

Overview of Japan's Energy Efficiency Policies on Buildings and Appliances

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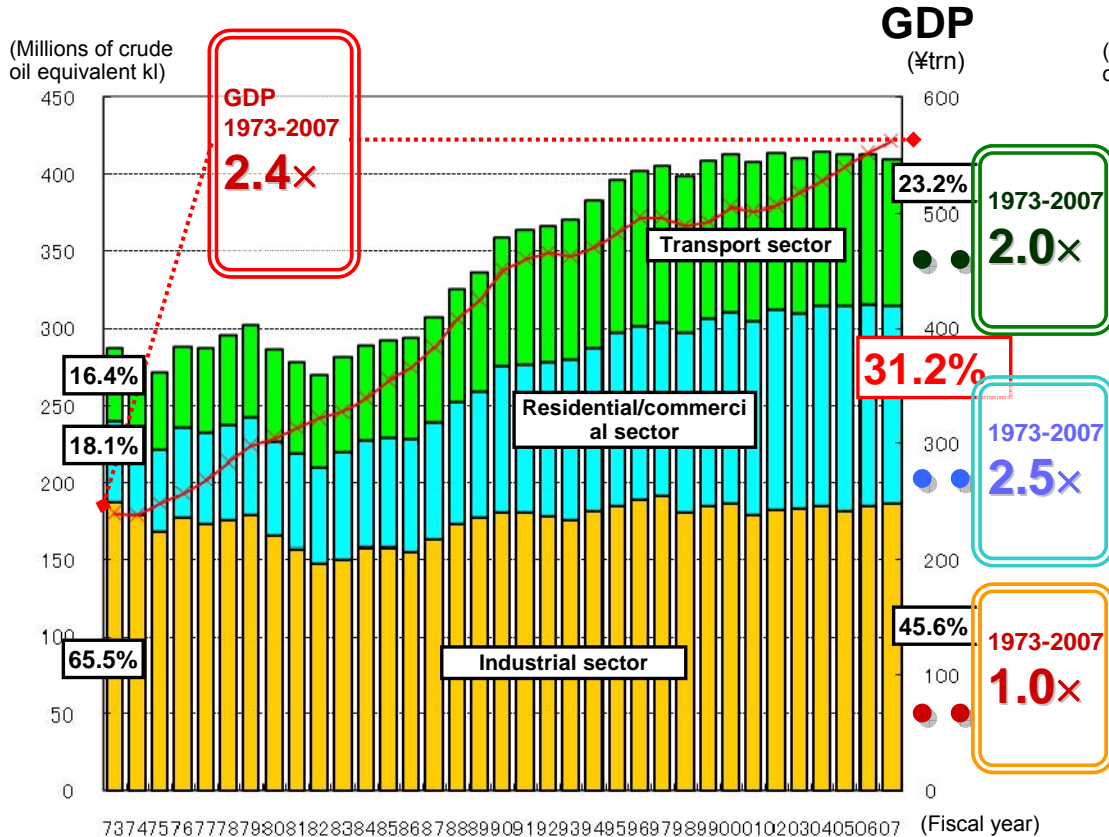
Agency for Natural Resources and Energy



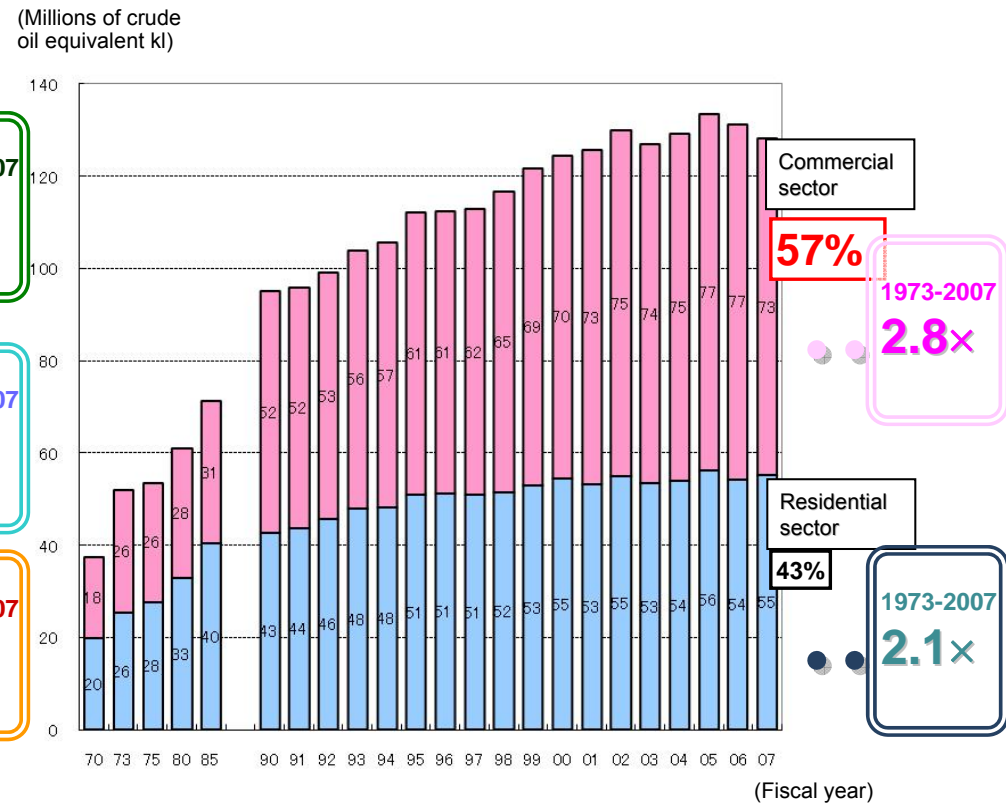
Trends in Japan's Final Energy Consumption and Residential/Commercial-Sector's Energy Consumption

- Residential/commercial-sector accounts for 30% or more of final energy consumption and has grown remarkably compared to the industrial and transportation sectors.
- Energy saving measures for commercial buildings are urgently required, since the commercial sector including office buildings consumes more than half of total energy consumption in the residential/commercial sector. Moreover its growth has been more striking than that of the residential sector.

