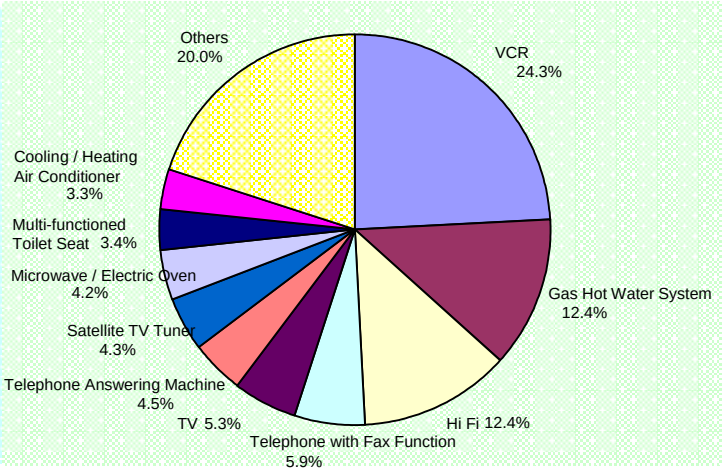
Trend in Standby Power

* Standby Power: Electricity consumed by machinery / equipment while it is not in use.

Standby power out of the total power consumption at the household sector



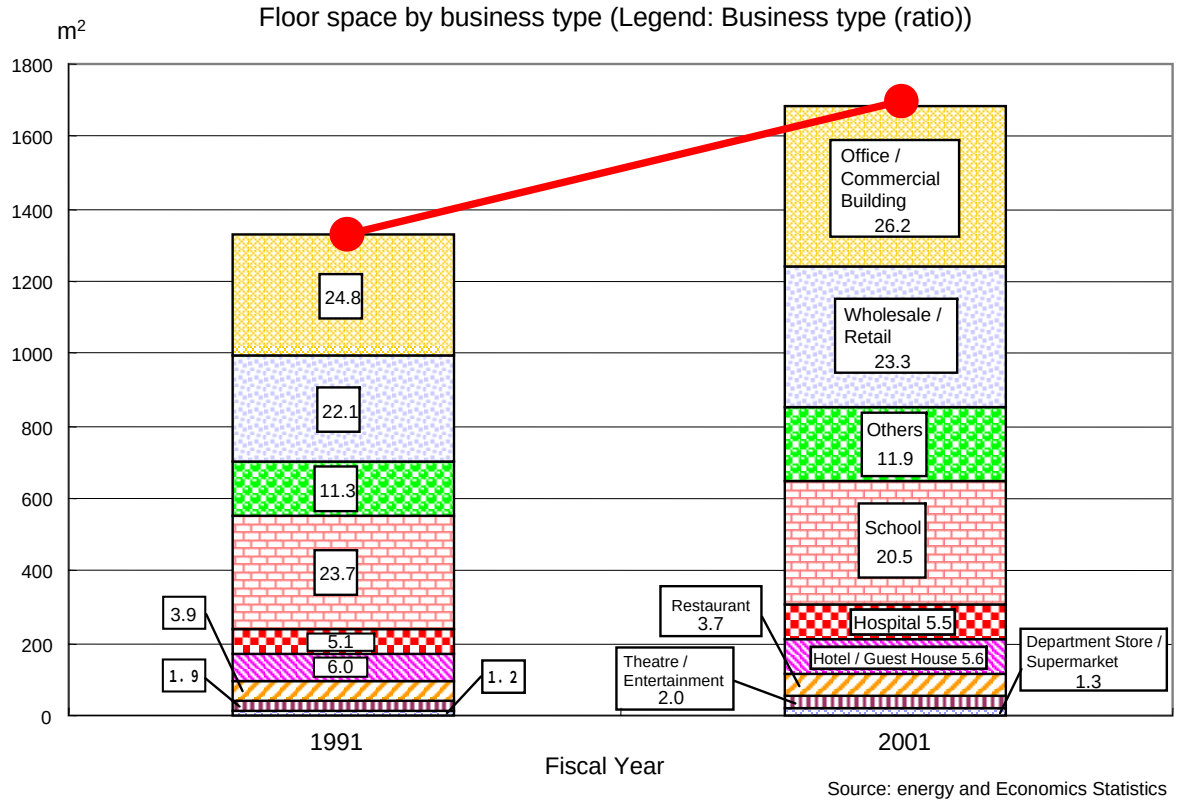
Breakdown of standby power by appliance annually consumed at a household



Source: ECCJ, 'Research on the standby power consumed in household in 2000'

- The amount of standby power consumed at households accounts approximately 10% of the total household power consumption (equivalent to TV power consumption at all households).

Transition in Floor Space by Business Type

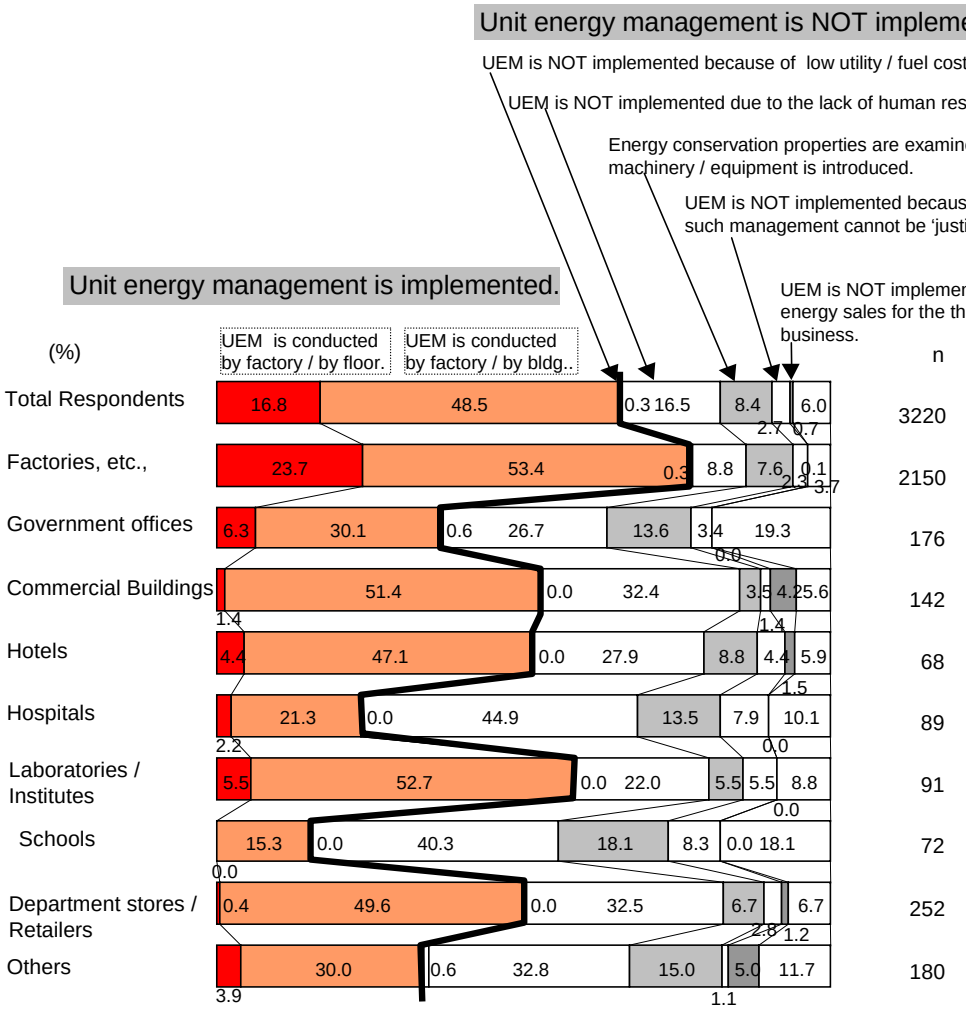


Source: energy and Economics Statistics

- The energy consumption in the commercial sector is consistently increasing.
- This is attributed to the expansion of total floor space for office and commercial buildings.

