Policy and Strategy in Japan towards ZEB Realization

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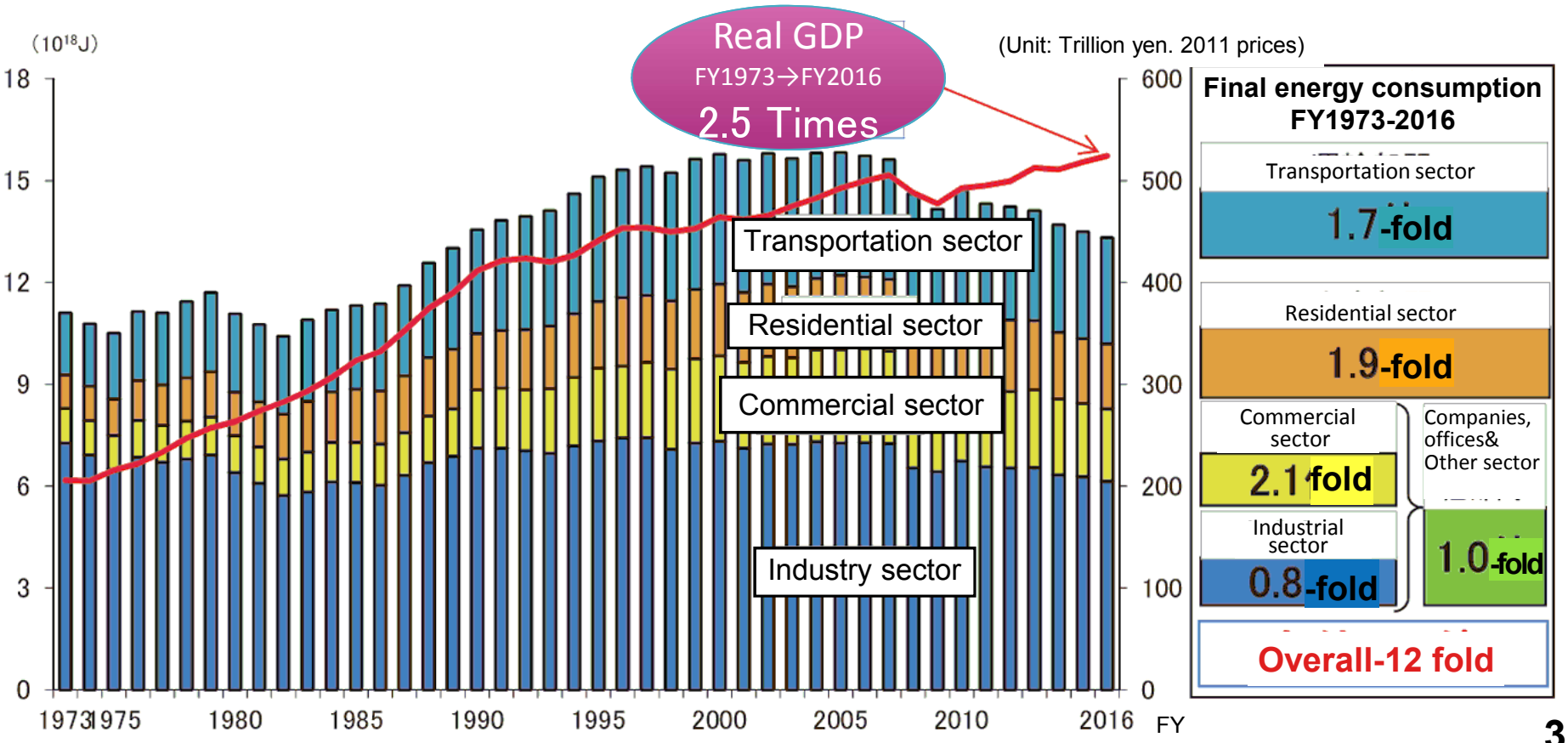
1.1 Trends in Final Energy Consumption in Japan

- The final energy consumption of Japan has consistently increased, except for periods immediately following the two oil crises and the recent economic downturn.
- Until 2016 the GDP continued increasing to about 2.5 times the 1973 level and the consumption of energy for individual sectors significantly increased with the Consumer sector increasing to **about 2 times**, while the transportation sector increased to **about 1.7 times**, whereas the industrial sector decreased to **about 0.8 times**.

