

Energy Efficiency Activities on Residences and Buildings - Cool Roof Paints- in Japan

September 2011

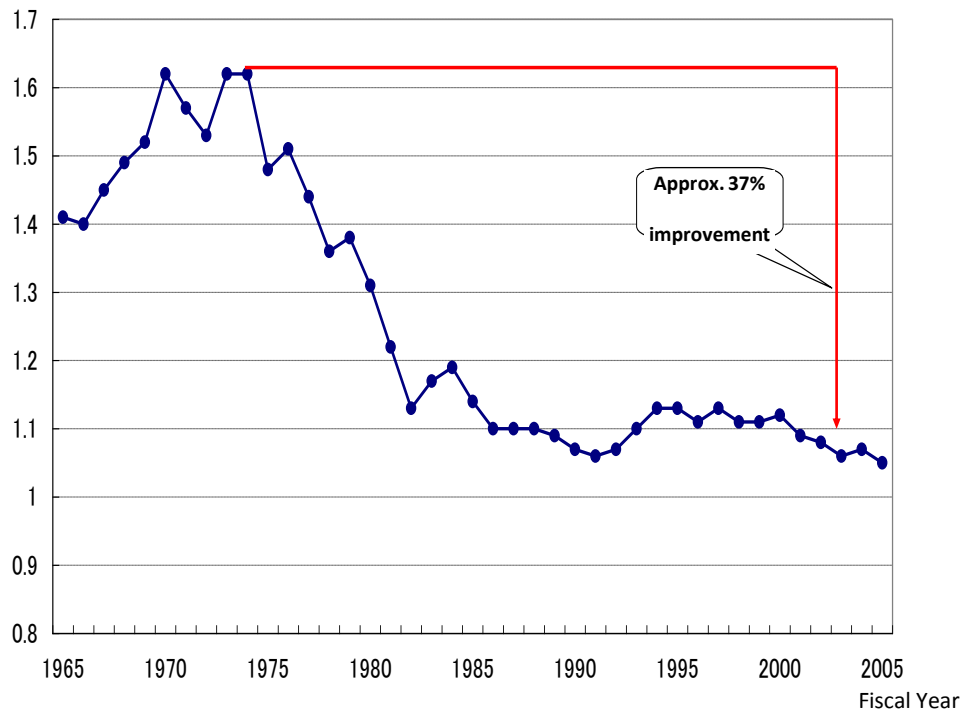
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Energy Conservation Efforts of Japan after Oil Crises

- Japan improved the energy efficiency by 37% in last 30 years after the oil crises in the 1970s.
- Japanese primary energy consumption per GDP is the lowest in the world owing to various energy conservation measures.

Energy use per real GDP of Japan

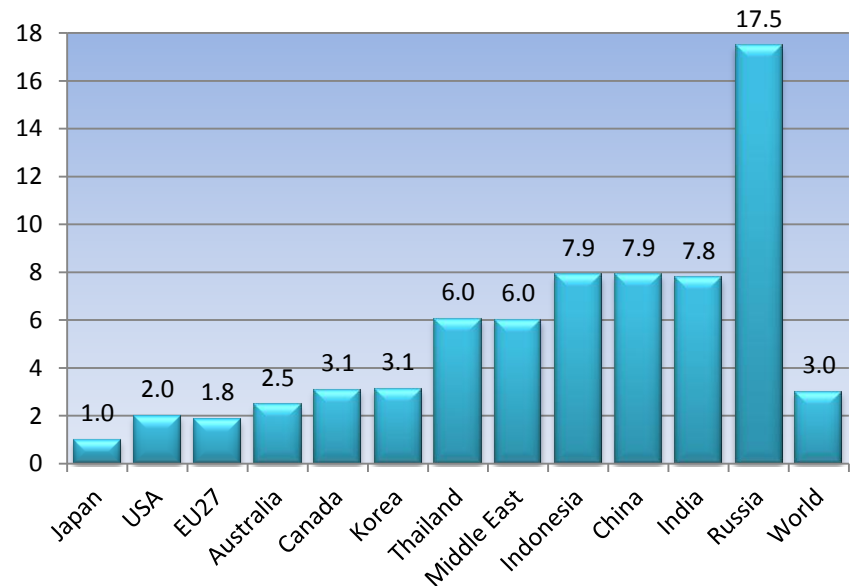
(Oil converted kilo ton/1 billion yen)



(Source) "Total Energy Statistics" by ANRE

Primary energy supply per GDP unit of each country (2007)

(Index Japan=1.0)

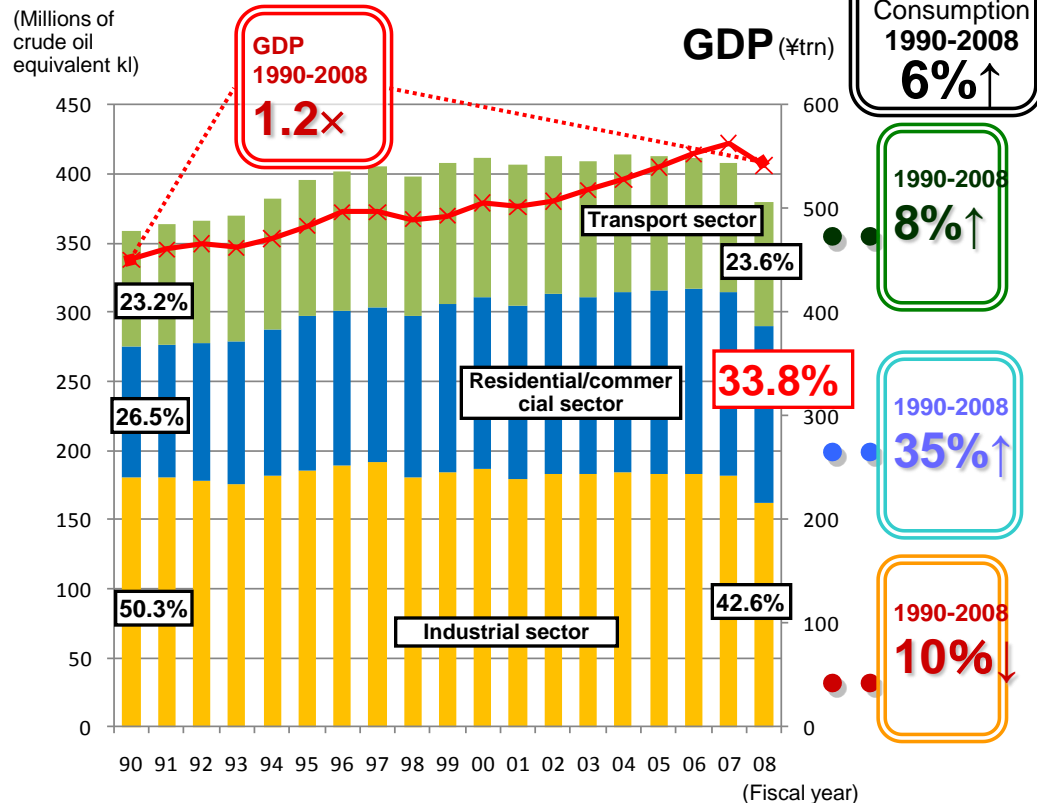


* Calculated according to IEA Energy Balances of OECD/Non-OECD Countries(2008edition)
Index of each country making Japan 1, based on the value dividing primary energy consumption by GDP.