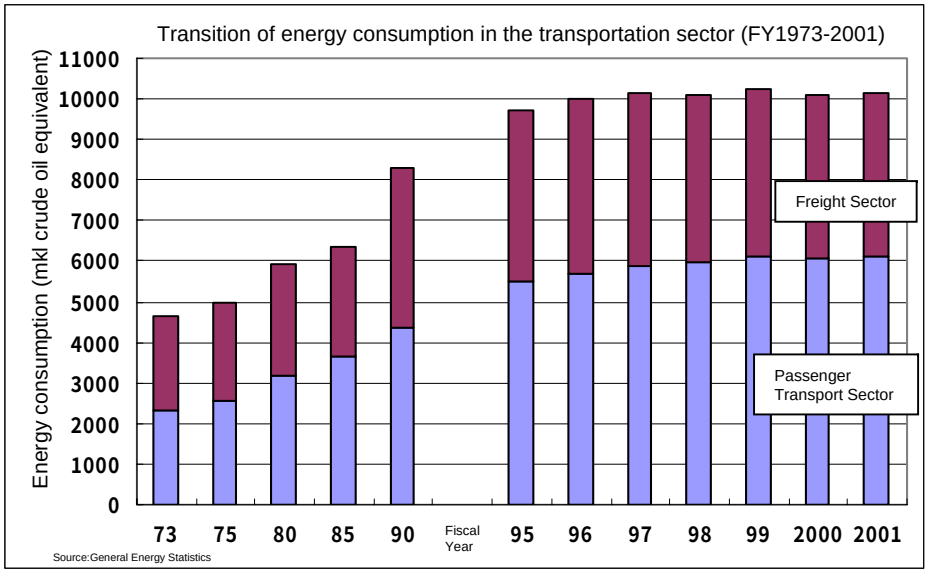
Status of Unit Energy Management (UEM) in the Commercial Sector

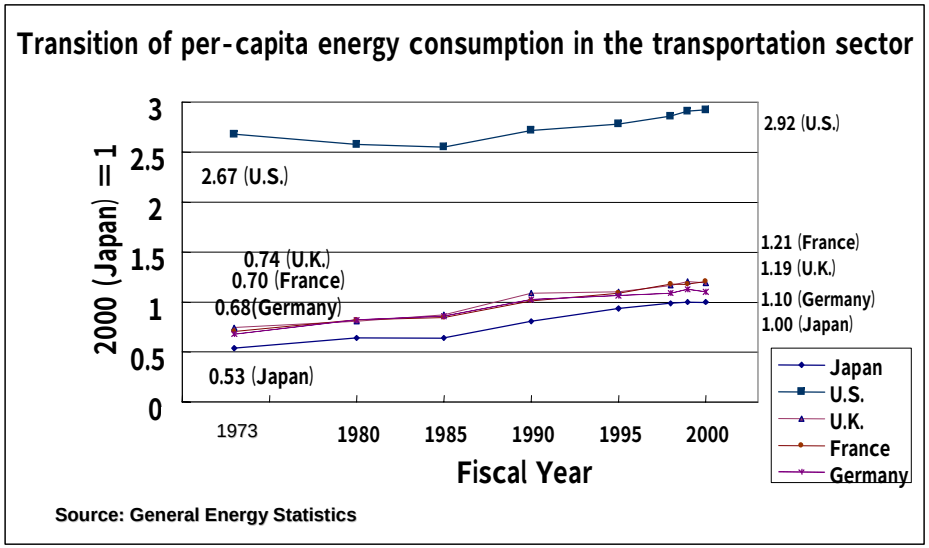
<Status of unit energy management in the commercial sector>



- The survey for the 2nd category factories indicates that UEM is implemented more actively in factories and less actively in business premises.

Transition of Energy Consumption in the Transportation Sector

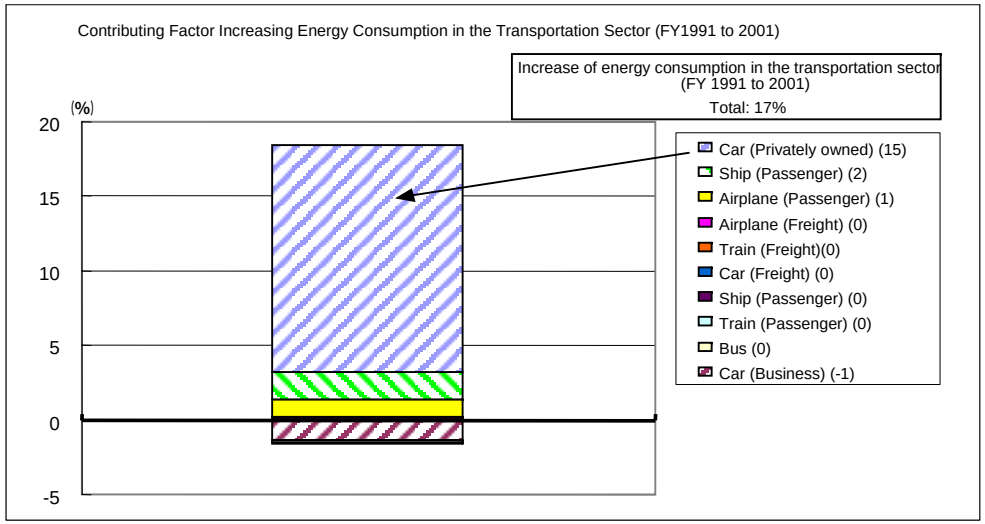


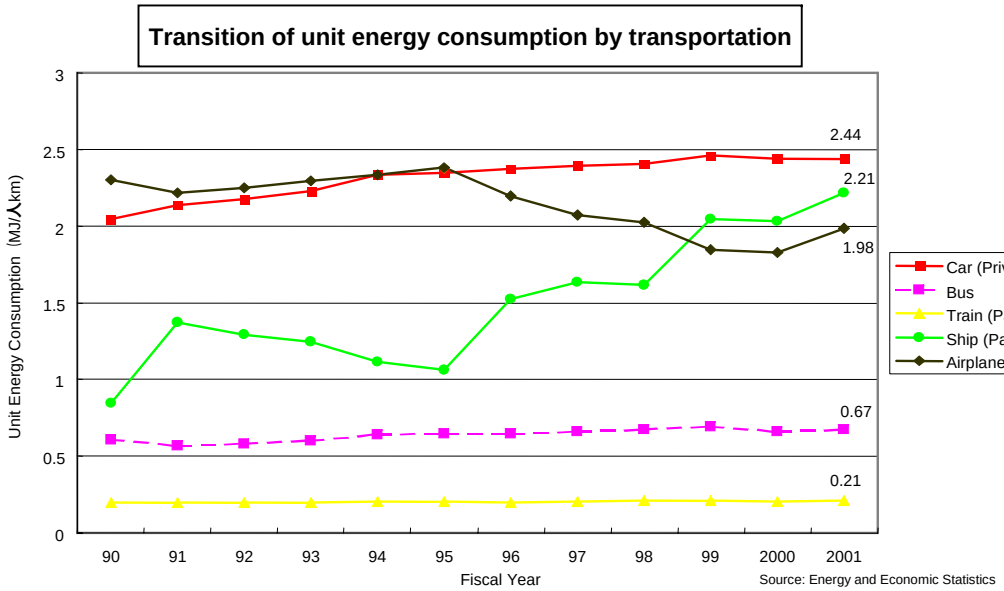


- The energy consumption in the transportation sector as a whole has not shown radical change, but that of the passenger transport sector has shown the upward trend.

- The energy consumption per-capita in the transportation sector is lower in Japan than in other major industrialized countries, but its margin is being narrowed.

Contributing Factors Increasing Energy Consumption in the Transportation Sector



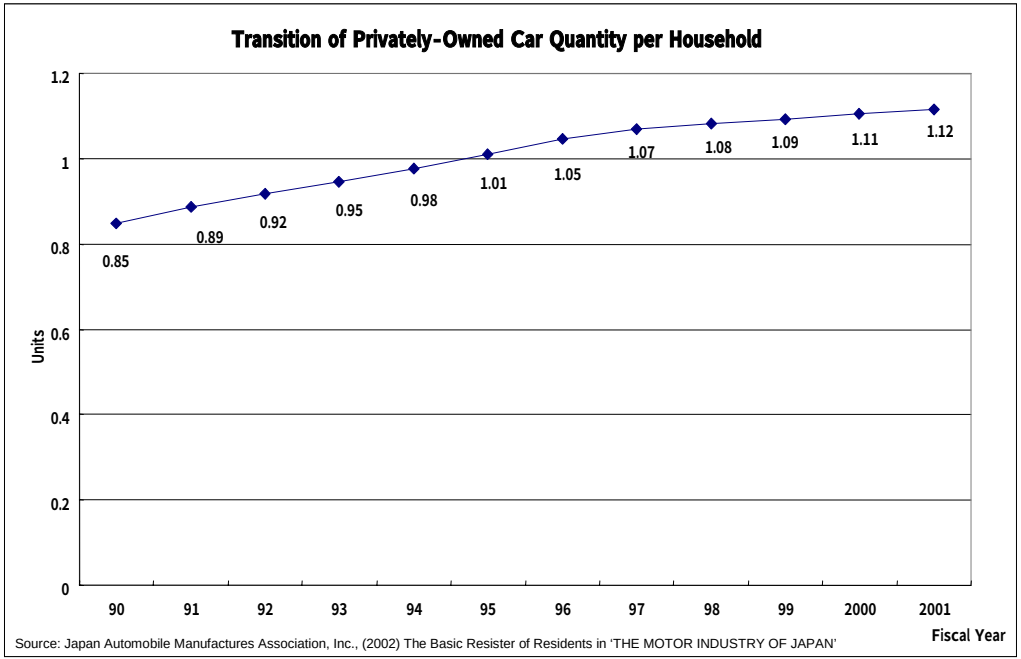


Source: Energy and Economic Statistics

- The privately-owned cars contributed 90 % of the total energy consumption in the whole transportation sector increased during FY1991 to 2001.