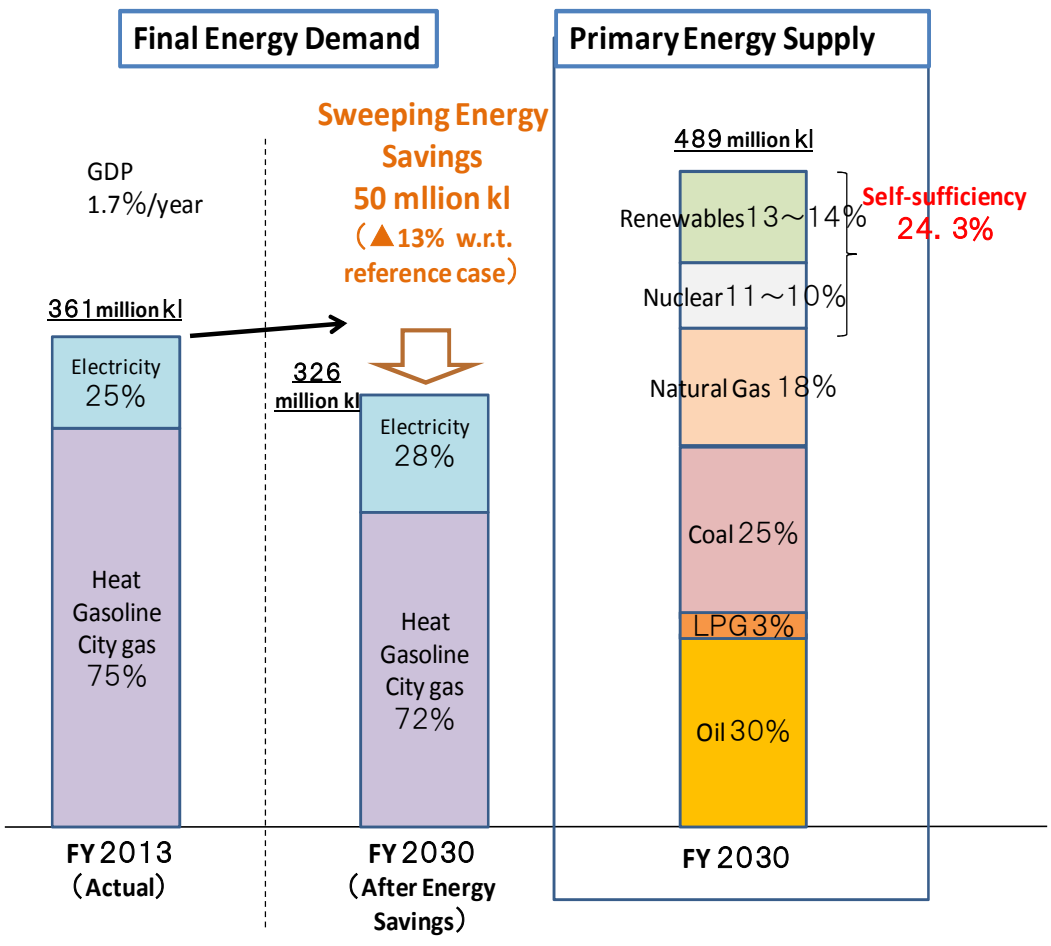


Source: METI Website

1.2 Energy Supply/Demand Structure toward CO_2 Emissions Reduction Target in 2030

- While energy demand growth is projected in line with economic growth (**an average 1.7%**), energy efficiency is expected to improve as much as after the oil crises thorough energy conservation (**35% in 20 years**).
- **Energy supply/demand structure improvement** (energy self-sufficiency rate: 6% in 2014 ⇒**24.3%** in 2030)
- **Japan's CO_2 emissions reduction target**

  (**26% CO_2 emissions reduction** in 2030 compared with 2013 level)



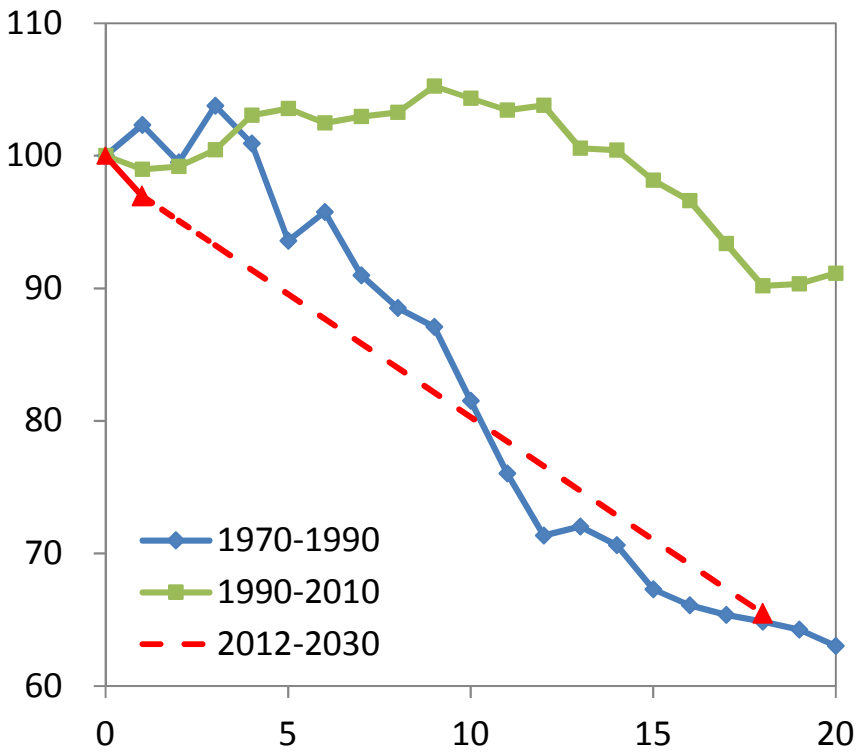
- Long term Target: 80% CO_2 emission reduction in 2050

(Source) METI "Long-term Energy Supply/Demand Outlook" p.5 (July 16, 2015)

1.3 Need for Further Improvement of Energy Efficiency

- Thorough energy conservation measures could save final energy demand by 13% to 326 million kl.
- Energy conservation measures would be accumulated to improve energy efficiency as much as just after the oil crises.