[Trends in final energy consumption and real GDP]



[Breakdown of commercial and residential sectors]



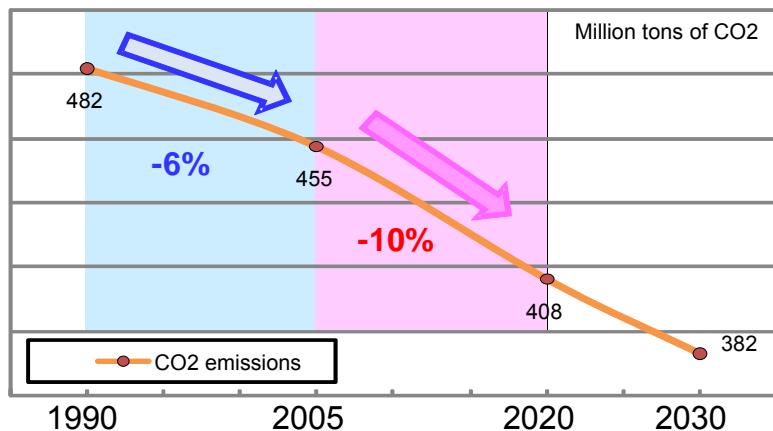
Source: Energy Balances in Japan (Processed Statistics), Annual Report on National Accounts of Japan

Note: Owing to the revision of the method for compiling Energy Balances in Japan (Processed Statistics), it should be noted that figures for fiscal 1990 onward are based on a different compilation method from that used for previous figures.

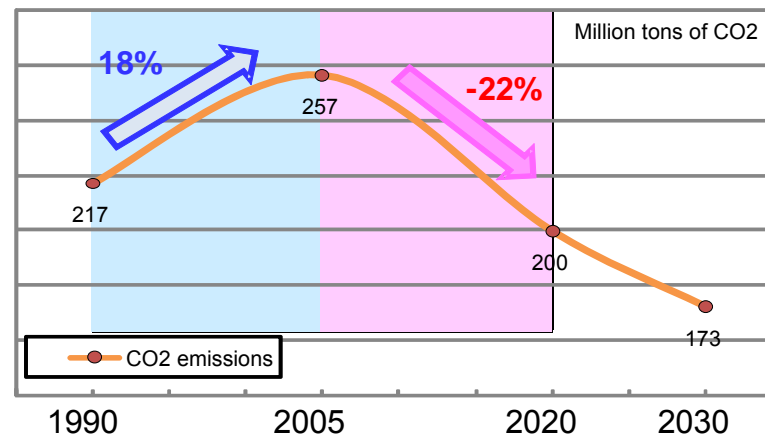
Prospect of CO2 Emissions by Sector

- Our PM announced Japan's mid-term emission reduction target, which is to cut Japan's GHG emissions by 25% in 2020 if compared with 1990, subject to international negotiations. The following is the emission path for the previous mid-term target: 15% cut compared with 2005. In any event the largest reduction will need to be realized in commercial sector.

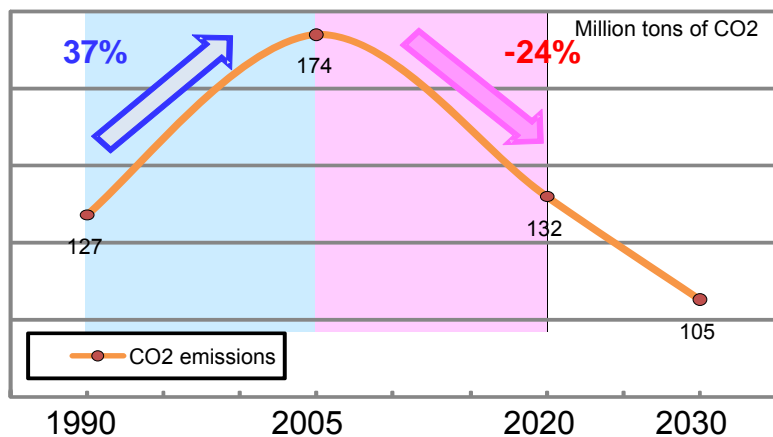
Prospect of industrial sector (not including conversion sector)



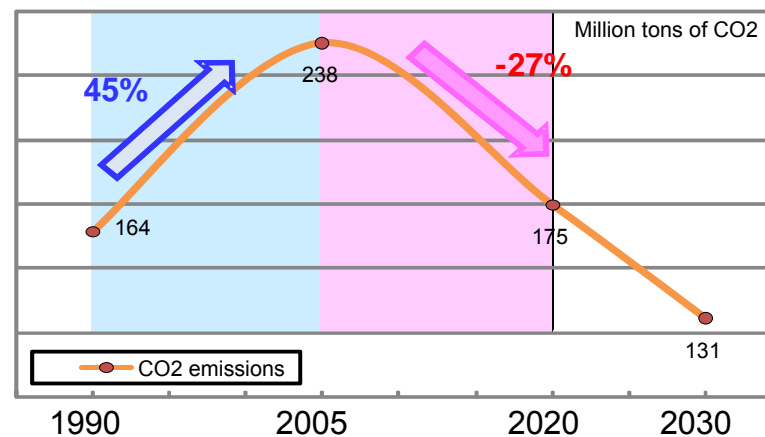
Prospect of transportation sector



Prospect of residential sector



Prospect of commercial sector



Energy-saving Measures in Commercial Sector

- “No end to energy saving.” Japan continuously improves its energy efficiency performance by strengthening regulations and providing assistance.

Regulations (relevant to the commercial sector)

Energy Efficiency Law

- ◆ **Design stage:** With regard to non-residential buildings, the thermal insulation performance of the building envelope and the energy efficiency performance of the building equipment are evaluated.
The obligation to notify the administrative agency of such evaluation has been expanded to buildings with floor space of 300 m² or more from the current 2,000 m² or more. (To be enforced on April 1, 2010)
- ◆ **Operation stage:** Business operators whose total annual energy use in their factories and offices (including franchise chains) is 1,500 kl or more (crude oil equivalent) are required to make efforts to improve energy intensity by 1% or more every year.
[Obligations]
 - Submit annual regular reports on status of energy use.
 - Submit medium to long-term plans regarding energy saving investment.
 - Appoint Energy Management Officers at the Board level, and factories and offices.
- ◆ **“Top Runner Program”:** Improvement of energy efficiency of air-conditioning, lighting, hot water and OA equipment.

Assistance

- ◆ Fiscal support: Annually JPY 30 billion for housing and building energy efficiency and JPY 50 billion for energy efficiency in general (excl. Economic Stimulus Package)
- ◆ Taxation: Accelerated depreciation, deduction of income tax, etc.
- ◆ Low interest rate finance

Acceleration of Development of Zero Emission Buildings

○ The GOJ put forward its ZEB target in April, 2009: “Acceleration of development of zero emission buildings (development aimed at making new public buildings zero emission by 2030)”.