- Privately-owned cars have poor unit energy consumption compared to other transportation facilities.

Transition in the No. of Privately-Owned Cars



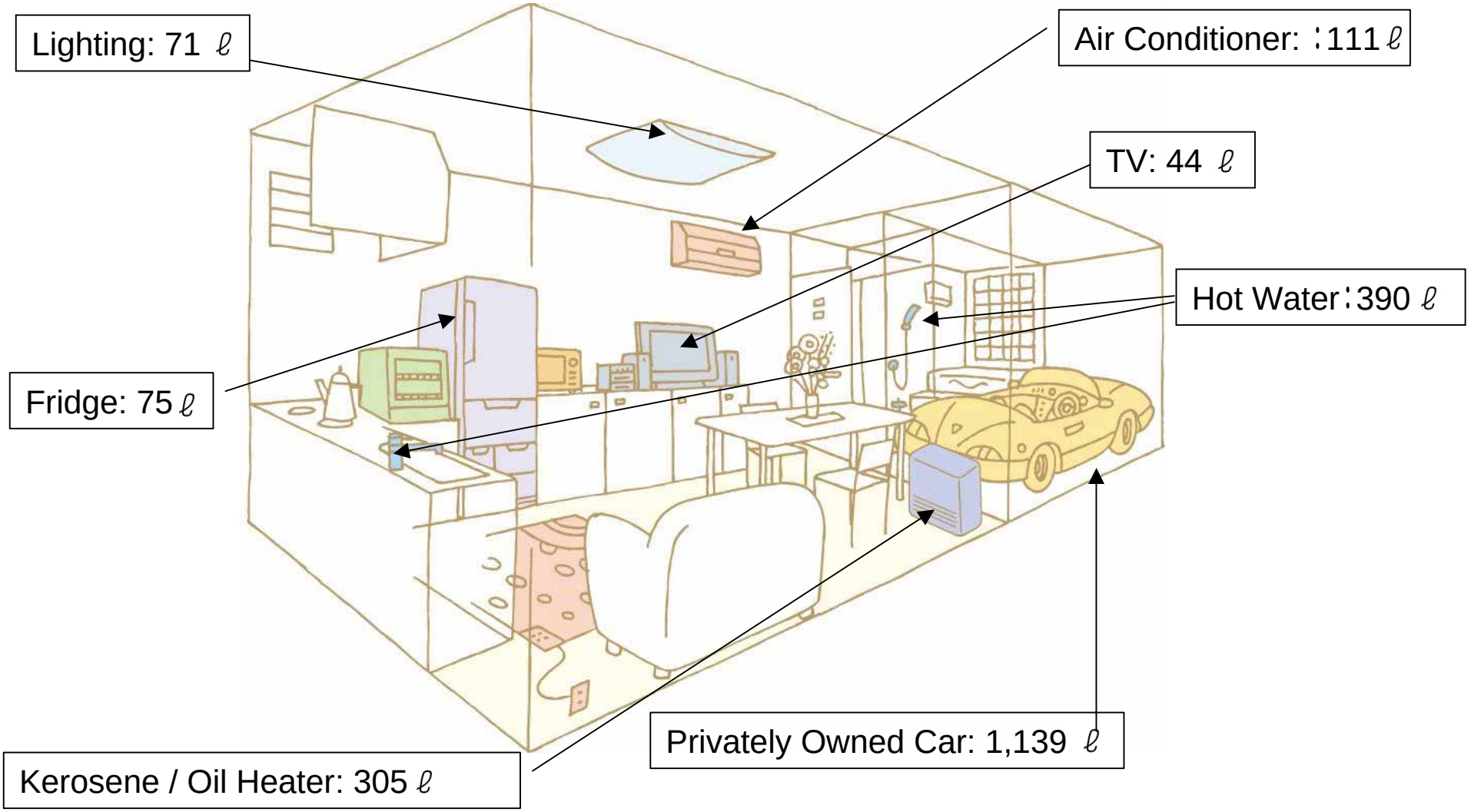
Source: Japan Automobile Manufactures Association, Inc., (2002) The Basic Resister of Residents in 'THE MOTOR INDUSTRY OF JAPAN'

	2002年		1992年		Growth
Prefecture	Rank	Units per household	Rank	Units per household	Rate (%)
Toyama	1	1.693	5	1.212	39.7%
Fukui	1	1.693	6	1.197	41.4%
Gunma	3	1.663	1	1.315	26.5%
Gifu	4	1.651	2	1.274	29.6%
Tochigi	5	1.596	3	1.269	25.8%
Kyoto	44	0.913	40	0.764	19.5%
Kanagawa	45	0.831	41	0.762	9.1%
Osaka	46	0.734	46	0.646	13.6%
Tokyo	47	0.557	47	0.564	-1.2%

Source: Automobile Inspection & Registration Association, 'Transition in the Number of Owned Cars'

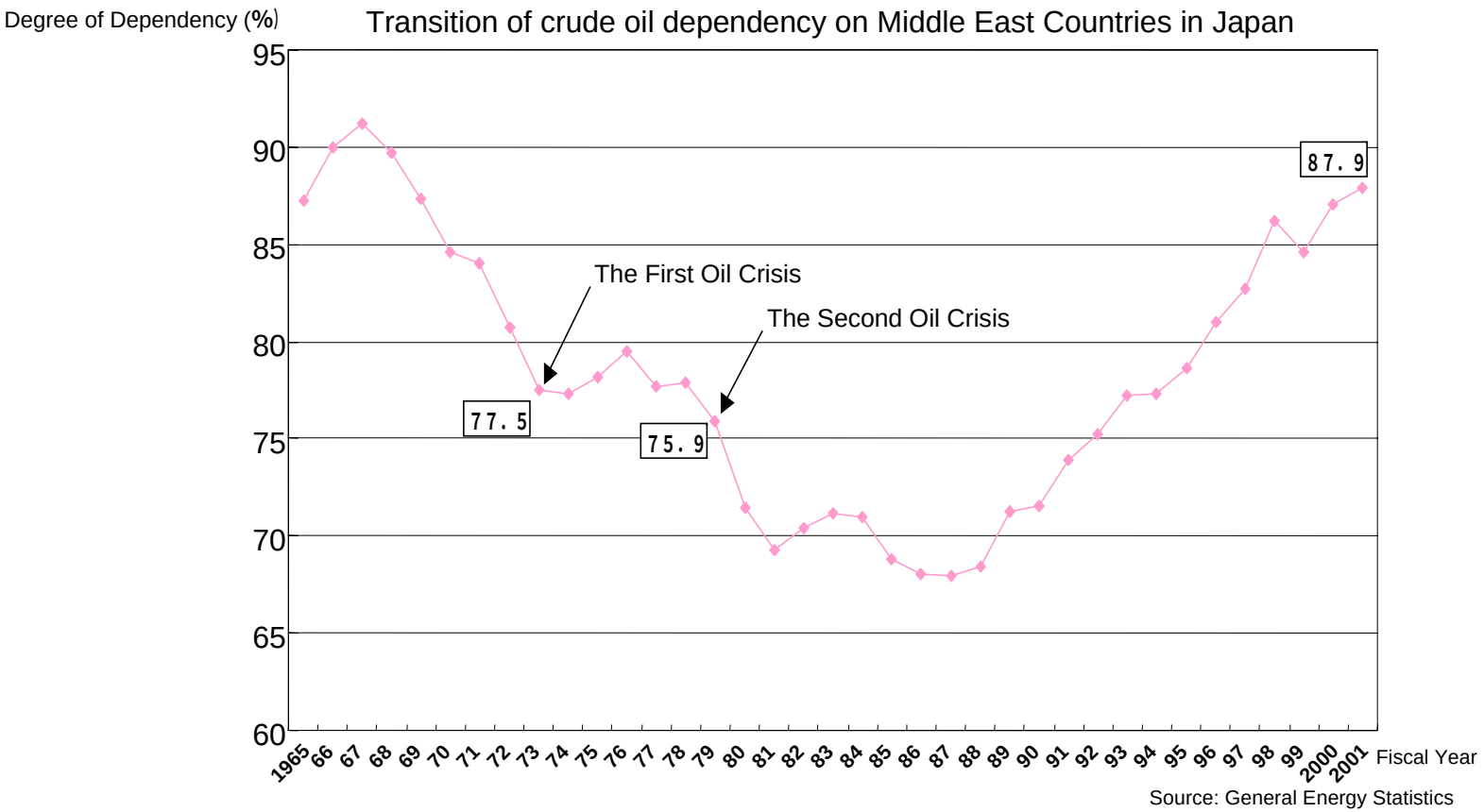
- The increase in the number of privately-owned cars per household is significantly contributing to the energy consumption growth in the transportation sector.
- The number of privately owned cars are greater in regional areas and smaller in urban areas.