【Improvement in Energy Intensity】



(Source) METI "Long-term Energy Supply/Demand Outlook" p.5 (July 16, 2015)

1.4 "Energy Innovation Strategy" by METI in 2016

Thorough Energy Efficiency & Conservation

(Target to 2030) EE&C :Energy intensity improve: ▲35%

Building & Residence Sectors

<Design>

- **Promotion of introduction of energy saving equipment**
  - **Top Runner standard of lamps**
- **Promotion of EE&C on houses/buildings**
  - **Mandatory standards of BEC (for design)**
  - **Promote Zero Energy houses/buildings**
  - **Promote renovation for EE&C**

<Operation>

- **Expand EE&C Benchmark System**
  - **To distribution & service businesses**
  - **Strict benchmark standards**
- **Promote EE&C in S&M enterprises**
  - **Local consulting platform**
  - **EE&C mutual supporting system**
- **New evaluation system for business operator classification on EE&C**
  - **Develop the classification system**
  - **Create unused heat utilization system**

1.5 History of the Energy Conservation law and Standard for Buildings

1980 Establishment of building energy conservation standards (Second oil shock)
Initially, PAL, CEC/AC, and office applications were subject to the notification requirements.

1993 CEC/V, L, HW, and EV were added. Hospitals and schools also became subject to the notification requirements.

1998 Introduced Type 2 designated factories (buildings) in the EC Act.

2002 Notification of energy conservation measures (for new construction and extension and reconstruction) was made compulsory.
All buildings (2,000m^2 or greater), with the exception of residences, became subject to the regulations. (For large-scale renovations in 2006 and for buildings 300m^2 or larger in 2010)

The standards achievement rate was improved to 90% by making notification compulsory.

2002 Obligatory submission of periodical report for Type-2 Designated factories &buildings

2005 CASBEE for Buildings completed (CASBEE tools have been developed and revised until now)

2013 New Building EC Act for design (Introduced primary energy standards)

2015 Proposed "ZEB concept" and the project started

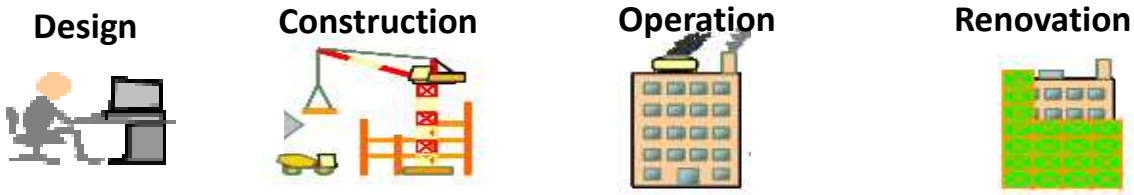
2016 Benchmarking system for buildings (convenient stores)

2017 Mandatory requirement standard for design

1.6 Overview of the Energy Conservation Law on Buildings

Obligation of the Building Owners under the Energy Conservation Law

Design | Construction | Operation | Renovation



For Design and Renovation (MLIT)

Buildings having total floor area 300 m^2 or larger

Before construction

- Compliance to EC standard specified in EC law (2000m^2 and more)
- Notification of energy saving measures to the competent authority (300m^2 and more)

Renovation

- Notification of energy saving measures to the competent authority before extensive renovation

For Operation (METI)

Specified Business Operator classified by annual energy consumption:
1500kL(oe) or more

Designated EM factory /building
Type 1: 3000kL(oe) or more
Type 2: 1500kL to 3000kL(oe)

- Energy management control officer & Energy management planning promoter to be selected.
- Energy managers(Type 1 or Type 2) to be selected for each designated energy management factory/building.
- Submission of medium and long-term plan and periodical report by each company.
- Compliace to EC Standard

Contents

2.1 Background of ZEB dissemination

- The current energy efficiency measures cannot achieve COP21 requirements for reduction of global warming gas in Japan.
- The current Japanese E. E. Law for buildings does not have enough power to achieve the target for reduction of GHG in building sector. Therefore, the following target has been set in order to promote and disseminate high level energy efficient buildings, “ZEB Ready” though the continuous efforts to realize (net)ZEB