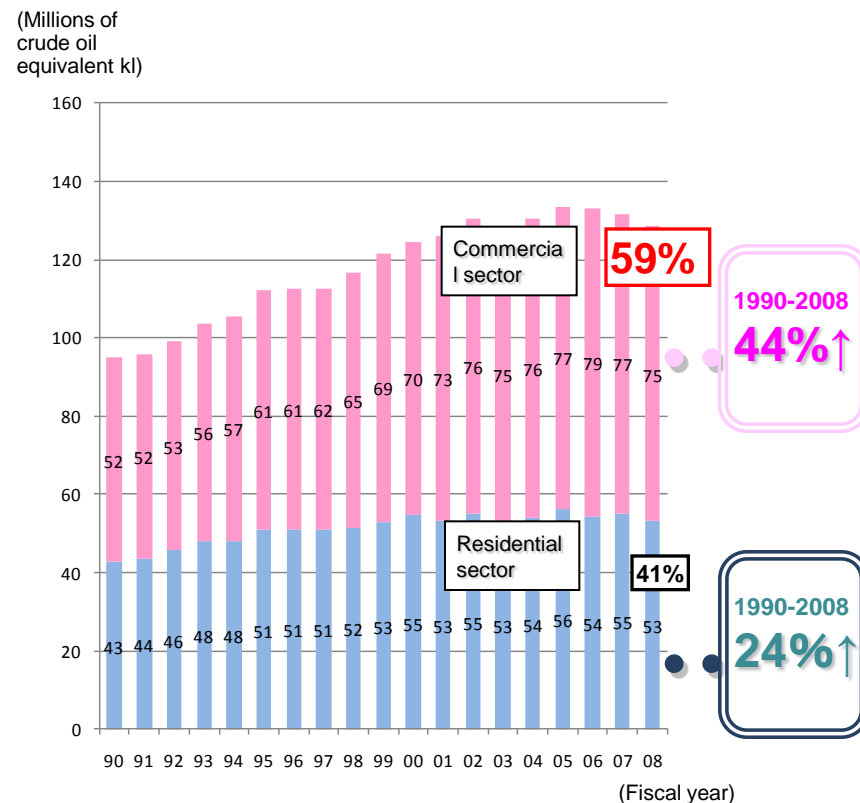
Trends in Japan's Final Energy Consumption and Residential/Commercial-Sector's Energy Consumption

- 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]



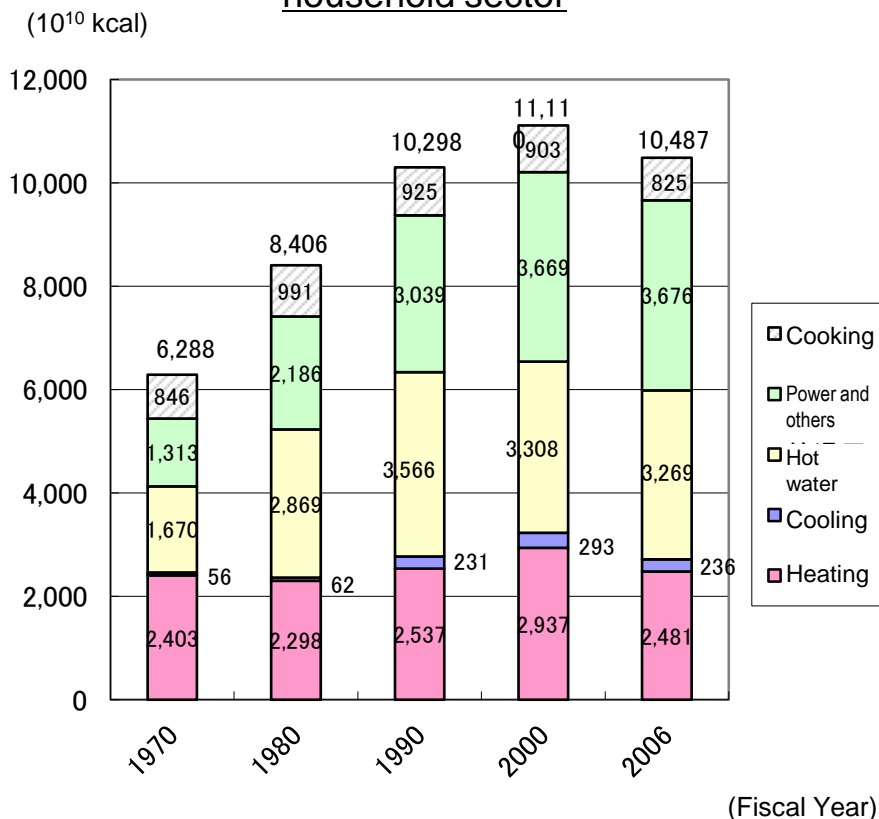
Source: Energy Balances in Japan (Processed Statistics), Annual Report on National Accounts of Japan

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.

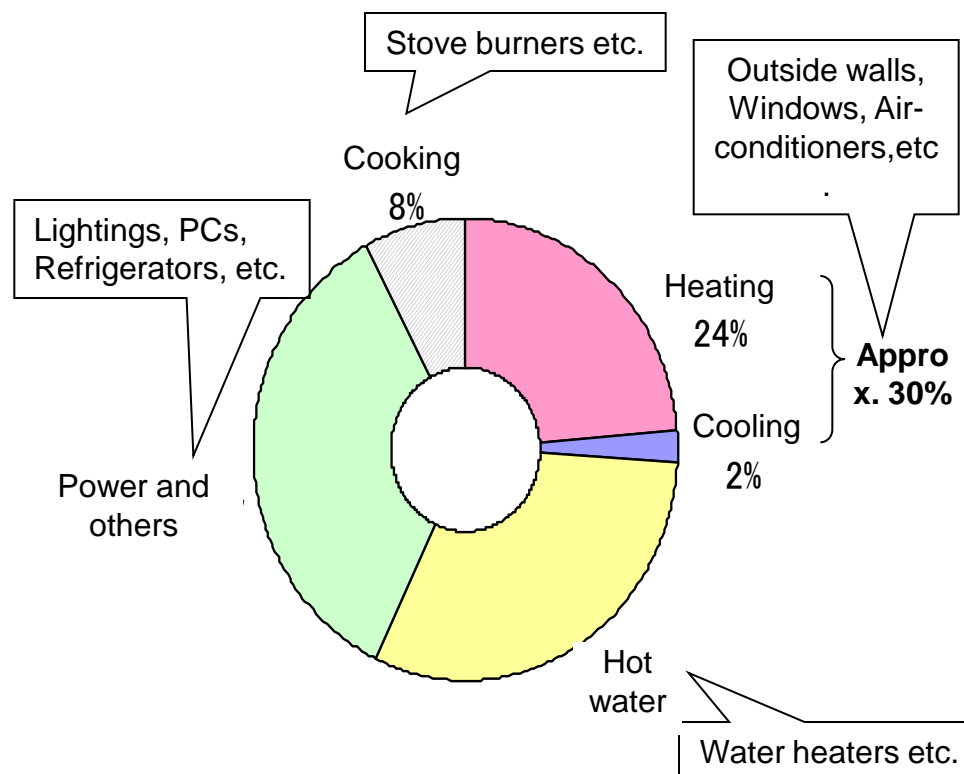
Energy Consumption in the Household Sector

- The energy consumption by household tends to greatly increase.
- The energy consumption by electric home appliances tends to increase. That of cooling and heating is also likely to increase, accounting for approx. 30%.