Annual Energy Consumption per Household (FY2001)



* Unit: 1 crude oil equivalent

Rising Crude Oil Dependency on Middle East Countries



Source: General Energy Statistics

- The rate of crude oil dependency in 2001 reached to 87.9 % which has largely surpassed the rate at the time of the oil crises, 77.5%.

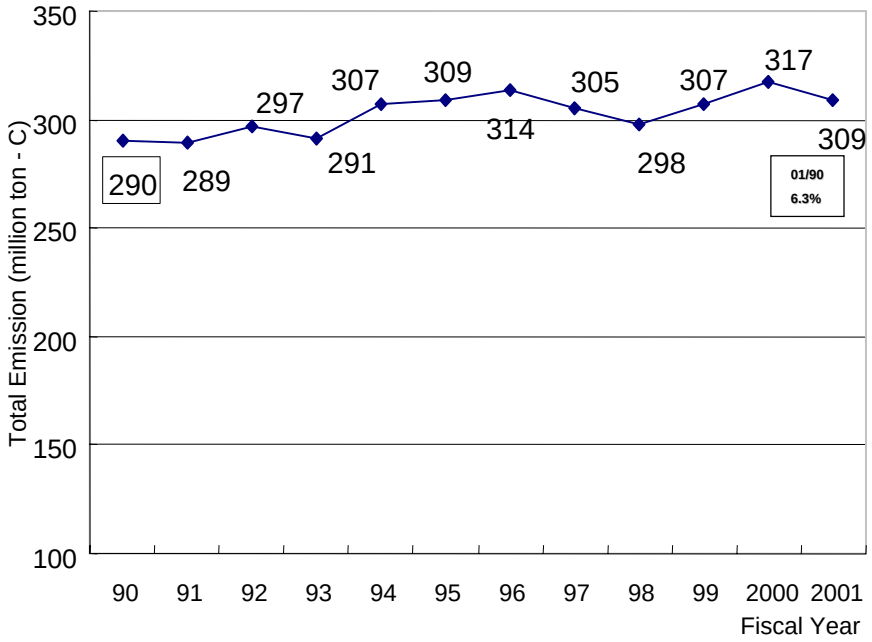
The Amount of CO2 Emitted from Energy Utilization in Japan

The COP3 (the 3rd Conference of Parties of UN Framework Convention on Climate Change) held in December 1997 agreed on the the reduction targets of GHG emission assigned to each developed country and issued its agreement as the 'Kyoto Protocol'. Japan is responsible for reducing 6% of the total GHG at the average value in 2008 to 2012 in comparison with 1990s. (US= -7%, EU= -8%)

Breakdown towards 6% GHG Cut-Down

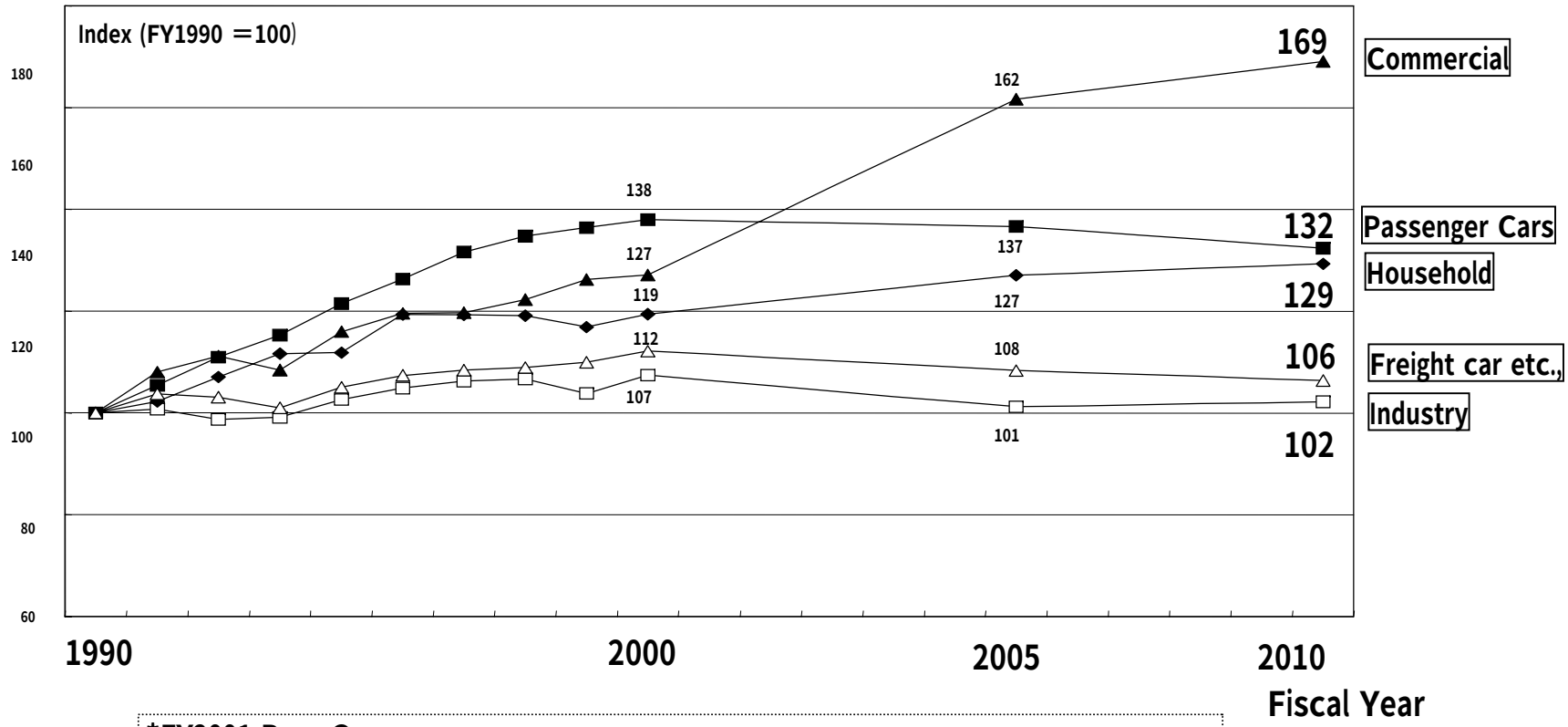
▲2.5%	Emission reduction of CO2, Metane, and Dinitrogen Monoxide
	0%：Emission reduction of CO2 arising from energy utilization. (Maximize possible measures controlling energy demand & supply)
	▲0.5%: Emission reduction of metane and dinitrogen monoxide
	▲2.0%: Development of innovative technologies and exersion from all levels of civil society
▲3.9%	Land and Forest Management
+2.0%	Emission reduction of CFCs substitutes (HFC,PFC,SF6)
Additional Provision (▲1.6%)	Joint Implementation and Emission Trading

Transition of the Amount of CO2 Emission from Energy Utilization in Japan



Projection of Energy Consumption in Each Sector

Projection of Energy Consumption in Each Sector (2001 Base Case)



***FY2001 Base Case**

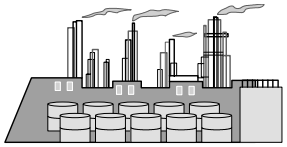
Projection for FY2001re-appraised based on the case where the measures and provisions only made only in 1998 were implemented.

Source: Verdict for Comprehensive Resource Energy Study: June 2001

Factory / Business Premise Measures Under the Revised Energy Conservation Law

Factory / Business Premise with Large Energy Consumption

Factories



- Appointment of Energy Manager (Mandatory to possess Energy Manager License)
- Preparation & Submission of Regular Report
- Formulation & Submission of Mid-term Plan

Energy Manager

Business Premise

- Appointment of Energy Management Officer
- Preparation & Submission of Regular Report
- Formulation & Submission of Mid-term Plan

(Participation of Energy Management License Holder is Mandatory.)

Government

Factory / Business Premise with Medium Energy Consumption

School

Department Store

Hotel

Office Building

Energy Management Officer

- Appointment of Energy Management Officer
- Preparation & Submission of Regular Report

- Under the Revised Energy Conservation Law in 2002, the civil / commercial sector which significantly increases its energy consumption shall enhance energy management.
- On-site survey targeting the 1st class designated energy management factory shall be conducted from 2001.
- Action plans initiated by Keidanren and other industries shall be formulated / followed-up. (Support under the supplemental provisions are provided to achieve achievement.)