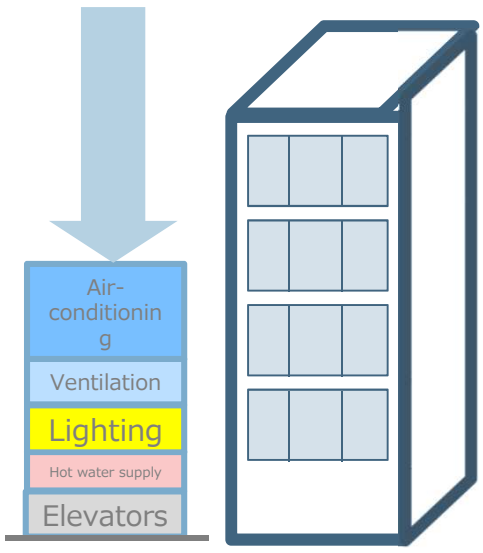
1. Realize ZEBs in newly constructed public buildings by 2020
2. Realize ZEBs in average newly constructed public and private buildings by 2030

2.2 “ZEB family” Concept

The concept of ZEB has been expanded to “ZEB series” according to actual conditions. First step is to aim for super low-energy buildings which are defined as “ZEB ready”, and then aim for “ Nearly ZEB” and “(net) ZEB”.

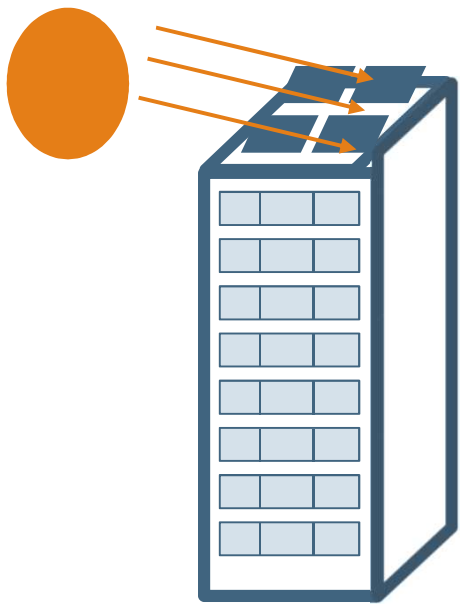
ZEB Ready

(Significant energy saving more than 50% from reference point)



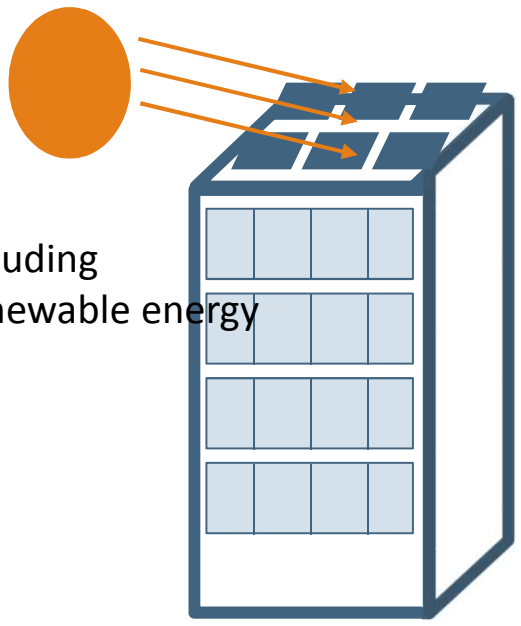
Nearly ZEB

(Net energy saving not reach 100% But more than ZEB Ready)