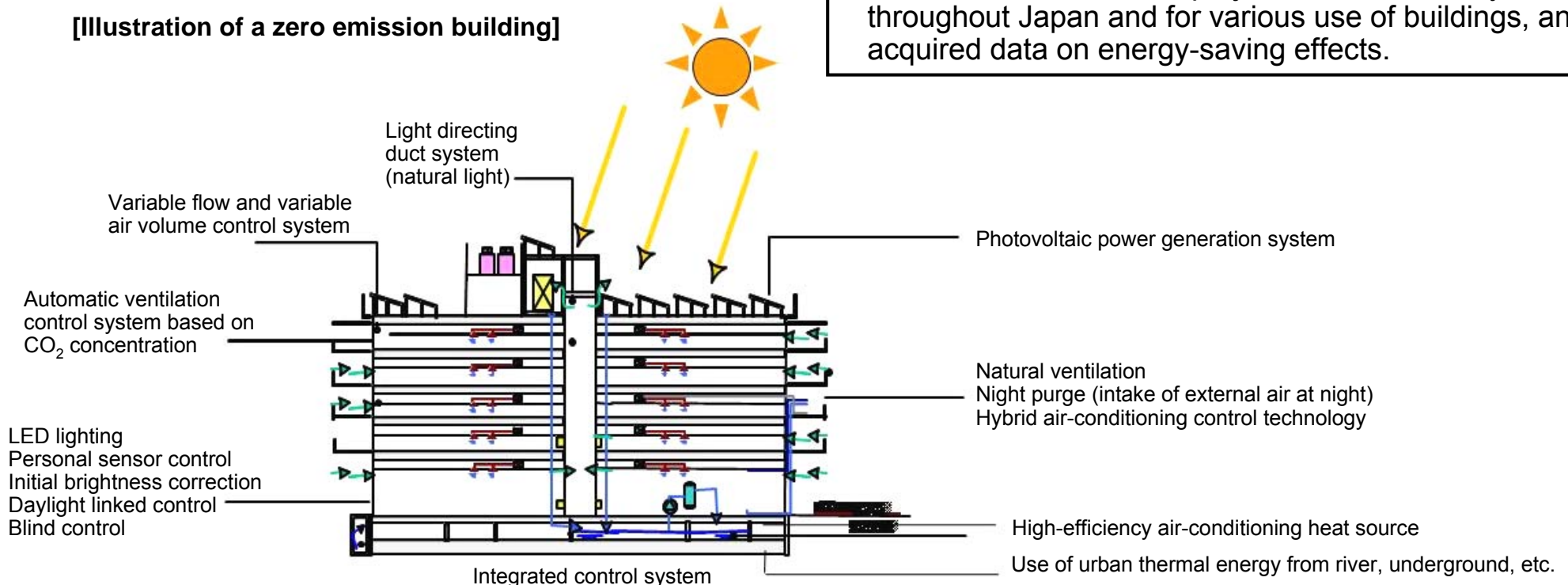
ZEB definition

Defined as a building that emits zero CO₂ on annual net basis by reducing energy consumption through enhancement of the energy efficiency performance of the building envelop and equipment, and the use of renewable energy on site.

Accelerated development of zero emission buildings

- ◆ Aim to drastically raise energy efficiency performance through technological development and integration of advanced design technologies, equipment and operational control as total systems.
- ◆ Conduct demonstration projects of such total systems throughout Japan and for various use of buildings, and acquired data on energy-saving effects.

[Illustration of a zero emission building]



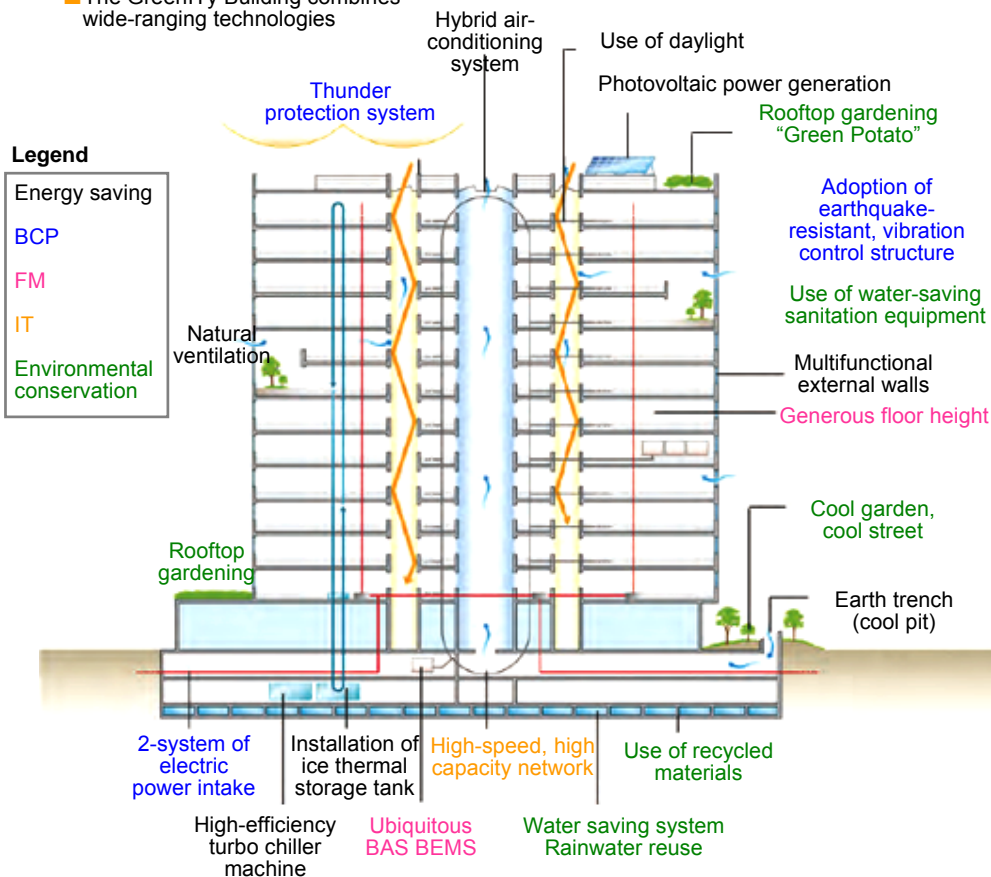
Potential to Realize ZEB (1)

- Annual CO₂ emissions and energy consumption could be reduced by 30-40% even with existing technologies.
- To realize ZEB (100% reduction), progress in individual technologies, as well as comprehensive design and integrated control to effectively combine such technologies, is needed.
- Overall cost analysis, including cost-up at design stage and cost-down at operation stage, is another challenge.

[GreenITy Building]

By the combined use of 259 element technologies, including those in the diagram below, it is possible to reduce annual CO₂ emissions and energy consumption by 40%.