Legislative Change in Designated Energy Management Factory under the REC Law

Annual Energy Consumption		Industrial Category	
• Fuel (Heat)	• Electricity	• Following 5 industries: • Manufacturing • Mining • Electricity supply • Gas supply • Heat supply	• All industries other than those listed at left e.g. office buildings, department stores, hotels, schools, hospitals, government offices, and amusement parks) • Head office / office bldg. of the left listed industries.
3,000ｋL	1,200 万 kWh	1st Category Specified Business Conductor	1st Category Designated Business Conductor
1,500ｋL	600 万 kWh	2nd Category Specified Business Conductor	

Current regulatory obligations

Enhancement of Civil / Commercial Sector

- Appointment of energy management officer
- Preparation & Submission of mid- & long- term plans
- Energy management license holder participation at the time of mid- & long- term plan preparation
- Regular reporting (instead of recording)

Current regulatory obligations

- Appointment of energy management officer
- Regular reporting (instead of recording)

Current regulatory obligations

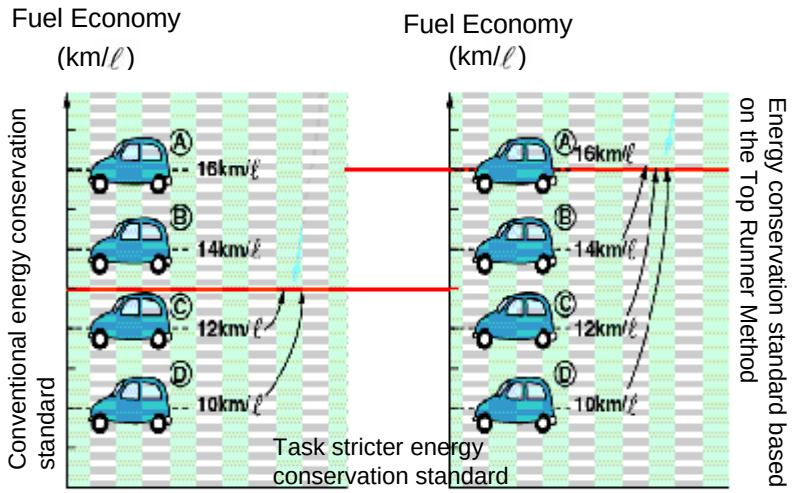
- **Appointment of an energy manager (Mandatory to possess an official energy manager license)**
- **Preparation and submission of mid- & long- term plans**
- **Regular reporting**

*** Information written in red are the legislative changes in the Energy Conservation Law revised in 2002.**

Energy Efficiency Improvement of Machinery & Equipment (Top Runner Method)

＜Top Runner Method＞

EXAMPLE



- The Top Runner Method was introduced for the energy conservation standard of home appliances and OA equipment and automobile fuel economy standard.

*** Top Runner Method:**

The method seeks continuous improvement in energy conservation standard/performance of products beyond those of the latest products. E.g. Fuel economy standard of automobile, energy conservation standard for electric equipment etc.

Energy-Conservation Target for Specific Equipment

	Target Year	Energy Conservation Effects
Passenger cars (gasoline fueled)	2010	23%
Passenger cars (diesel fueled)	2005	15%
Trucks (gasoline fueled)	2010	13%
Trucks (diesel powered)	2005	7%
Air conditioner (cooling & heating)	2004(Partly 2007)	63%
Air conditioner (cooling only)	2007	14%
TV unit	2003	16%
VCR	2003	59%
Fluorescent lamps	2005	17%
Photocopier	2006	30%
Computer	2005	83%
Magnetic disc device	2005	78%
Electric Refrigerators / freezers	2004	30%

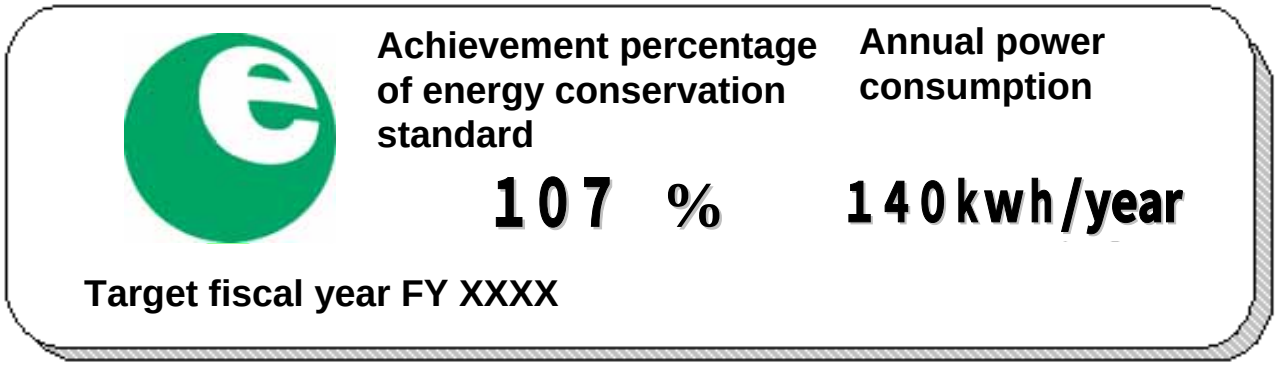
The energy-conservation effect is as compared with that of 1997 (and as compared with 1995 for automobiles, and 1998 for electric refrigerators / freezers).

Additional equipment subjected from December 2002

	Target Year	Energy-conservation effects
Stove	2006	(Gas)1%/(Oil)4%
Gas cooker	2006	14%
Gas hot water system	2006	4%
Oil hot water system	2006	4%
Electric toilet seat	2006	10%
Vending machine	2005	34%
Transformer	2006(Partly 2007)	30%

Energy-conservation effects in comparison with FY2000

Efficiency Improvement of Home Appliances (Energy Saving Labeling Program)



- The Energy Conservation Labeling system has been introduced to provide consumers with information on the energy saving properties of individual products.

  Subjected 5 equipment at present: Air conditioners, fluorescent lamps, TVs, refrigerators, and freezers

Promotion of High-Efficiency Water Heater

CO2 Refrigerative Heat-pump Water Heater

Utilizing the principle of a heat pump used in an air-conditioner, it can be heated with energy of about 3 times more than input energy. This realized energy saving of about 30% compared to traditional combustion-type boiler.

Latent-heat Recovery Water Heater

It recovers latent heat of exhausted gas, which was wasted. This realized energy saving of about 15% compared to a conventional type boiler.

Gas Engine Water Heater

Utilizing waste heat of gas energy with addition of power, it realized energy saving of about 10% per a whole building at the time of the commission.

- Energy demand for hot-water supply dominates about 30% of the total energy consumption in a household.
- Newly high-efficient water heater such as CO2 refrigerative heat-pump water heater , latent-heat recovery water heater , and others are introduced smoothly in the market.

Reduction in Standby Power Consumption

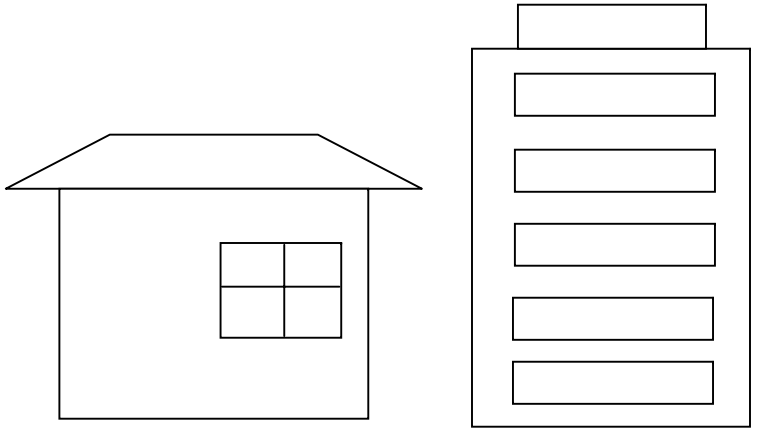
<Outline of Voluntary Efforts by Relevant Industries>

- **In regards to products that essentially require standby power, the relevant industries shall work toward the goal up to 1W in standby power by the end of FY2003 (by the end of freezing year 2004 for an air-conditioner).**
- **In regards to major home electrical appliances except for the above-mentioned products, the relevant industries shall also work toward the goal as close to zero watt as possible in standby power of the products' bodies by the end of FY2003.**

Industries concerned:
Japan Electronics and Information Technology Industries Association (JEITA), Japan electrical manufactures' Association (JEMA), and Japan Refrigeration and Airconditioning Industry Association (JRAIA)

- Standby power consumption in the household sector accounts for about 10% of its total power consumption.
- Ensure better environment for the smooth implementation of the highly-motivated voluntary programs for the attrition of standby power consumption which was proposed from manufacturers.