(net)ZEB

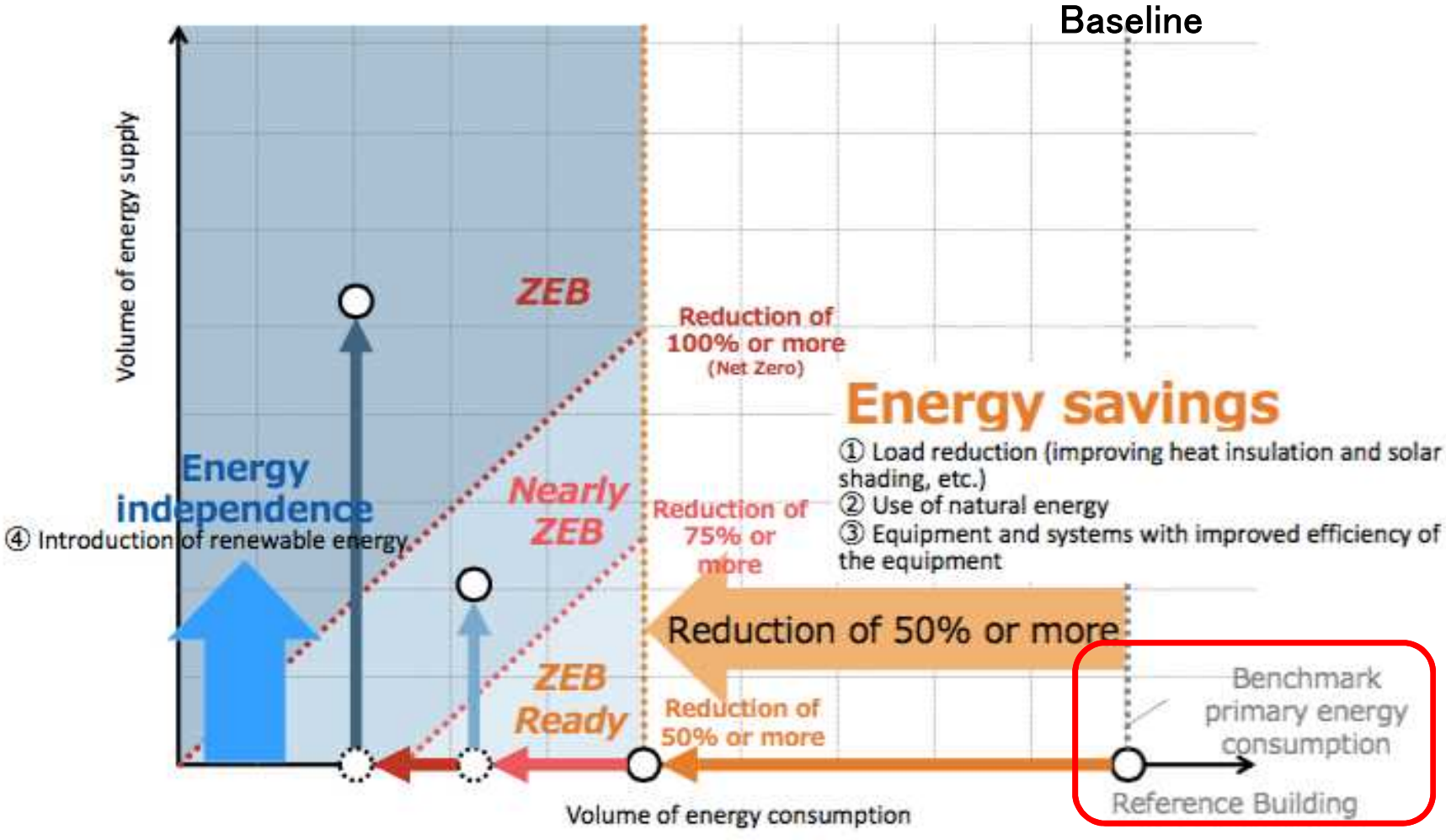
(Net energy saving of 100% or more)



Including Renewable energy

2.3 Definition and evaluation methods of ZEBs

The Building Energy Conservation Act specifies how to calculate the baseline to define ZEB Family Concept.



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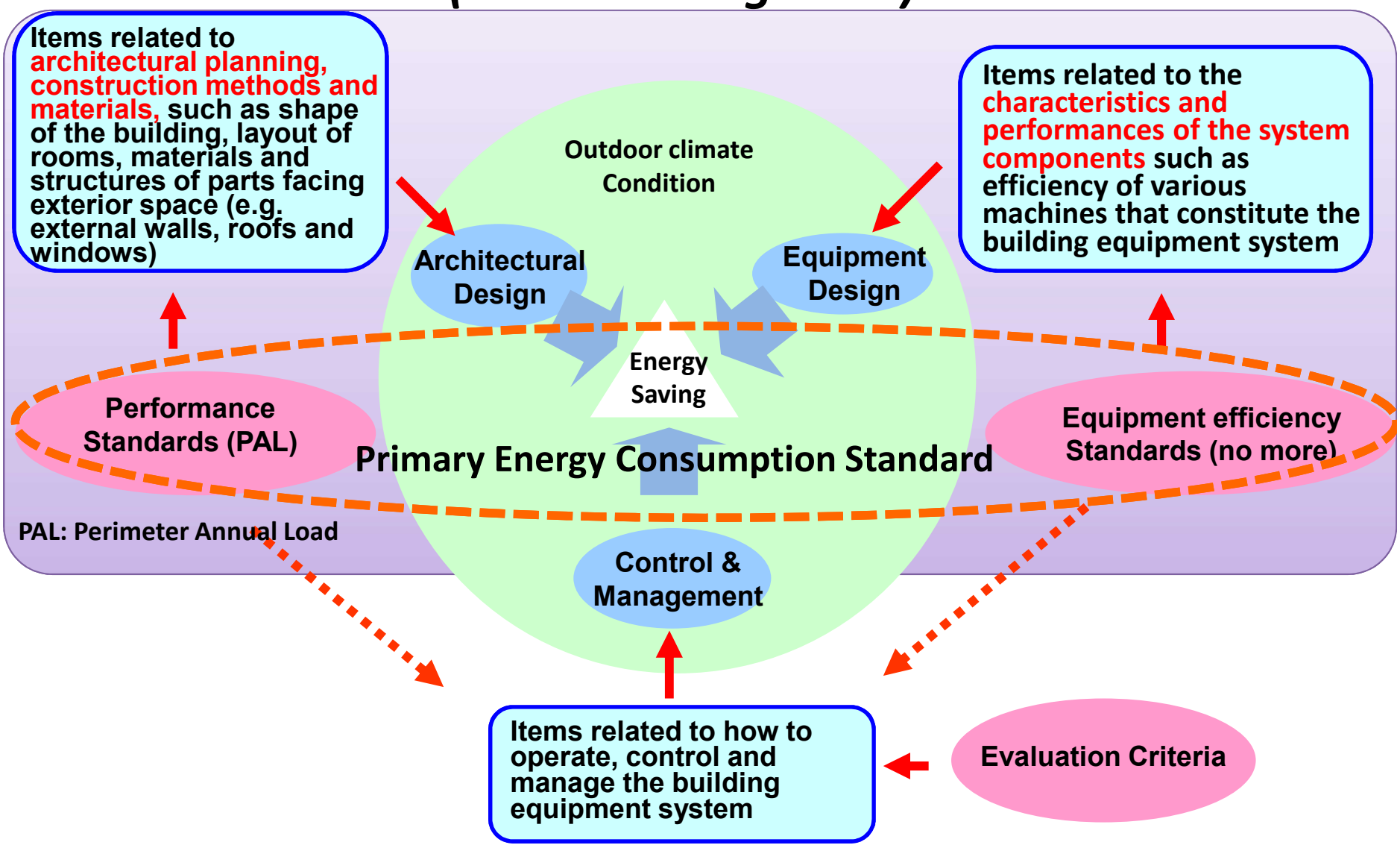
3.1 The Related Regulations on Buildings (New Building Code)