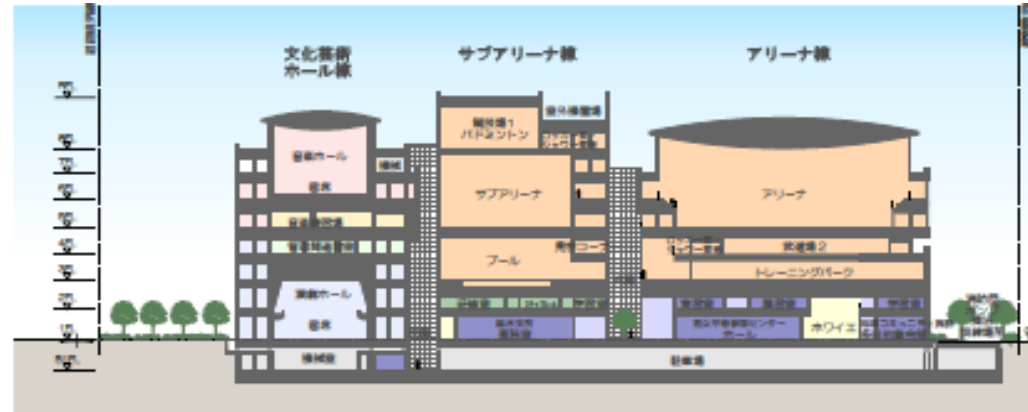
■ The GreenITy Building combines wide-ranging technologies



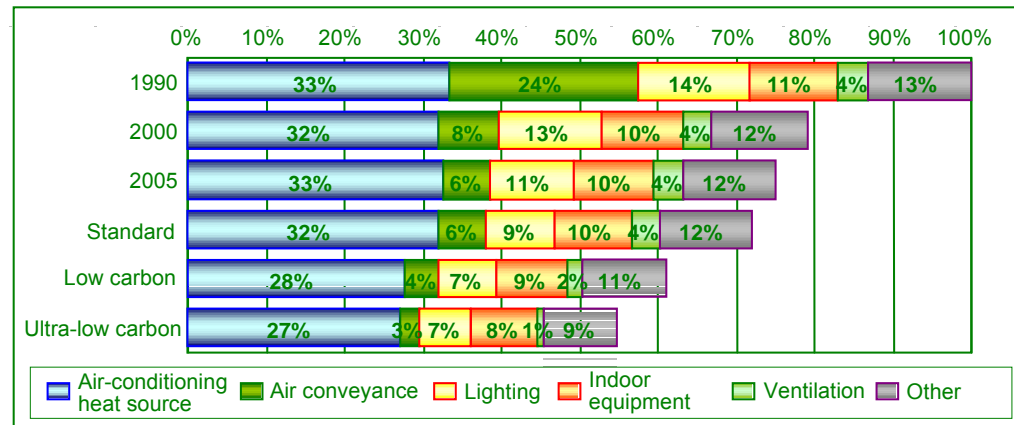
Source: NTT Facilities CSR Report 2008

[Plan to develop low carbon public facility in Tokyo]

■ Overview of basic plan (cross section)



■ Emission volume ratio (100% in 1990) calculation results by type of consumption



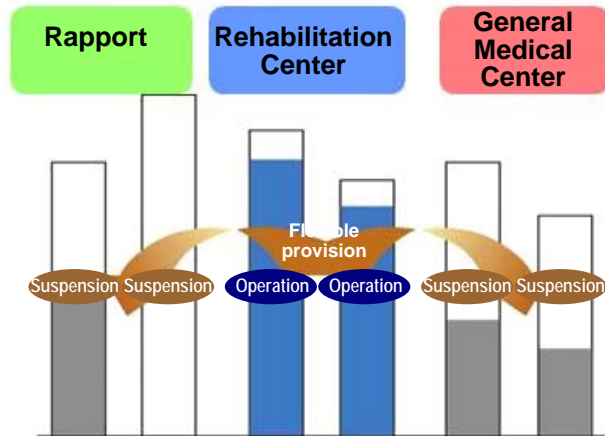
Source: Nikken Sekkei Research Institute, Data for Environmental Symposium sponsored by Minato Ward

Potential to Realize ZEB (2)

- Japan should aim to develop ZEB through the networking of neighboring buildings for more efficient energy use because of its characteristics of commercial buildings (medium to high-rise buildings are packed in narrow sites).
- There are burgeoning signs of area network of energy usage, such as
 - Sharing of energy facilities among existing buildings in the same area (Yokohama City below)
 - Networking of several district heating and cooling systems (vicinity of Nagoya Station)
 - Supply of co-generation waste heat from new buildings to existing district heating and cooling systems (Akasaka Intercity).

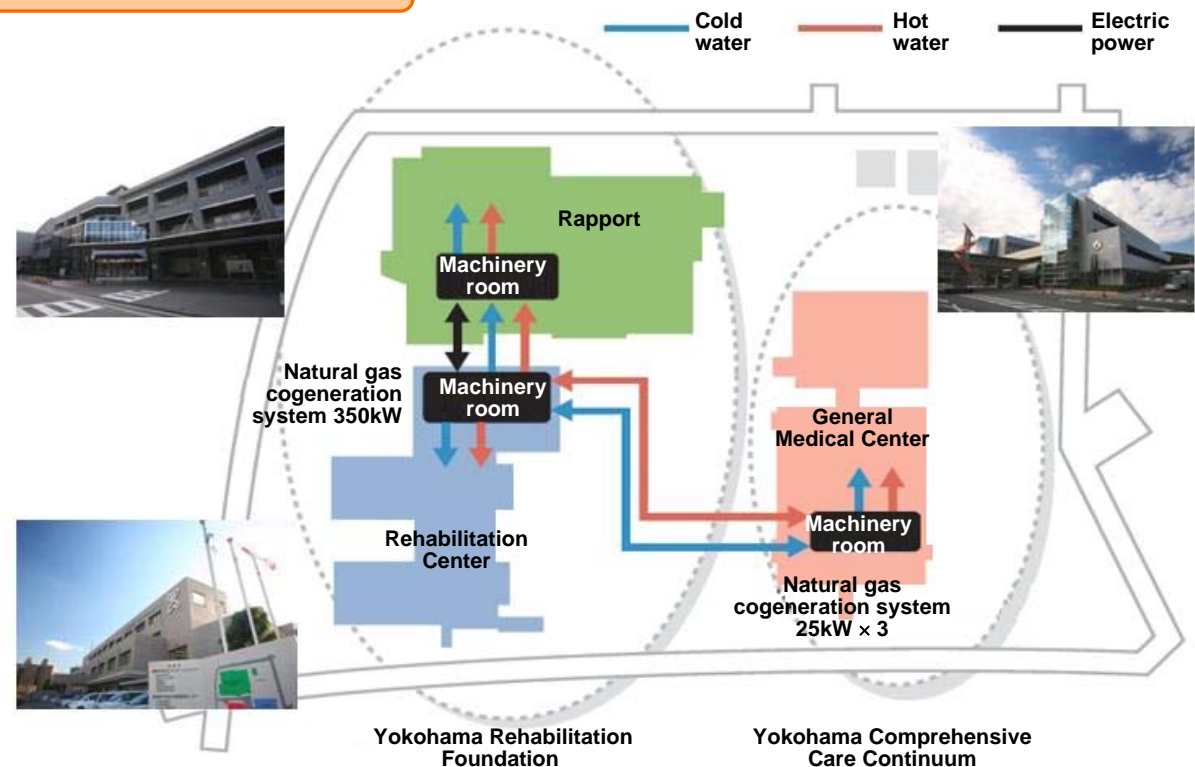
Example of introduction in Yokohama City