Promotion of Residence & Building Outperforming Energy-Conservation

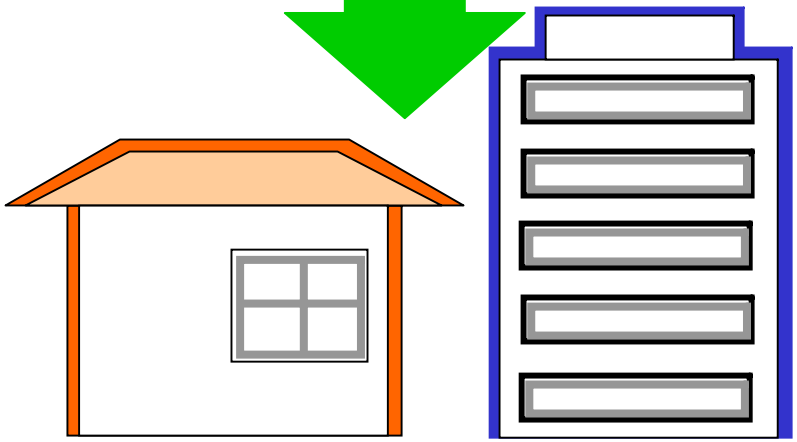


Residence：

From FY2008, the rate of energy-saving standard conformity to erect new residences shall be set above 50%.

Building：

From FY2006, the rate of energy-saving standard conformity to construct new buildings shall be set above 80%.



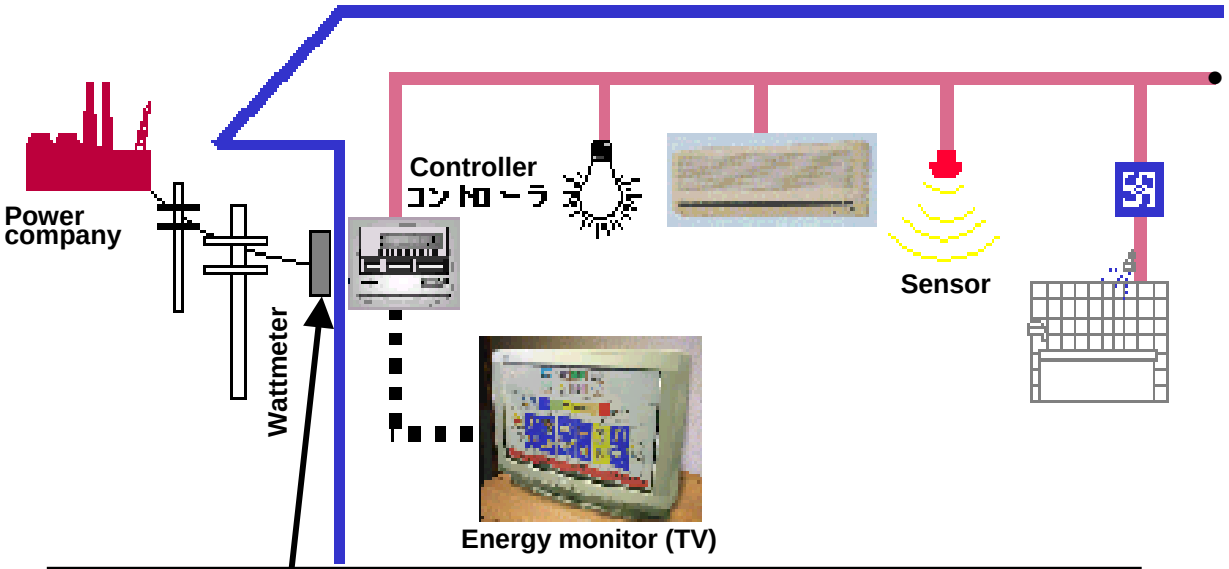
<Improvement in residence energy-saving performance>

- **Popularize indication of energy-saving performance**
- **Support for standard fulfilled residence**

<Improvement in building energy-saving performance>

- **The 2002 Revised Energy Conservation Law provides that outsourcer of specific building whose space is larger than 2000m^2 and non-residential-purposed is obliged to notify the energy-conservation provision.**
- **Support for standard-fulfilled building.**

Promotion of Home Energy Management System (HEMS)



This program promotes to popularize IT based systems facilitating energy demand management at home (energy conservation practice) encompassing automatic optimal operation of home appliances (e.g air-conditioners, refrigerators etc.), and real time indication of energy usage status and charges.

Optional Services:
- **Information services, internet connection services**
- **Security services**
- **Equipment maintenance services etc.**

Action program for promotion

Monitors will be recruited from FY2001

Phase I: Verification through field tests
- Verification of energy-conservation effects
- Verification of price mechanism & incentive performance
- System standardization

FY2001 - 2003

2-3 years later

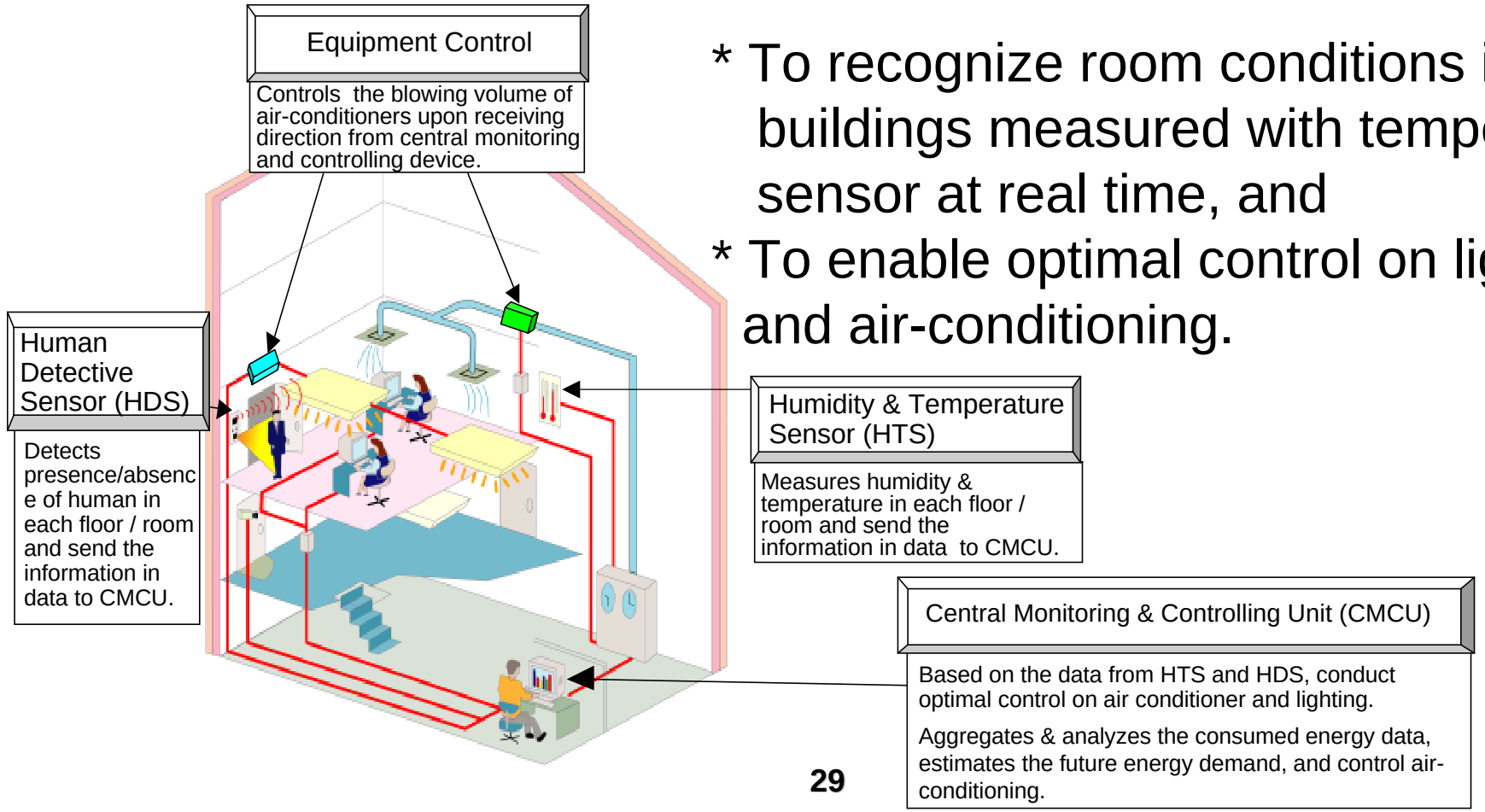
Phase II: Full system popularization
- Home appliances makers, information service companies, security enterprises, and power companies formulate consortiums and provide consumers with services.

Promotion of Commercial Building Energy Management System (BEMS)

BEMS Image

- Promote to popularize BEMS through active utilization of IT technology, which enables;

* To recognize room conditions in buildings measured with temperature sensor at real time, and
* To enable optimal control on lighting and air-conditioning.