3.2 Approach of Primary Energy Regulations

What is Primary Energy Consumption?

- The energy obtained from nature, including fossil fuels, nuclear fuels, hydropower, and sunlight, is known as “primary energy”, while the energy (such as electricity, kerosene, and city gas) obtained by changing or processing this energy is called “secondary energy”. Each type of energy uses different measuring units (such as kWh, ℓ, and MJ).
- Converting these units to primary energy consumption amounts allows us to find the building total energy consumption in the same units (MJ and GJ).

Approach of Using Primary Energy Consumption Standards

- In buildings that are subject to the evaluations, based on the common conditions such as area categories and floor areas, the design primary energy consumption calculated from the actual building design specifications should basically be lower than the reference primary energy consumption calculated from the standard specifications (building envelope and standard facilities corresponding to the 1999 standards).
- The primary energy consumption is calculated as the total of the energy consumptions of the “Air Conditioning, Heating and Cooling Equipment”, “Ventilation Equipment”, “Lighting Equipment”, “Hot Water Supply Equipment”, “Elevators”, and “Office Equipment, Home Electric Cooking Appliances, etc.*”.

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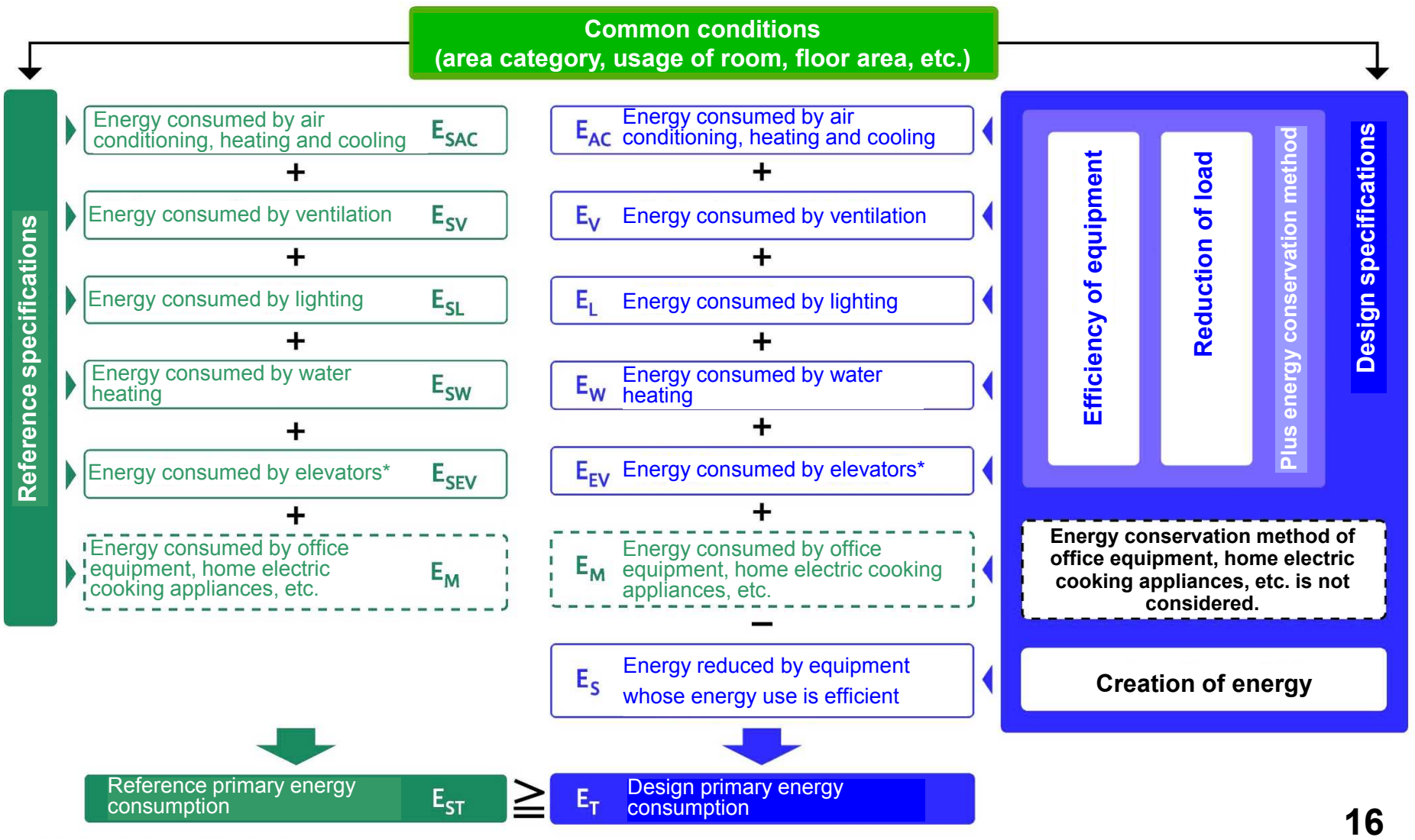
3.2 Approach of Primary Energy Regulations