Transition of energy consumption in the household sector



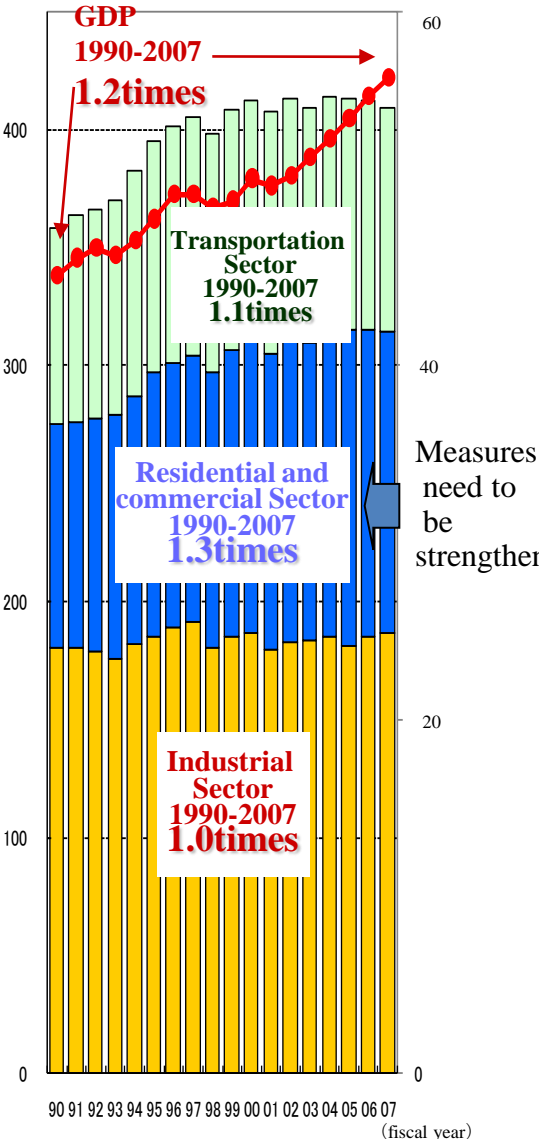
Energy consumption in the household sector (FY2006)



(Source) Made by ANRE based on Total Energy Statistics and the Handbook of Energy & Economy Statistics in Japan (2008 edition)

Overview of Japan's energy efficiency policy

Energy consumption (million kl)
GDP (billion yen)



Regulation

- Energy management obligation by Energy Conservation Law
 - Factories/Business establishment
 - Transportation
- Residence and Buildings
 - Energy Efficiency standard
 - Report of Energy Efficiency action
- Top Runner Program

Voluntary action

- Promotion of Nippon Keidanren's Voluntary Action Plan

Incentive

- Promotion of high fuel economy vehicles (clean energy vehicles)
- Subsidies for promoting energy efficient facilities (high-efficient building, high-performance industrial furnace etc.)
- Energy-saving labeling, Forum for Promoting energy efficient home electric appliances, etc.
- Tax incentive for energy efficient reform of residence, Low-interest loan

Cross Sectoral approach

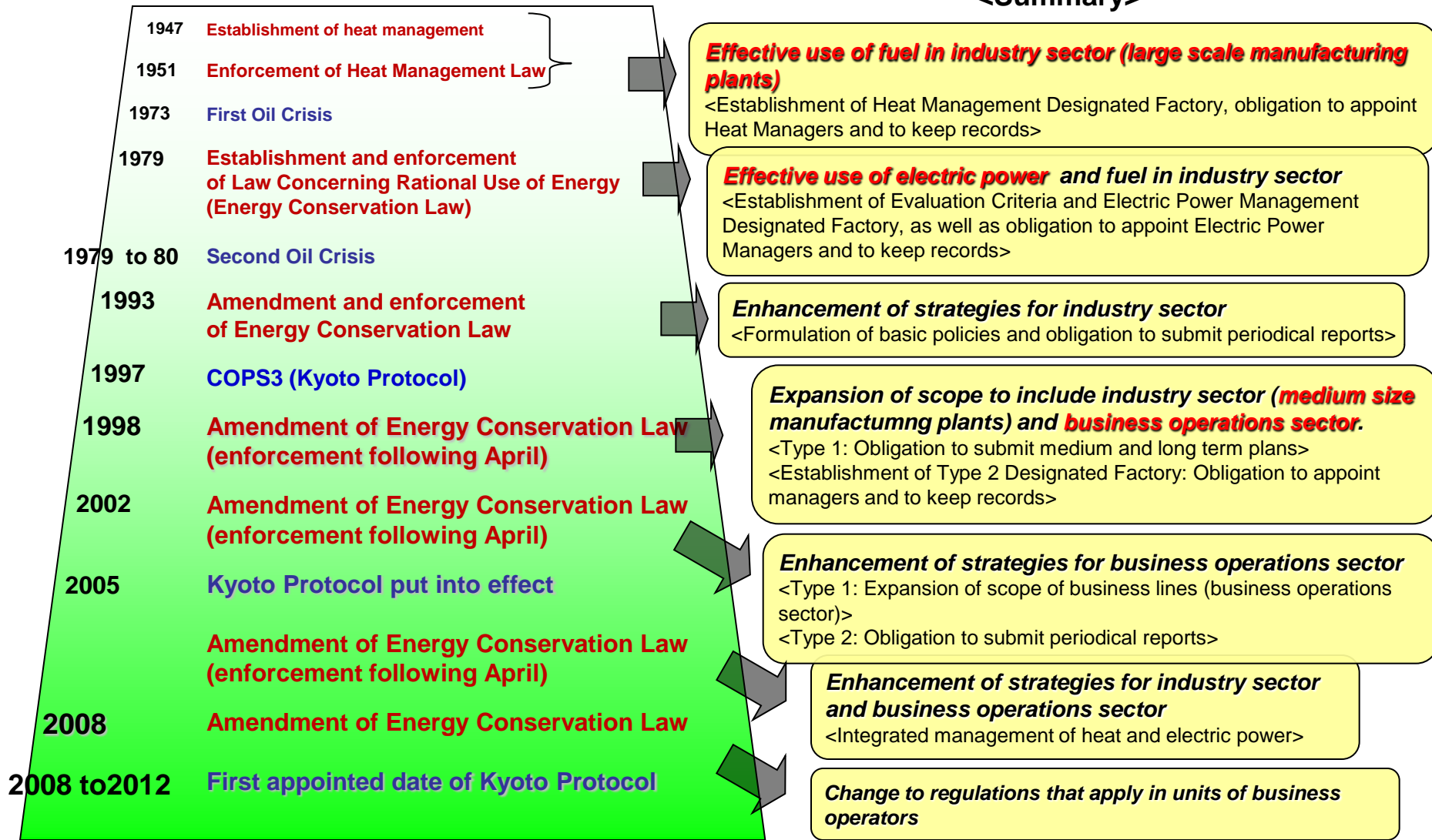
- Providing information and promotion of national movement
- Promotion of energy efficiency technological development
- Promoting international cooperation

Chronicle of Energy Conservation Law

- Japan has been leading the world in implementing energy conservation strategies against backdrop of rising petroleum prices such as oil shocks and intensification of global competition.

<Changes undergone by energy conservation strategies: 60 years history of energy conservation in Japan>

<Summary>



Overview of the Energy Conservation Law

Factories/Business Establishments

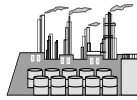
Specified business organizations

Energy management is made obligatory for organizations that are using more than prescribed energy in factories, etc.

Franchise chains are viewed as business organizations and the same regulations are introduced for them.

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- Obligation to appoint energy management supervisors.
- Obligation to submit mid-term and long-term plans.
- Periodic report of the state of energy use.



Transportation

○ Specific transport business organizations

(Freight, passengers)

(Number of cars owned: 200 trucks or more, 300 trains or more)

- Obligation to submit mid-term and long-term plans
- Obligation to periodically report the state of energy use

○ Specific cargo owners

(Transport volume a year, 30 million ton kilo or more)

- Obligation to submit plans
- Obligation to periodically report the state of energy used for consigned transport

Residences and Buildings

○ Specific buildings

(Total floor area, 2,000m² or more)

- Obligation of construction owners who build or reform specific buildings to report energy conservation measures to administrative bodies

- Obligation to report the state of periodic maintenance



Measures for Machinery and Equipment

Top runner program

- Energy conservation criteria for passenger cars, air conditioners, TV, etc. From among the products currently available in the market, the product the energy conservation efficiency of which is the best in the same product category is selected, and other products in the same product category are asked to make their performance the same as or better than the product thus selected.