Size of area: 3.5 ha
Total floor space: About 40,000 m² (3 buildings combined)



- Optimally operate and flexibly provide power and heat among buildings
→ Avoid inefficient partial-load operation

Energy consumption reduced by **18%** in 2008



Potential to Realize ZEB(3)

Our initial estimate is that it should be possible to realize ZEB by around 2030 in medium and low-rise office buildings with certain technological progress as outlined below. Furthermore, possibility of achieving ZEB should become even greater, if potential for area network of neighboring buildings is taken into account.

[Assumptions]

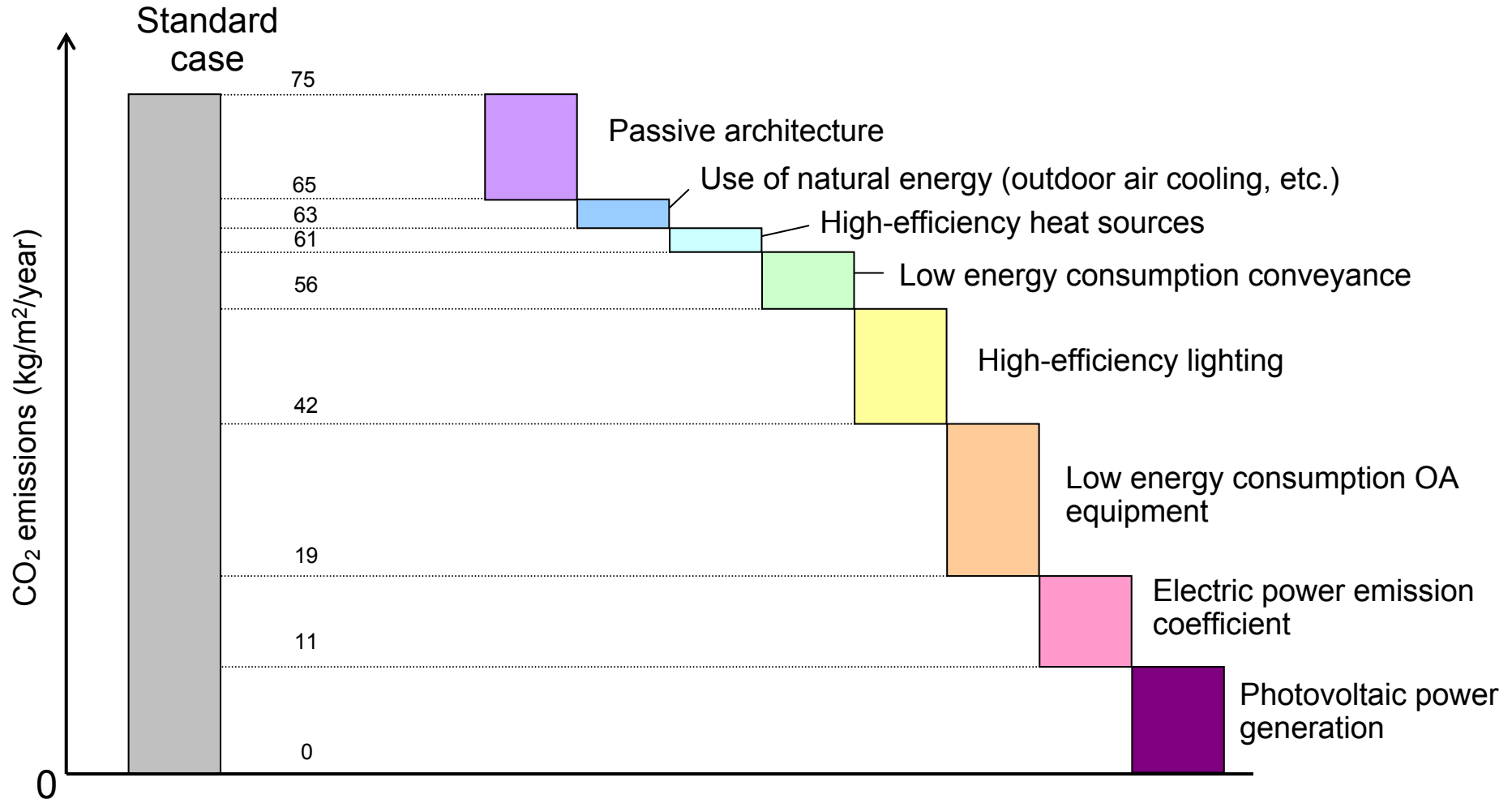
- Office building with about 5,000 m² per floor (roughly the same size as annex building of METI).
- Primary energy consumption: 2,000 MJ per square meter per year (average for office buildings)
- Technological progress by around 2030 (based on “Cool Earth Energy Innovative Technology Plan” etc.)
 - **Passive architecture**: high thermal insulation, solar shading
 - **Use of natural energy**: outdoor air cooling, night purge, and outdoor air intake control based on indoor CO₂ concentration
 - **High-efficiency heat sources**: development of heat sources with about **20% higher efficiency** than at present (raising the current COP 6.4 turbo chillers to around 8.0)
 - **Low energy consumption conveyance**: thorough use of inverters, high-efficiency motors, pumps and fans, low friction loss piping and duct size
 - **High-efficiency lighting**: development of high-efficiency lighting equipment and brightness setting with **one-third of the current level** of power consumption, and thorough use of variable light and blinking control
 - **Low energy consumption OA equipment**: development of low-consumption OA equipment, security and disaster prevention equipment, and standby power equipment with **one-third of the current level** of power consumption
 - **Electric power emission coefficient**: 2030 energy supply and demand estimates
 - **Photovoltaic power generation**: installation of panels with conversion **efficiency that is double** the current level on **two-thirds of rooftop area**

[Result]

- **Low-rise buildings with three floors or less will achieve ZEB, and buildings even with around 10 floors will be able to reduce emissions by about 90% (almost zero).**