Based on the following calculation methods, the design building primary energy consumption should be less than the standard values.

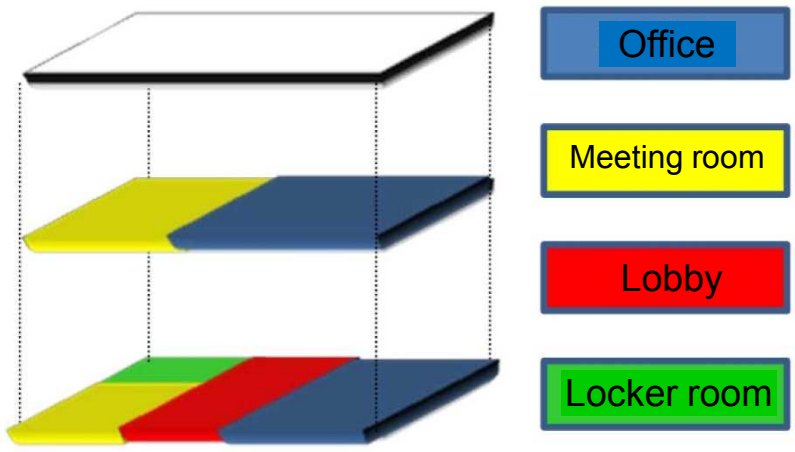


* The target is non-residential buildings and apartment residences.

3.3 Method of Calculating the Reference Primary Energy Consumption

(1) Room usages are classified and floor areas of each room usage are totaled.

<Building>



(2) The reference primary energy consumption of each piece of equipment is calculated by using the reference primary energy consumption of each room usage (example: air conditioning).

Room usage	Reference value of air conditioning (GJ/m²・year)	Floor area	Total of each room usage (GJ/year) (Reference value x Floor area)
Office	1.0	2,000	2,000
Meeting room	0.8	1,000	800
Lobby	0.9	500	450
Locker room	1.0	200	200
Total		3,700	3,450

Reference primary energy consumption of each piece of equipment (GJ/year) = All room usage $\sum$ (Reference primary energy consumption of each piece of equipment of each room usage (GJ/m²・year) × Area of each room (m²))

(3) The reference primary energy consumption of an entire building is calculated by totaling the reference primary energy consumption of each piece of equipment.

Reference primary energy consumption of entire building (GJ/year) = All equipment $\sum$ Reference primary energy consumption of each piece of equipment (GJ/year)

ECCJ The Energy Conservation Center Japan

3.3 Method of Calculating the Reference Primary Energy Consumption

In order to allow consideration of the differences in energy consumptions due to the configuration of the room usages, the reference primary energy consumption is set for approximately 200 room usages.

8 usages of building
Office, etc.
Hotel, etc.
Hospital, etc.
Shop, etc.
School, etc.
Restaurant, etc.
Meeting hall, etc.
Factory, etc.

Each usage is detailed to the level of room usages.

○ Office, etc. [Unit: MJ/m²・year]

Room usage	Equipment			
	Air conditioning	Ventilation	Lighting	Water heating
Office	872	0	498	16
Meeting hall	912	0	231	39
Locker room	780	138	202	768
....				
Central monitoring room	2,677	0	1,171	36

Approximately 200 room usage

○ Energy load is calculated based on time, etc. during which equipment is used found by examining each piece of equipment.