Provision of Information

- Announcement of energy conservation products introduced by electricity and gas companies, and announcement of activities, including implementation and achievement, to provide information
- Provision of understandable energy conservation information (yearly energy consumption, fuel efficiency, etc) by retail stores of home electric appliances, etc.

Regulations Related to Energy Conservation Performance of Residences/Buildings

<Before FY2008 Revision>

Those who are planning to construct large-sized (**2000m² or above**) residences/buildings **must submit notification** concerning relevant energy conservation measures etc.

Revision

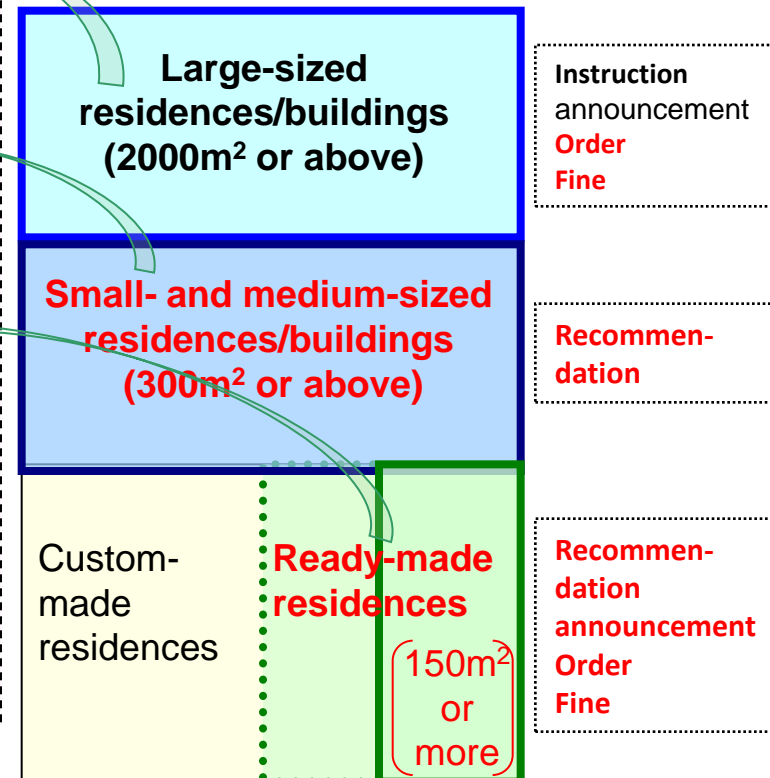
<After FY2008 Revision>

- ① **Orders and fines are introduced** for large-sized (2000m² or more) residences/buildings
- ② **To include** small- and medium-sized (**300m² or above**) residences/buildings for the regulation
- ③ Introduction of "**Top Runner Standards for residences**" ※
→ Applicable to new **residences** sold by business operators engaged in supplying residences (**housing manufacturers** etc.)
※ About 20-30% less than other residence standards
- ④ Promotion of **labeling of energy conservation performance** of residences/buildings

※② was enforced in April, 2010 while others were enforced in April, 2009.

※The aim is to ensure effectiveness in combination with the Building Standards Act.

<Framework of the revised Energy Conservation Law>



※ FY2010 revisions shown in red

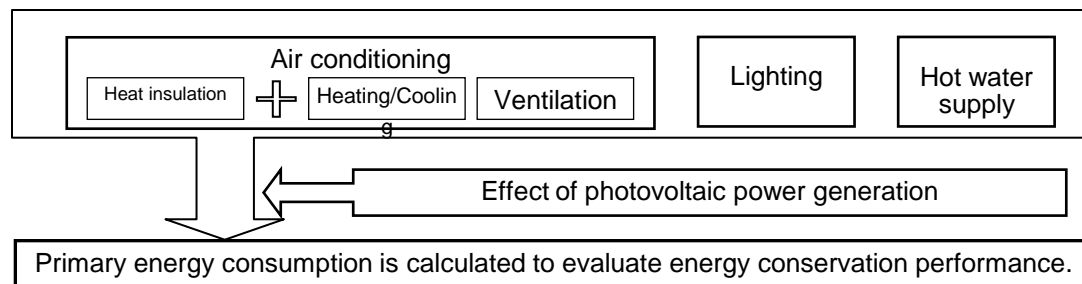
Top Runner Standards for residences

- Standards to evaluate the energy conservation performance of new specified residences (ready-made residences) constructed by construction clients engaged in the construction of residences on a regular basis (residential construction clients) (Enforced on April 1, 2009)
- These standards focus on the primary energy consumption of a whole residence as comprehensive evaluation is made including on heat insulation performance (※1) and the efficiency of air conditioning, hot water supply, photovoltaic power generation and other housing equipment.
- The standards require a residential construction client constructing 150 or more ready-made residences per year that the average primary energy consumption of new residences that the client supplies in a year be below the standard primary energy consumption (※2). The target fiscal year is FY2013.

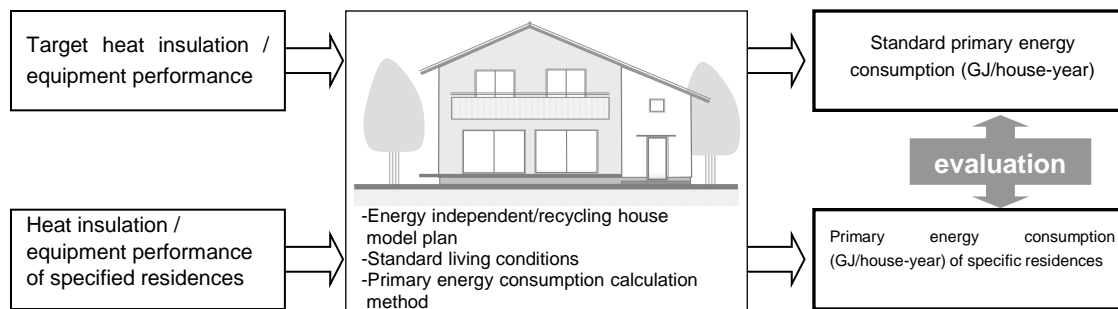
(※1) Clients must make efforts to comply with the current FY1999 energy conservation standards of judgment.

(※2) This is roughly 10% less than the primary energy consumption of a residence that meets the 1999 heat insulation performance standards and is equipped with facilities with the ordinary performance levels of 2010.

【Items included in the calculation of primary energy consumption】



【Concepts for the calculation of primary energy consumption】



■ Eligible eco-points recipient

Eco-points are applicable to those houses that are completed and delivered to the owners on and after the day the supplementary budget is approved. (With regard to new eco houses, only those on which construction started on and after December 8, 2009, are eligible.)

① Eco reform

- Window modification for better heat insulation (installation of inner window (for double sash), replacement of glass (for double glass))
- Installation of heat insulation material on outer wall, ceiling, or floor
- ※ Additional eco-points are issued when renovation for barrier-free features is made in addition to eco reform.

② New eco house

- New eco house meeting the Top Runner Standards (energy conservation standards + added performance (high-efficiency water heater etc.)) under the Energy Conservation Law.
- Wooden house (meeting the energy conservation standards)

■ Eco-points can be exchanged for various items.