Potential to Realize ZEB (4)

[Results of initial calculations: Case of three-story building]



Points of Discussion in ZEB Committee

1. Basic Premises of ZEB in Japan

- Definition of ZEB
- Priority of measures aimed at achievement of ZEB
- Design ZEB or operational ZEB, new buildings or existing buildings
- Possibility of ZEB and rationale behind target setting

2. Roadmap toward the Achievement of ZEB

- Technological issues
 - State-of-the-art technologies (design technologies, control systems, major equipment such as HVAC, lighting, OA equipment, PV)
 - Performance of specific buildings that incorporated these technologies (comprehensive building design, integrated building control, etc)
- Institutional issues
 - Regulations
 - Networking of neighboring buildings for more efficient energy use (e.g. district heating and cooling)
 - Use of urban thermal energy from river, underground, etc.
 - Incentive split between building owners and tenants
- Standardization

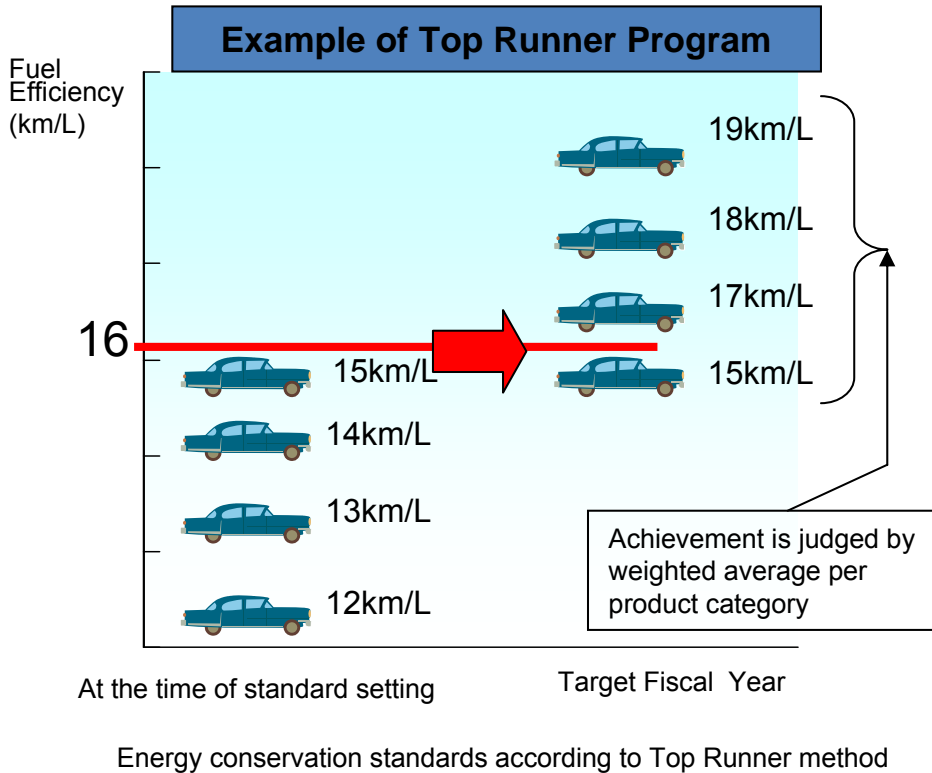
3. Policies and Measures for the Dissemination of ZEB

- Supportive measures and incentives
- Information to society and awareness raising

4. International Partnership of ZEB

Top Runner Program

- Energy Efficiency Law stipulates standards for domestic appliances and vehicles according to the Top Runner method. Manufacturers and importers are under the obligation to comply with the standards. For incompliance, manufacturers and importers are subject to government instructions, publication, order, penalty (under one million yen penalty).
- 23 product types were made the target of the program.



Target products (23 products)

| | |
|-----------------------------|----------------------------|
| 1. Passenger vehicles | 12. Space heaters |
| 2. Freight vehicles | 13. Gas cooking appliances |
| 3. Air-conditioners | 14. Gas water heaters |
| 4. TV sets | 15. Oil water heaters |
| 5. Video-cassette recorders | 16. Electric toilet seats |
| 6. Fluorescent lights | 17. Vending machines |
| 7. Copiers | 18. Transformers |
| 8. Computers | 19. Electric rice cookers |
| 9. Magnetic disc units | 20. Microwaves |
| 10. Electric refrigerators | 21. DVD recorders |
| 11. Electric freezers | 22. Residential router |
| | 23. Layer 2 switch |

Top Runner Program:

The concept of the program is that fuel efficiency standards for vehicles and energy efficiency standards for electric appliances, etc. are set at a higher level than that of the best performer in each product category currently available in the market.

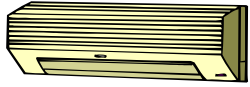
Energy Efficiency Improvement by the Top Runner Program

| Equipment | Improvement of energy efficiency (Achievement) |
|--|--|
| TV sets (CRT televisions) | 25.7 % (FY1997→FY2003) |
| Video-cassette recorders | 73.6 % (FY1997→FY2003) |
| Air-conditioners * (Room air-conditioners) | 67.8 % (FY1997→FY2004) |
| Electric refrigerators | 55.2 % (FY1998→FY2004) |
| Electric freezers | 29.6 % (FY1998→FY2004) |
| Gasoline passenger vehicles * | 22.5 % (FY1995→FY2005) |
| Diesel trucks * | 21.7 % (FY1995→FY2005) |
| Vending machines | 37.3 % (FY2000→FY2005) |
| Computers | 99.1 % (FY1997→FY2005) |
| Magnetic disc units | 98.2 % (FY1997→FY2005) |
| Fluorescent lights * | 35.6 % (FY1997→FY2005) |

* The energy conservation criteria for the products marked * are fixed by the energy consumption efficiency per unit (for example: km/l), while the energy conservation criteria for those not marked * are fixed by the amount of the energy consumption (for example: kWh/year). The "improvement of energy consumption efficiency" said in the above table indicates the improvement factor based on each criteria (for example: if 10km/l becomes 15km/l, it is regarded as 50% improvement (not that fuel consumption was improved by 33%, i.e. from 10 liter to 6.7 liter consumed to drive 100km), and if 10kWh/year becomes 5kWh/year, it is regarded as 50% improvement).