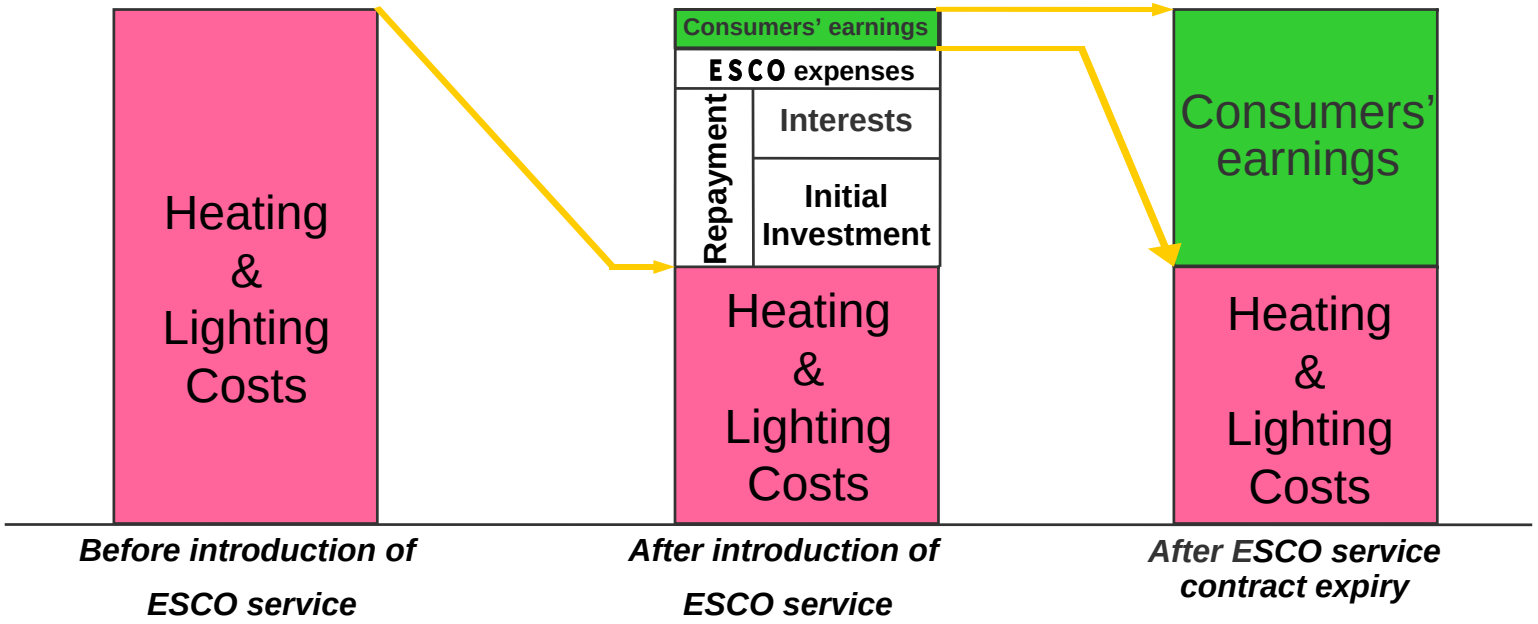


ESCO Business

- **ESCO business is an activity that provides comprehensive energy conservation-oriented services, and in rewards for the services, it receives a part of energy conservation benefits obtained by its customer.**

*ESCO: Stands for Energy Service Company

ESCO Activity Expense & Profit Sharing



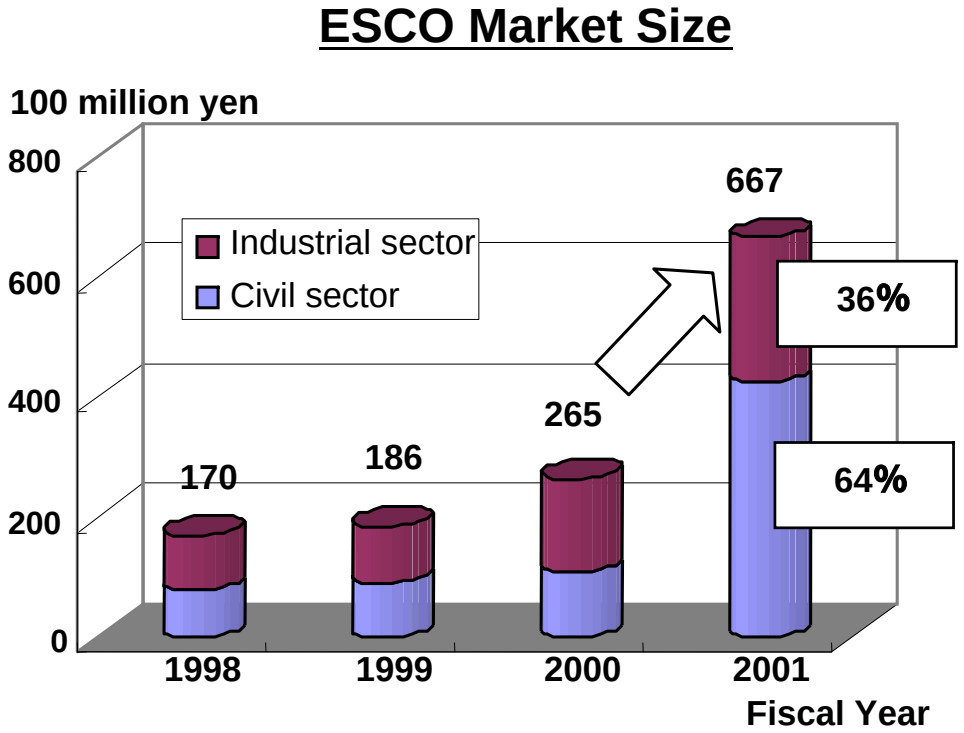
ESCO Market Size

★ ESCO market is rapidly growing in recent years.
(Track record in FY2001: Approx. ***670 billion yen***)

★ A research estimates its potential market size as 2,470 billion yen.
(Source: ECCJ's "ESCO Introduction Promotion Study Group Report")

★ The market size of ESCO in the US in 2000 is the approx. US$ 20 billion.

Large potentials for the market size expansion is expected.



Popularization of 'Idling-Stop' Cars

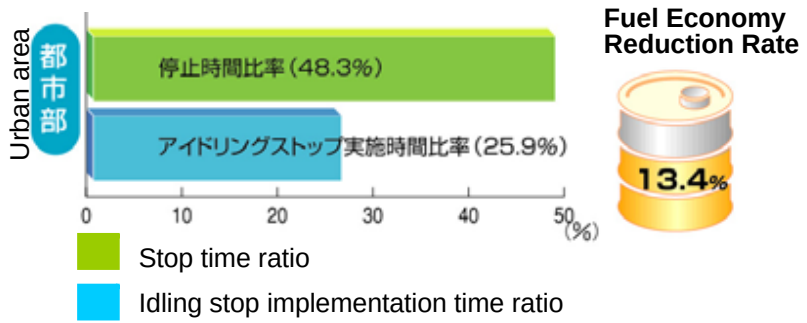
- **Actual ride of semiautomatic typed idling stop cars which was nationally conducted (3,719km) resulted in an average 5.8% (13.4% in urban areas) of the energy saving effects. The full automatic typed cars are expected the twofold effects.**

* "Semi-automatic type" : Drivers controls a gearshift and a button switch and prevent idling.

"Full-automatic type": The 'idling stop' is automatically performed in the process of usual accelerator / brake operation.

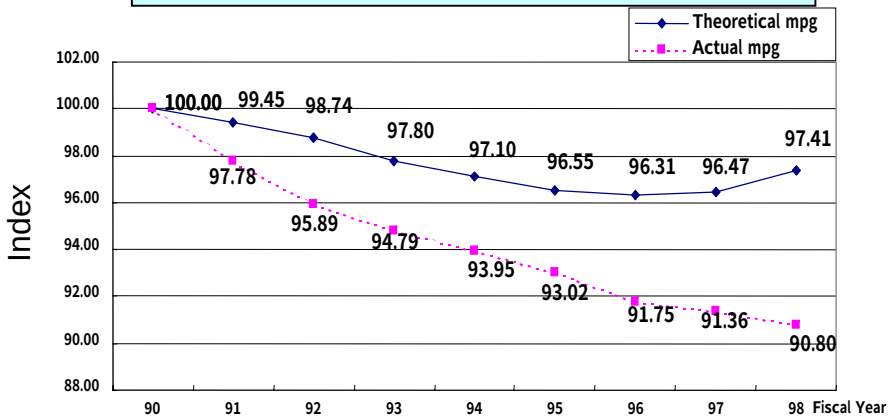
- **The cost for introducing 'idling-stop' cars will be partially subsidized, while the promotion and public relations through test-ride events etc. are conducted.**

<The stop & 'idling-stop' implementation time ratio in urban area>



Measures for improving logistics and traffic efficiency

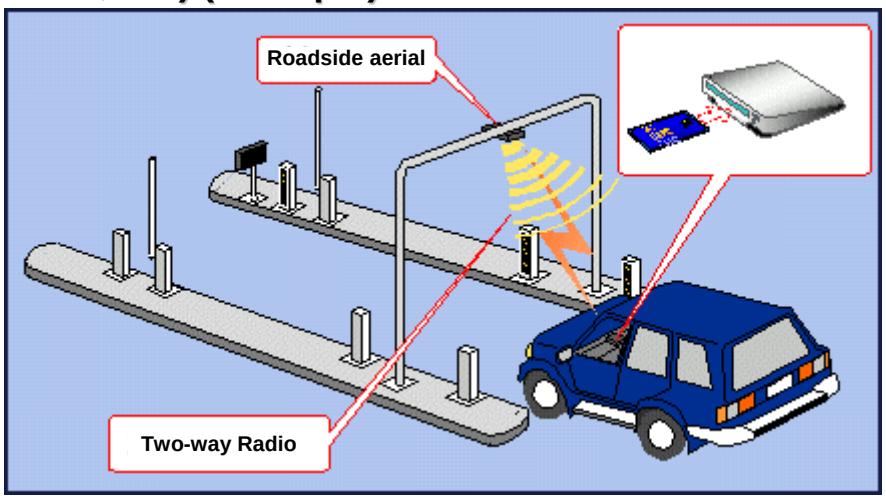
Transition of Theoretical & Actual mpg of private-owned cars



Source: Complied by the Agency of Natural Recourses and Energy from the Energy and Economy Statistics, the Transportation-related Energy Summary and the Annual Statistics on Automobile Transportation

- The deterioration of actual fuel economy for automobiles is greater than that of theoretical fuel economy depending on road conditions etc.