○ Eco-points gained through purchases of home electrical appliances

- Gift certificates and prepaid cards (for environmental fundraising and other environment-related drives, for using public transportation)
- Items that contribute to regional development (local gift certificates, local merchandise)
- Goods that are highly energy-saving and environmentally friendly, etc.

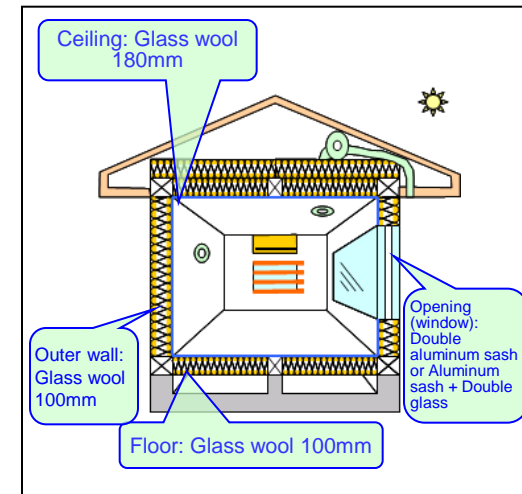
※ To meet the needs to exchange eco-points gained through eco renovation that can be much higher than when normally gained through purchases of home electrical appliances, the list of exchangeable items will be expanded.



Double sash



Double glass



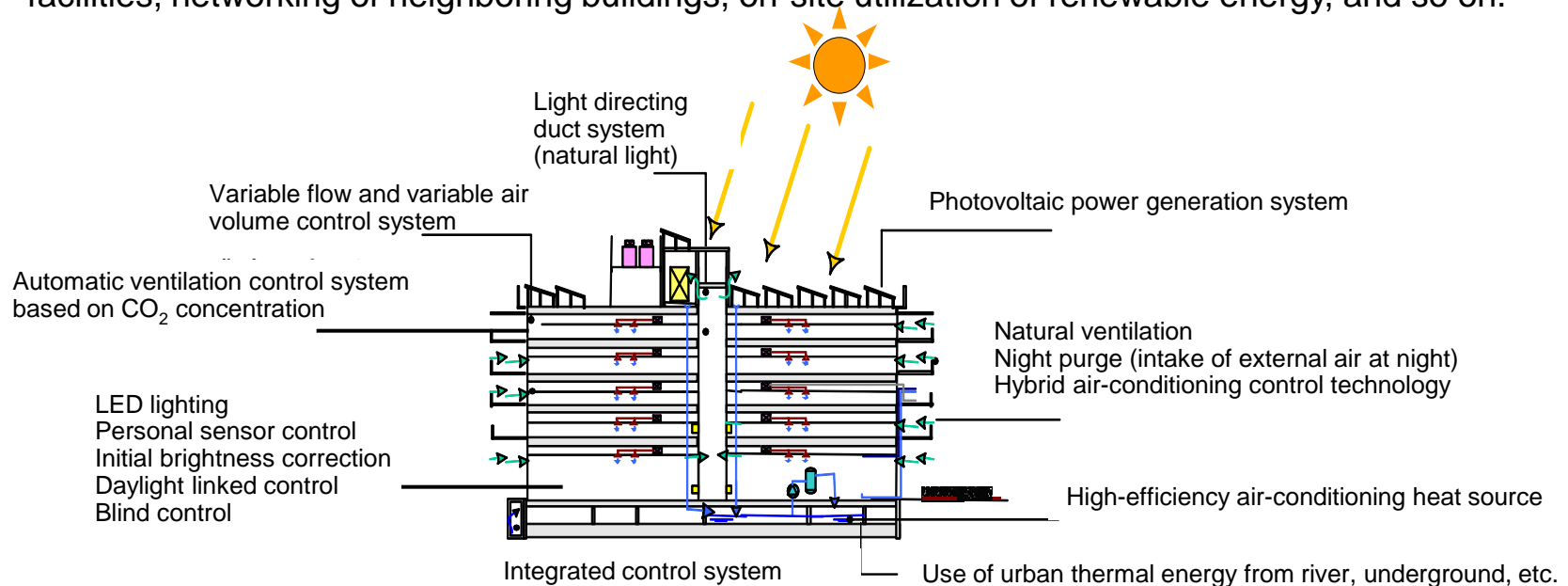
Example of a house meeting the energy conservation standards (wooden house in Tokyo)

Committee on Realization and Dissemination of ZEB

- Potential for improving energy efficiency is high in the commercial sector. The International Energy Agency (IEA) recommended acceleration of the “Net-Zero Energy Buildings” (ZEB) at the G8 Hokkaido Toyako Summit. In April 2009, Japan determined to accelerate ZEB development with a view to making newly constructed public buildings ZEB by 2030.
- In order to examine the roadmap to realization and dissemination of the “Net-Zero Energy Buildings (ZEB),” a “Committee on Realization and Dissemination of ZEB” (chaired by Prof. Yuzo Sakamoto, the School of Engineering, the University of Tokyo) has been held after May 2009 (8 times in total). The committee members also visited Europe and the United States to understand their policies and technological trends of ZEB.

[Definition of ZEB]

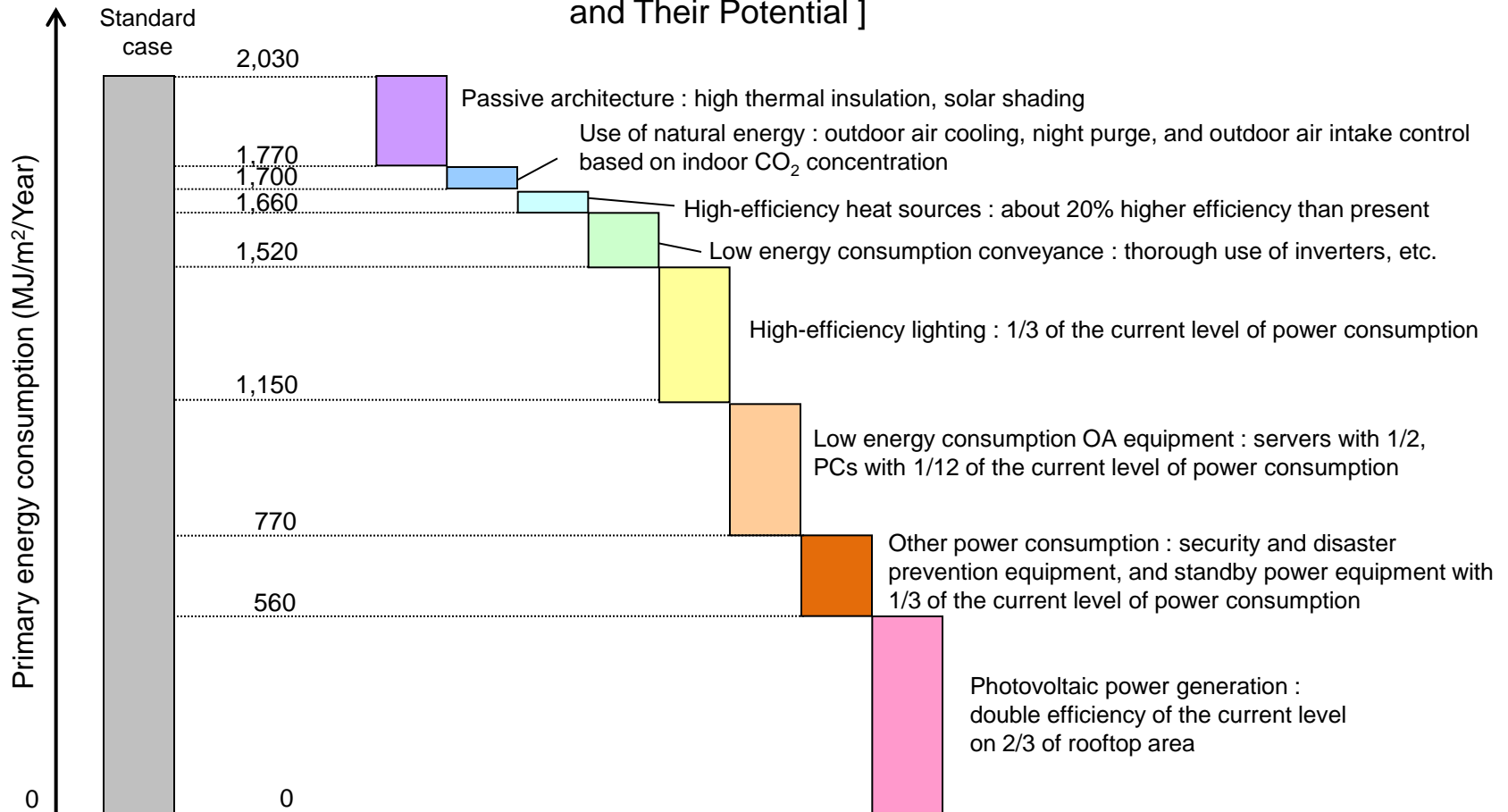
A building that consumes zero or nearly zero energy on an annual net basis by reducing primary energy consumption in the building through enhanced energy efficiency performance of the building envelop and facilities, networking of neighboring buildings, on-site utilization of renewable energy, and so on.