Example of Energy Efficiency Improvement for Home Electric Appliances

<Improvement of energy consumption efficiency of air-conditioners>



Electricity consumption in the season, 627 kWh cut
Electricity cost of the year, 13,800 yen cut



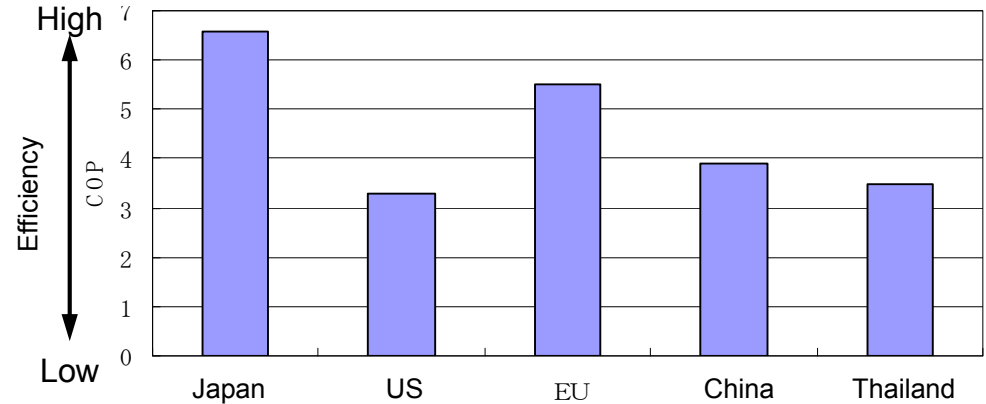
The product made in FY2007
Electricity consumption in the season, 865kWh
Electricity cost of the year, 19,000 yen

The product made in FY1995
Electricity consumption in the season, 1492kWh
Electricity cost of the year, 32,800 yen

1 Simple average of air conditioners for both cooling and heating, wall-hanging type, cooling capacity (2.8kW class) and typical energy conservation type. (Source: The Japan Refrigeration and Air Conditioning Industry Association) The Electricity consumption of the season means the total of the electricity consumed during cooling period (June 2 to September 21) and during heating period (October 28 to April 14).
*2 Calculated making the price of electricity per 1kWh 22 yen (including tax) (the reference price suggested by Home Electric Appliance Fair Trade conference).

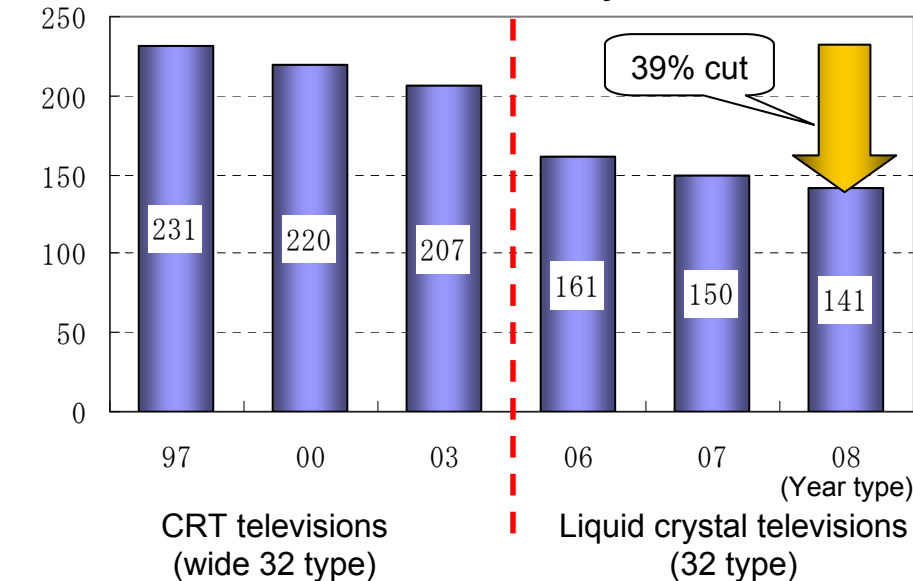
<International comparison of energy consumption efficiency>

Comparison of the best efficiency of air conditioners available in the countries of the world. (Same cooling capacity class, 2005)



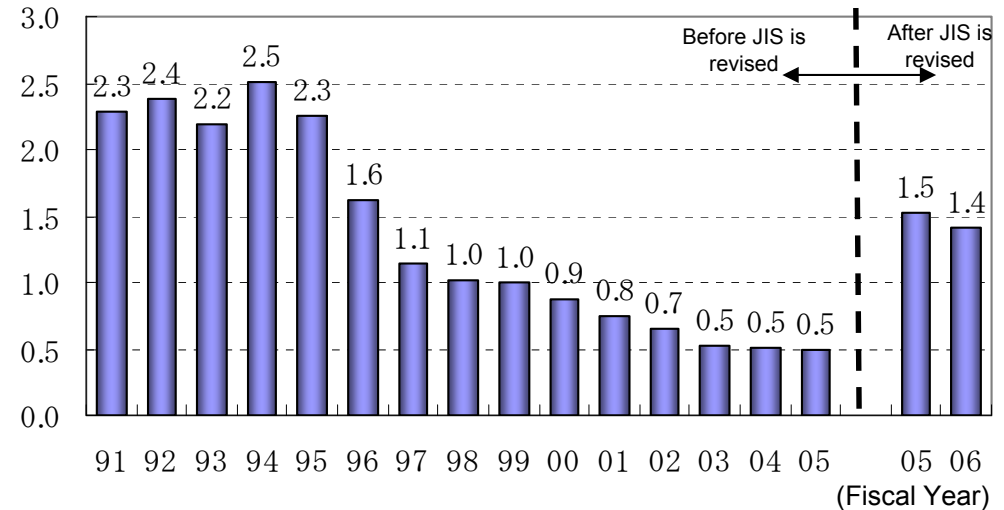
* COP = Output energy/Input energy

Electricity consumption <Transition of electricity consumed by televisions in a year>