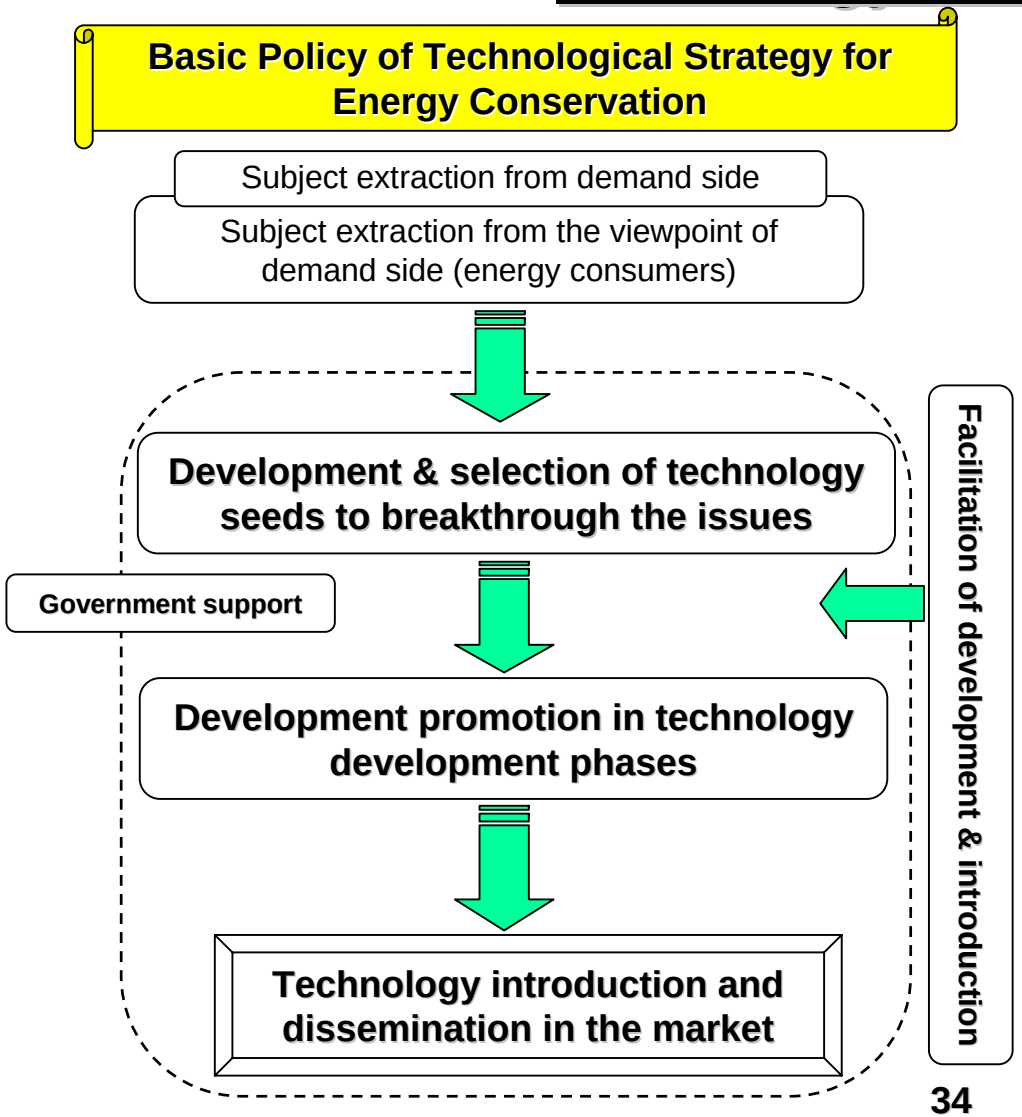
ITS (ETC) (Example)



Source: Organization for Road System Efficiency (foundation), 'What is ETC?'

- The Intelligent Transportation System (ITS) is developed / utilized to improve logistics and transportation efficiency.

Promotion of Technological Strategy for Energy Conservation



- In June 2002, ‘the energy conservation technological strategy’ was outlined in order to light the direction to breakthrough the demand side issues.
- Public offering on seeds technology from its development to demonstration testing shall be invited, and special support for energy conservation technology development vis-à-vis the strategy shall be provided.

Forecasted Effects of Future Energy Conservation Measures

- **Forecasted Effects of Future Energy Conservation Measures**

57 million kiloliters

Breakdown:

Industrial Sector: 20. Million kℓ Civil Sector: 18.6 million kℓ

Transportation Sector: 16.9 million kℓ

Cross-sector Measures: 1 million kℓ

* The amount will surpass the total energy annually consumed in all the households (approx.. 55 million kl).

Towards the Energy Conserved Lifestyle for 2010

○ Home appliances, oil / gas equipment

* Purchase products compliant with energy conservation standard

Utilization of Energy Conservation Labeling, etc.

Energy saving of Approx. 16%(TV) - 63%
(Heating & Cooling Air-conditioner)

○ Measures of Total Energy Demands

* Install Home Energy Management system.
  →Energy saving by automatic controlling machinery / equipment
  →Cost Display of Energy consumption

Energy saving of approx. 10% in household power consumption

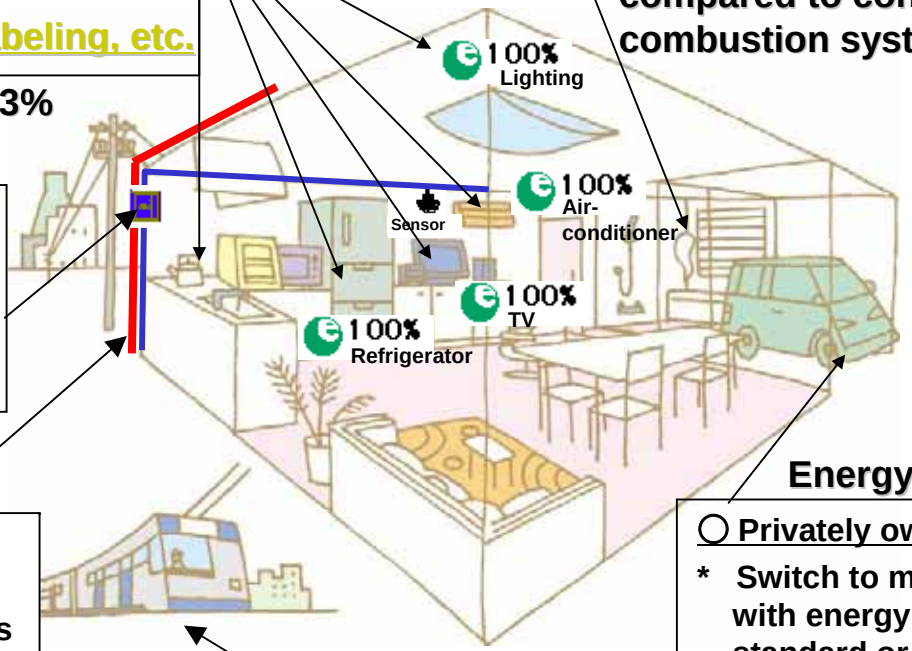
○ Heat Insulation Improvement

* Construction / renovation of residence compliant with next-generation standards

Energy saving of approx. 20% for heating-cooling air conditioner vs. the conventional standard

○ Install high-efficiency hot water systems

Energy saving of approx. 15-30% compared to conventional combustion system



Energy saving over 23%

○ Privately owned car

* Switch to modes compliant with energy conservation standard or clean energy cars

○ Utilization of public transport and bicycle

The total energy saving expected from public cooperation to these activities is estimated

approx. 14 million kl