ZEB is Achievable

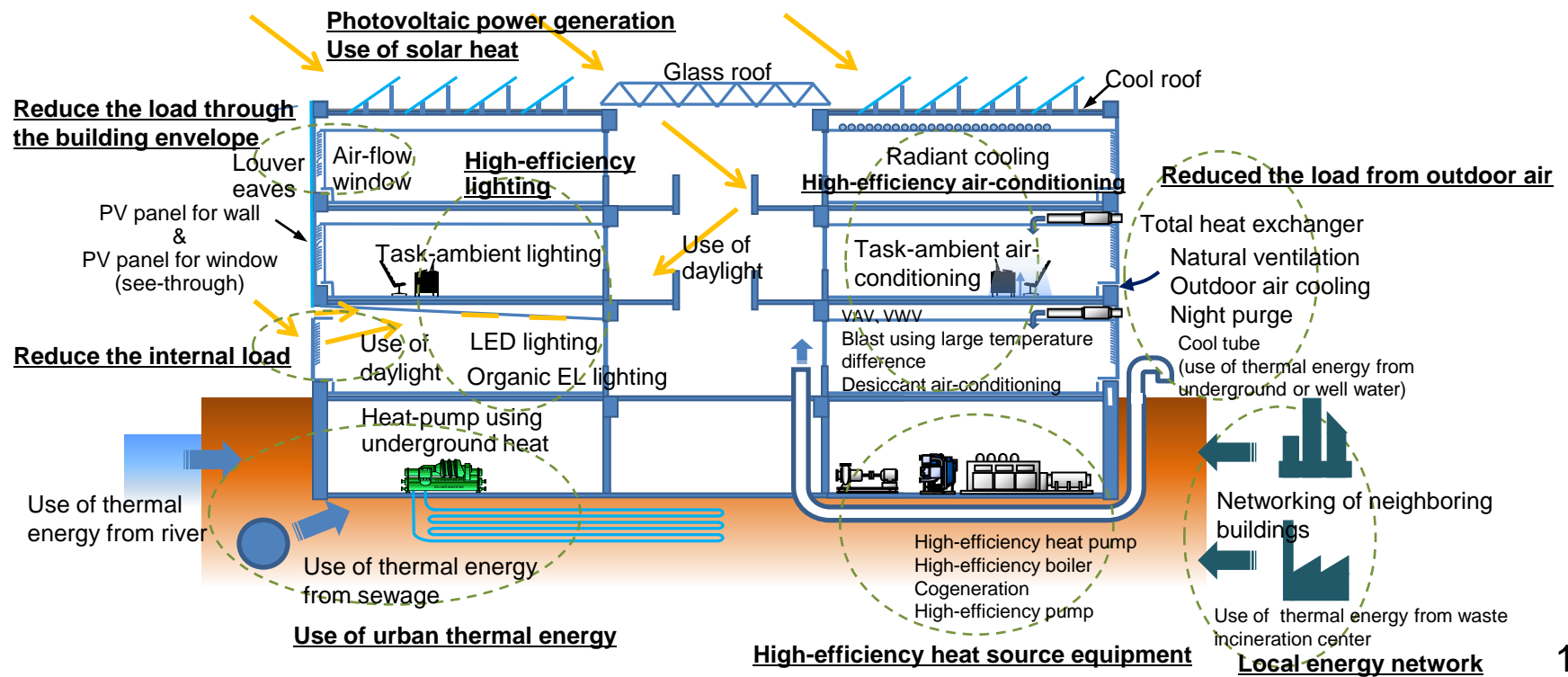
- ZEB is achievable for medium- and low-rise office buildings if the prospect of technological advance up to 2030 is taken into account.
- Although only 3-story or lower buildings will achieve ZEB, 10-story buildings can also reduce energy consumption by about 80% from the current level.
- Potential for ZEB will further increase by networking neighboring buildings and using solar panels for façade, etc.

[Various Energy Efficiency Technologies for ZEB and Their Potential]



Major Challenges for Achieving ZEB

- Total system architecture including operations: Design various energy efficiency architectural technologies in a comprehensive manner and integrate them at an operational stage.
 - [Examples] - Optimum introduction of passive architecture
 - Optimum integrated control of blinds, lighting, and air-conditioning
 - Lighting, air-conditioning, and OA equipment control utilizing security information
 - Task and Ambient lighting and air-conditioning
- Networking of neighboring buildings: Effective utilization of energy through networking multiple buildings
- Use of urban thermal energy: Utilization of thermal energy of rivers and sewage for heat pumps
- Tenant buildings: Response to an incentive split between owners and tenants, necessity to enable tenants' energy efficiency efforts (difficulty in revolutionary energy efficiency design, compared with company-owned buildings)
- Standardization: Standardized interfaces and data specification among facilities and devices to enable integrated control



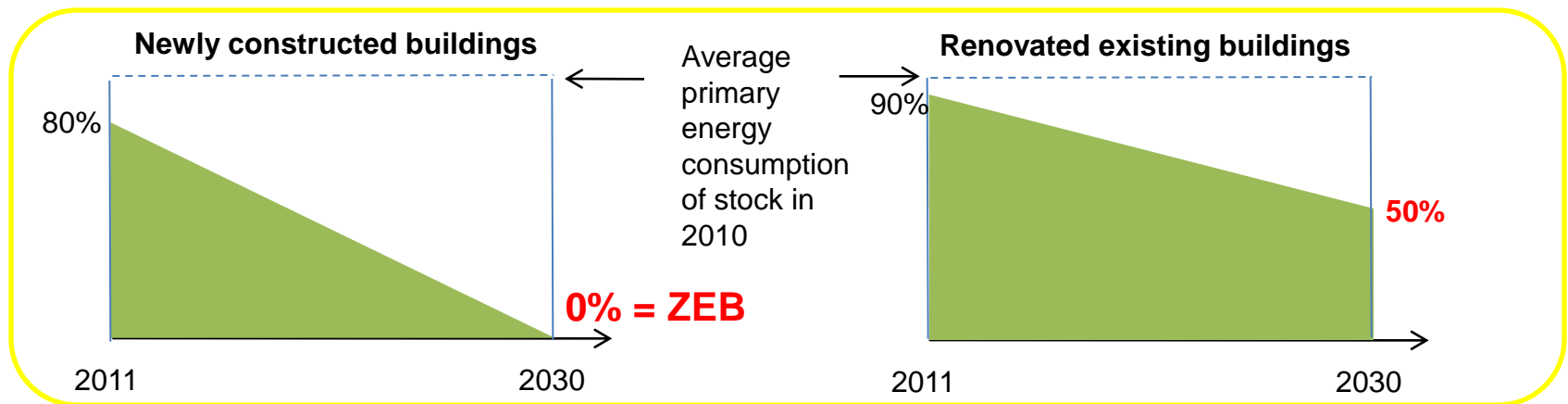
New Vision and Energy Efficiency Potential for ZEB Realization in 2030