<Transition of yearly electricity consumption of refrigerators>

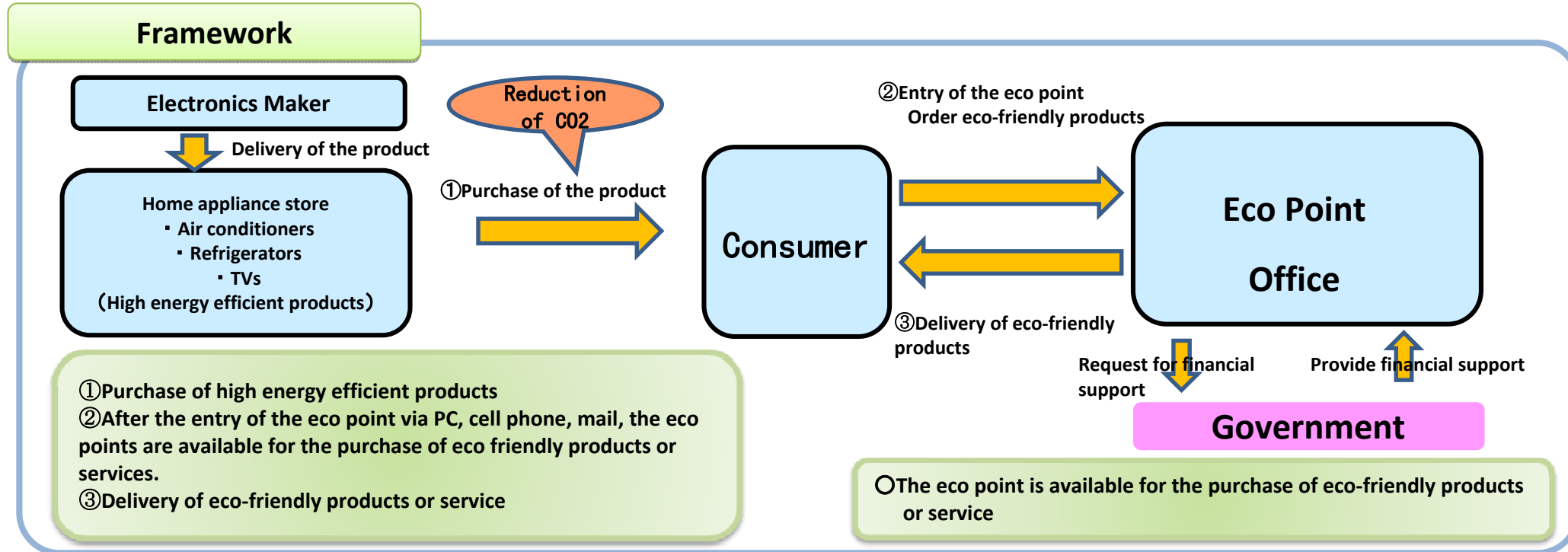
Yearly electricity consumption per 1L (kWh/L)



(Source) Energy Conservation Catalogue of each year (The Energy Conservation Center, Japan), the Handbook of Energy and Economy Statistics in Japan (2008 edition)

Promotion of "Green Electronics" by using "Eco Points"

* "Eco-friendly" means "Environmentally-friendly"



Concept of the Eco Point

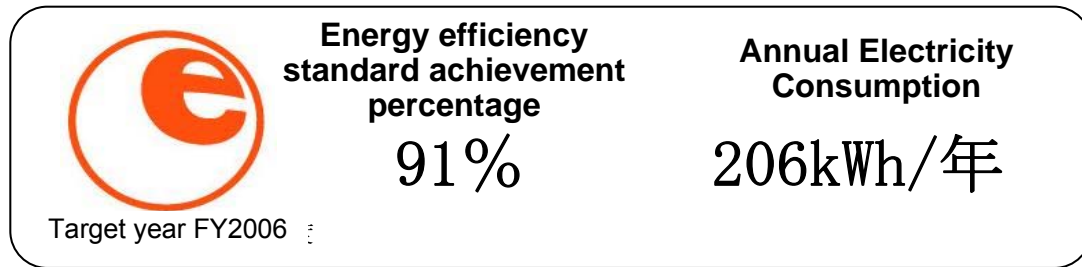
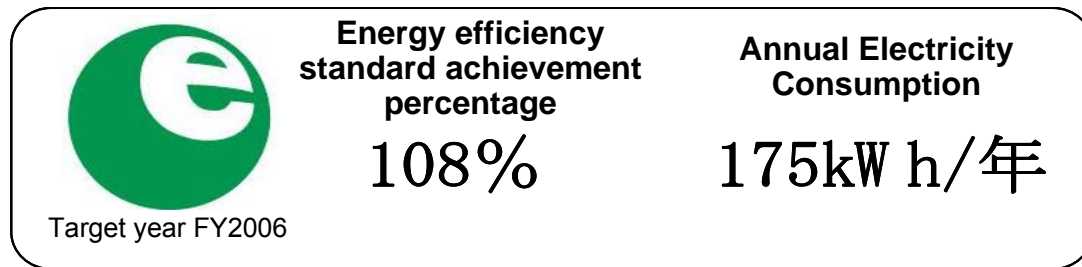
- About 5% of the purchase price of "Green Electronics" (energy efficient A/C, refrigerators, TVs) is added as the Eco Point
- An extra 5% is added in case of TVs (for the promotion of digital broadcasting)
- A recycling charge is also added to the eco point

| Conditions | A/C | Refrigerator | TV |
|-------------------------------|------------------|------------------|---------------------|
| High energy efficient product | 5 % | 5 % | 5 % + 5 % (for DTV) |
| In case of recycling | Recycling charge | Recycling charge | Recycling charge |

Energy Saving Labeling Program

- The energy saving labeling program has been introduced to inform consumers of energy efficiency of home appliances and to promote energy-efficient products.

Examples of energy saving labeling



Label for the product's main unit

- As of April 2006, labeling is applied to the following 13 products: air conditioners, refrigerators, freezers, fluorescent lights, TV sets, space heaters, gas cooking appliances, gas water heaters, oil water heaters, electric toilet seats, computers, magnetic disks, and transformers.

Uniform Energy Saving Label

- The Energy Efficiency Law revised in April 2006 stipulates that retailers shall make efforts to provide information. In light of this, a guideline was formulated to provide information by using uniform energy-saving labels.
- The system started in October 2006. As of October, 2009, televisions, air conditioners, refrigerators and electric toilet seats are covered by this system.

Uniform Energy Saving Label



【Multi-stage rating system】

- Energy efficiency performance is indicated in 5 stages, from 1 to 5 stars, from low to high performance of products offered in the market.
- In order to clarify the compliance level with the Top Runner standard, arrows are placed under the stars, showing achievement and non-achievement.

【Energy-saving labeling system】

- Products which achieved the Top Runner standard carry a green “e” mark, while others carry an orange “e” mark.
- Achievement level and annual electricity consumption are also indicated.

【Expected annual electricity bill】

- The expected annual electricity bill is indicated to show the energy efficiency (annual electricity consumption) clearly.

Energy Efficient Product Retailer Assessment System

- In order to promote energy efficient products, it is essential to facilitate the efforts of retailers, who are the contact point between manufacturers and consumers.
- Recognition should be given to retailers who actively promote energy-efficient products or provide appropriate energy efficiency information.
- The energy efficient product retailer assessment system was introduced in FY2003.

Logo

2005年度



省工ネ型製品普及推進優良店

- Targeted retailers:
All home appliance retailers whose sales coming from home appliances account for 50% or more of total sales.
- In FY 2008, about 1600 retailers applied for this assessment system. Out of 1600, about 900 were given recognition. Among them, seven retailers received ministerial awards.
- Selected retailers are authorized to carry a special logo.