- In view of a new mid-term target of reducing greenhouse gases by 25% from the 1990 level by 2020 and the technological possibility of ZEB realization, we should come up with a more ambitious vision for ZEB realization, switching from limited ZEB realization of newly constructed public buildings formulated in April 2009 to “ZEB realization of newly constructed buildings as a whole by 2030”.
- When this vision is materialized and the existing buildings are renovated to greatly increase energy efficiency, primary energy consumption in the commercial sector will be approximately halved in 2030.
- Required additional investment will be about \$ 9 billion a year. Energy cost reduction thereof is expected to considerably exceed the additional investment (\$180 billion (\$9 billion x 20 years)). Pay-back period will be about 8 years.

[Premises for Estimation]

- ZEB realization of newly constructed buildings as a whole by 2030 and 50% energy efficiency improvement by renovation of existing buildings.

* Primary energy consumption of newly constructed and renovated buildings in 2011 is assumed to be 80% and 90% of the average of all existing buildings, respectively.



- Out of the total floor areas of the commercial buildings in Japan, 2.5% is of newly constructed buildings and another 2.5% is to be renovated every year.*
- * It is assumed that the average life-time of buildings is 40 years, and that the existing buildings are renovated on a large scale every 20 years.
- Both newly constructed and renovated existing buildings will improve energy intensity by 1% every year because of energy efficiency efforts in operations.

Measures for Realization and Dissemination of ZEB (1)

- To promote market transformation for realization and dissemination of ZEB, it is essential to carry forward 1) regulations, 2) supportive measures and 3) information dissemination to and enlightenment of the society in a balanced manner.
- It is required to accelerate three innovations in 1) institutional, 2) technological and 3) working style aspects.
- Achievement of ZEB should be considered as an opportunity to enhance our industrial competitiveness.

1) Regulations

- Strengthen the current standards for the buildings in the Energy Efficiency Act. (formulated in 1999 and almost all of newly constructed buildings now achieve them)
- Evaluate energy consumption of the entire building in a comprehensive manner in the regulation.
Inclusion of power consumption of the OA equipment, lighting, etc., and making the energy efficiency standards mandatory are also envisaged in the future.
- Define the milestone on to what extent and when the energy efficiency standards will be strengthened toward ZEB in the future.
- Set benchmarks to determine the operational performances, and promote tenants' moving into more energy-efficient buildings.

2) Supportive measures

- Enhance tax incentives, budgetary supports.
- Support technological innovation.

3) Information dissemination to and enlightenment of the society

- Develop a labeling system for evaluating energy efficiency performance of the buildings

(In order to “visualize” performance and reflect it to real estate values)

- Promote “Eco Offices”, change working styles, and improve public awareness of energy efficiency.

Develop “ecological workplaces” across the nation.



(Intellectual lighting system with LEDs)



(Outdoor office)

[KOKUYO Eco Live Office Shinagawa]

Promotion of ZEHs and ZEBs (Residential & Commercial sectors)

Future visions

【House】

- Making **net-Zero-Energy Houses (ZEH) available by 2020**. Energy efficiency renovation of existing houses will double.
- Realizing **ZEHs in new average houses by 2030**.

【Building】

- Realizing **net-Zero-Energy Buildings (ZEB) in new public buildings by 2020**.
- Realizing **ZEBs in new average buildings by 2030**.

Basic strategies

- **Setting compulsory energy efficiency standards for houses and compiling compulsory standardization targets, time frame and support measures by the end of 2010 under the cooperation with the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)**

【House】

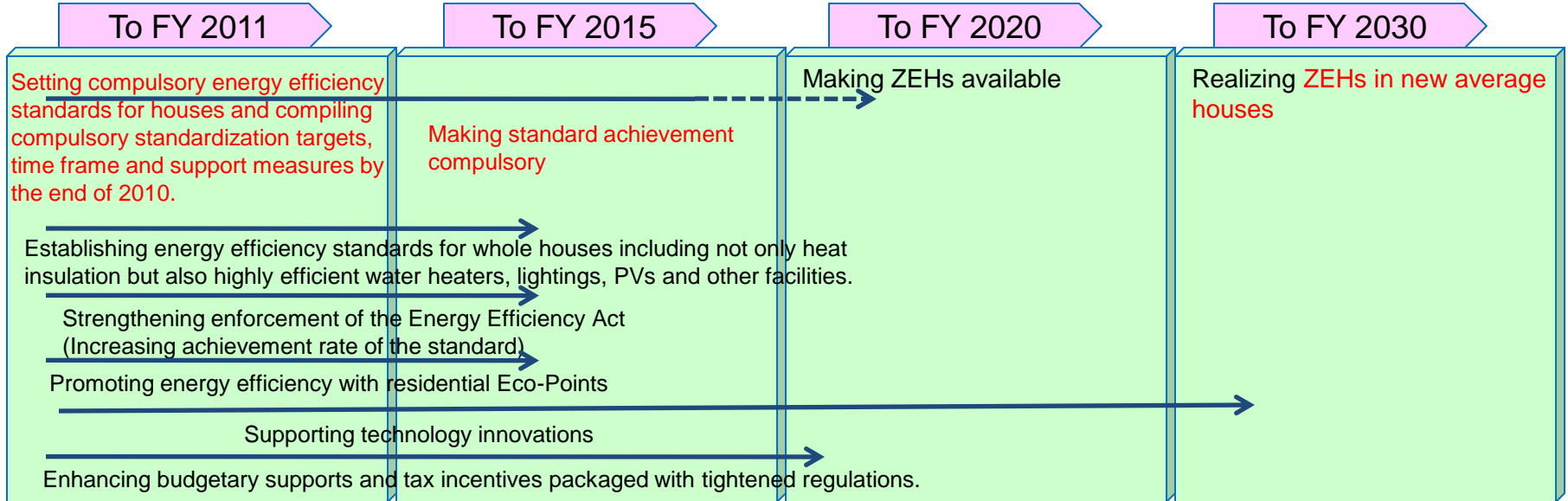
- Strengthening enforcement of regulations at the moment and **increasing achievement rate of the standard 1999 for new residential housing**.
- Establishing **energy efficiency standards for whole houses** including not only heat insulation but also highly efficient water heaters, lightings, PVs and other facilities.
- Enhancing budgetary supports and tax incentives packaged with above tightened regulations.

【Building】

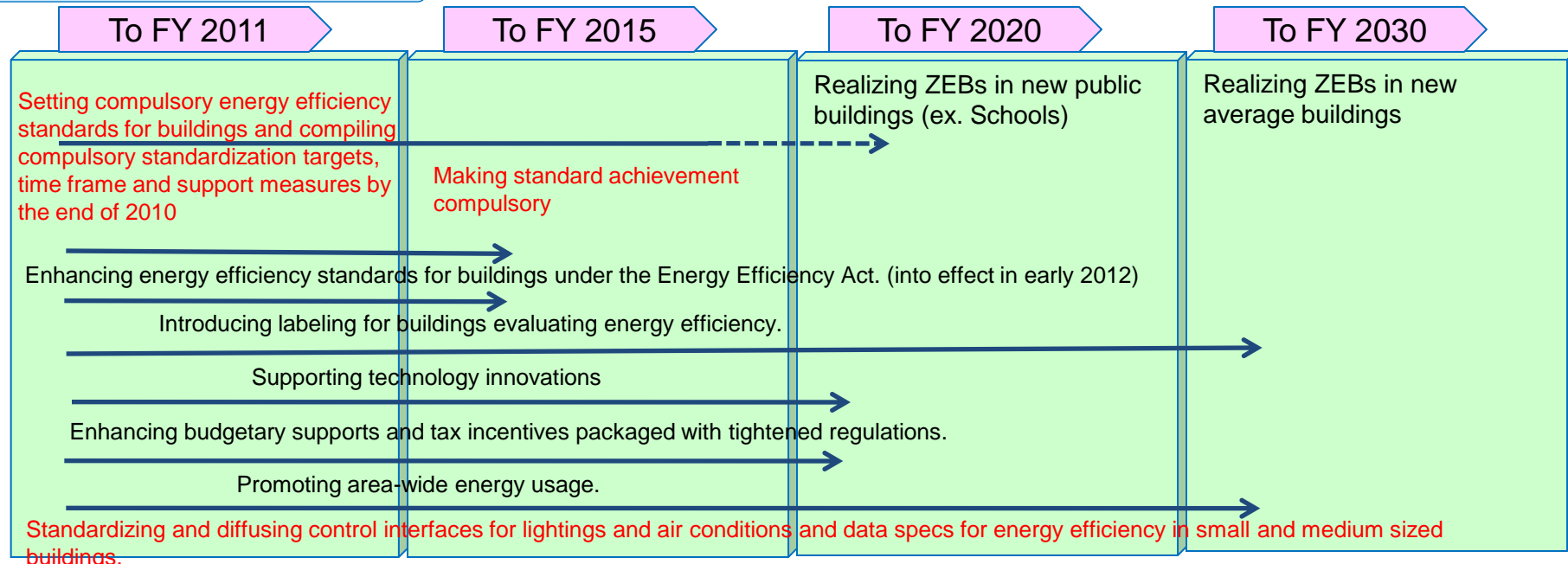
- **Introducing new integrated standards for energy consumption at whole buildings for implementation in two years**.
- Introducing labeling for buildings evaluating energy efficiency to visualize energy efficiency of buildings and reflect it in value of real estates.
- Enhancing budgetary supports and tax incentives packaged with above tightened regulations.
- Standardizing and diffusing control interfaces for lightings and air conditions and data specifications for energy efficiency in small and medium sized buildings.

Action Plan for ZEHs and ZEBs

Action Plan for ZEHs



Action Plan for ZEBs



Measures and Activities on Cool Roof Paints (1)

1. Law on Promoting Green Purchasing

(Law Concerning the Promotion of Procurement of Eco-friendly Goods and Services by the State and Other Entities)

➤ High solar reflectance paints were listed in Public Works Materials in Basic Policy on Promoting Green Purchasing in February 2010.

■ Evaluation Criteria

The solar reflectance in the near infrared rays region must be 40.0% or more when brightness L* value is 40.0 or less. Solar reflectance (%) in the near infrared rays region must be more than the value of brightness L* value when brightness L* value passes 40.0.

* 1) High solar reflectance paints in the evaluation criteria of this section are paints that contain pigments with high solar reflectance, and are necessary to be used for construction where metallic sides etc. are painted roofs/rooftops, etc of buildings.

2) The solar reflectance is calculated based on JIS K 5602.

Measures and Activities on Cool Roof Paints (2)

2. Pilot Programs for Inventing Cool City

- The “Pilot Programs for Inventing Cool City” launched in FY 2007 is a program that uses an integrated approach to combine multiple heat island countermeasures in the central districts of cities with notable heat island characteristics such as in Tokyo, Yokohama, Osaka, Nagoya, Fukuoka and Kita-Kyusyu.

3. Environmental Technology Verification Projects

- High solar reflectance paints were designated as a heat island countermeasure listed in six technology areas in the Environmental Technology Verification Projects launched in FY 2008.
- The verification projects issue a verification number and certification of “ETV” logo mark after verification.

Measures and Activities on Cool Roof Paints (3)

4. Standard in Japan

- Determination of reflectance of solar radiation by paints film; JIS K 5602 enacted in September 2008.
 - High solar reflectance paint for roof; JIS K 5675 enacted in July 2011.
- JIS: Japanese Industrial Standard

5. Advertisement of cool roof paints

- Cool roof paints were introduced as an effective solution on the electricity saving web site.
- Awareness/advertisement is essential for the dissemination of cool roof paints.

高日射反射率塗料(遮熱塗料)

高日射反射率塗料(若しくは遮熱塗料)とは、一般の塗料に比べ太陽光の近赤外波長域を高反射する塗料で、建物の屋根に塗装することにより、夏場のエアコン使用電力を一般の塗料を塗装した場合に比べ約7%削減が可能となります。(明度N6.0近似グレー色の場合)
以下に、国内で高日射反射率塗料を取り扱っている主なメーカーを紹介しますので、ご活用いただければ幸いです。

施工前 → 施工後(例)

熱に変化する太陽光(赤外線)を反射

高日射反射率塗料

削減主要メーカー

企業名	URL	企業名	URL
アドニス(株)	http://www.adonis.co.jp/	東日本塗料(株)	http://www.tai-eit.co.jp/
エスケー化成(株)	http://www.ek-chem.co.jp/	ロックベイト(株)	http://www.rockbeite.com/rockbeite/
関西ペイント販売(株)	http://www.kansai-paint.com/kansai-paint/	大同塗料(株)	http://www.daito-paint.co.jp/
神東塗料(株)	http://www.kandokai.co.jp/	(株)アサヒペン	http://www.asahipen.jp/
大日本塗料(株)	http://www.dai-nippon-paint.co.jp/	信和化学工業(株)	http://www.f.k.k.chem.co.jp/
宇部塗料(株)	http://www.ube-paint.co.jp/	清水化学工業(株)	http://www.kishida-chem.co.jp/
(株)トウベ	http://www.tobe-paint.jp/	日立化成建材(株)	http://www.hitachi-chem.co.jp/
水谷ペイント(株)	http://www.mizutani-paint.co.jp/	スズカフアイン(株)	http://www.suzukafuain.co.jp/
(株)ニラクル	http://www.niraku.co.jp/	AGコーティング(株)	http://www.agcoating.co.jp/
日本特務塗料(株)	http://www.nippon-tokuhomu.co.jp/	ムライケニスバルビヤク(株)	http://www.murayakenis.com/
日本ペイント販売(株)	http://www.nippon-paint.com/nippon-paint/	(株)日本塗料工業会	http://www.nippon-paint.com/

削減率(%)

7%減

高日射反射率塗料(遮熱塗料) 削減電力(kWh)

一般塗料(遮熱塗料) 削減電力(kWh)

資料:(株)日本塗料工業会 <http://www.nippon-paint.co.jp/>

http://seikatsu.setsuden.go.jp/docs/company_product/01.pdf

Measures and Activities on Cool Roof Paints (4)

◆ Future Activities

➤ Awareness/advertisement of cool roof paints

Cool Roof Paints are still one of the energy environmental technologies options available in building. More active awareness/advertisement is needed for the improvement of the use of cool roof paints both domestically and internationally.

➤ International Cooperation

Also needed is international cooperation, such as capacity building, cooperative deployment and demonstrations as well as making an international standard of cool roof paints.

Thank you for your Attention!