Equipment	Item
Air conditioning equipment	Yearly air conditioning time, lighting's heat generation, number of people in the room, equipment's heat generation, etc.
Ventilation equipment	Yearly ventilation time, number of ventilation, ventilation method, total pressure loss, etc.
Lighting equipment	Yearly lighting time, illumination setting, equipment type, maintenance ratio, etc.
Water heating equipment	Yearly water heating days, unit hot water use amount, etc.

Reference : Energy Consumption for Each Room Usage

MJ/m²・year

	Room usage	Air conditioning equipment Area category 1	2	3	4	5	6	7	8	Ventilation equipment	Lighting equipment
Offices, etc.	Office	892	863	895	925	974	1042	1071	1325	0	498
	Computer Office/Room	941	912	1067	1104	1195	1276	1300	1633	0	498
	Meeting hall	1003	965	928	952	979	1037	1072	1389	0	231
	Cafeteria	1003	965	928	952	979	1037	1072	1389	0	254
	Employees' Dining Room	409	387	367	375	378	413	423	537	0	141
	Central monitoring room	2257	2317	2822	2945	3172	3370	3551	4387	0	1171
	Locker room	808	771	799	826	852	903	928	1151	138	202
	Corridor	725	678	672	688	677	701	706	853	0	245
	Lobby	725	678	672	688	677	701	706	853	0	547
	Toilet	725	678	672	688	677	701	706	853	413	367
	Smoking Room	725	678	672	688	677	701	706	853	826	202
	Kitchen	0	0	0	0	0	0	0	0	3514	322
	Indoor Car Park	0	0	0	0	0	0	0	0	1366	123
	Machine Room	0	0	0	0	0	0	0	0	769	10
	Electric Room	0	0	0	0	0	0	0	0	1539	10
	Hot-Water Room, etc.	0	0	0	0	0	0	0	0	88	64
	Food Storehouse, etc.	0	0	0	0	0	0	0	0	176	70
	Photocopying Room, etc.	0	0	0	0	0	0	0	0	176	106
	Garbage Area, etc.	0	0	0	0	0	0	0	0	527	35

Reference: Area Categories in Japan depending on the climates

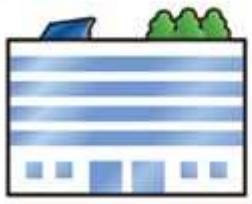
Area Category	Prefecture Name
1, 2	Hokkaido
3	Aomori, Iwate, Akita
4	Miyagi, Yamagata, Fukushima, Tochigi, Niigata, Nagano
5, 6	Ibaraki, Gunma, Saitama, Chiba, Tokyo, Kanagawa, Toyama, Ishikawa, Fukui, Yamanashi, Gifu, Shizuoka, Aichi, Mie, Shiga, Kyoto, Osaka, Hyogo, Nara, Wakayama, Tottori, Shimane, Okayama, Hiroshima, Yamaguchi, Tokushima, Kagawa, Ehime, Kochi, Fukuoka, Saga, Nagasaki, Kumamoto, Oita
7	Miyazaki, Kagoshima
8	Okinawa

3.5 Three Different Standards

The standards applied in the Building Energy Conservation Act are three-fold: energy consumption performance standards (energy efficiency standards), certification standards, and residential construction client standards.

● Energy Efficiency Standards

Mandatory Compliance/Evaluation of Compliance with Energy Efficiency Standards | Notification | Display of Certification of Conformity with Standards



● Non-residential buildings

◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes OA devices etc.)}}{\text{Standard value (excludes OA devices etc.)}} \leqq 1.0$

◎ Envelope performance Exempt from application

● Residential buildings

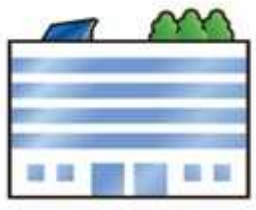
◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes home appliances etc.)}}{\text{Standard value (excludes home appliances etc.)}} \leqq 1.0$

◎ Envelope performance U_A Design value $\leqq$ Standard value
η_{AC} Design value $\leqq$ Standard value

3.5 Three Different Standards (2)

● Certification Standards

Certification of Performance Improvement Plans/Exception of Floor-Area Ratio Regulation



● Non-residential

◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes OA devices etc.)}}{\text{Standard value (excludes OA devices etc.)}} \leqq 0.8$

◎ Exterior PAL* $\dfrac{\text{Design value}}{\text{Standard value}} \leqq 1.0$

● Residential

◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes OA devices etc.)}}{\text{Standard value (excludes OA devices etc.)}} \leqq 0.9$

◎ Exterior U_A Design value $\leqq$ Standard value
η_{AC} Design value $\leqq$ Standard value

● Residential Construction Client Standards (tentative)

Housing Top-Runner Program

Up to 2019

◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes home appliances etc.)}}{\text{Standard value (excludes home appliances etc.)}} \leqq 0.9$

◎ Exterior Exempt from application

From 2020

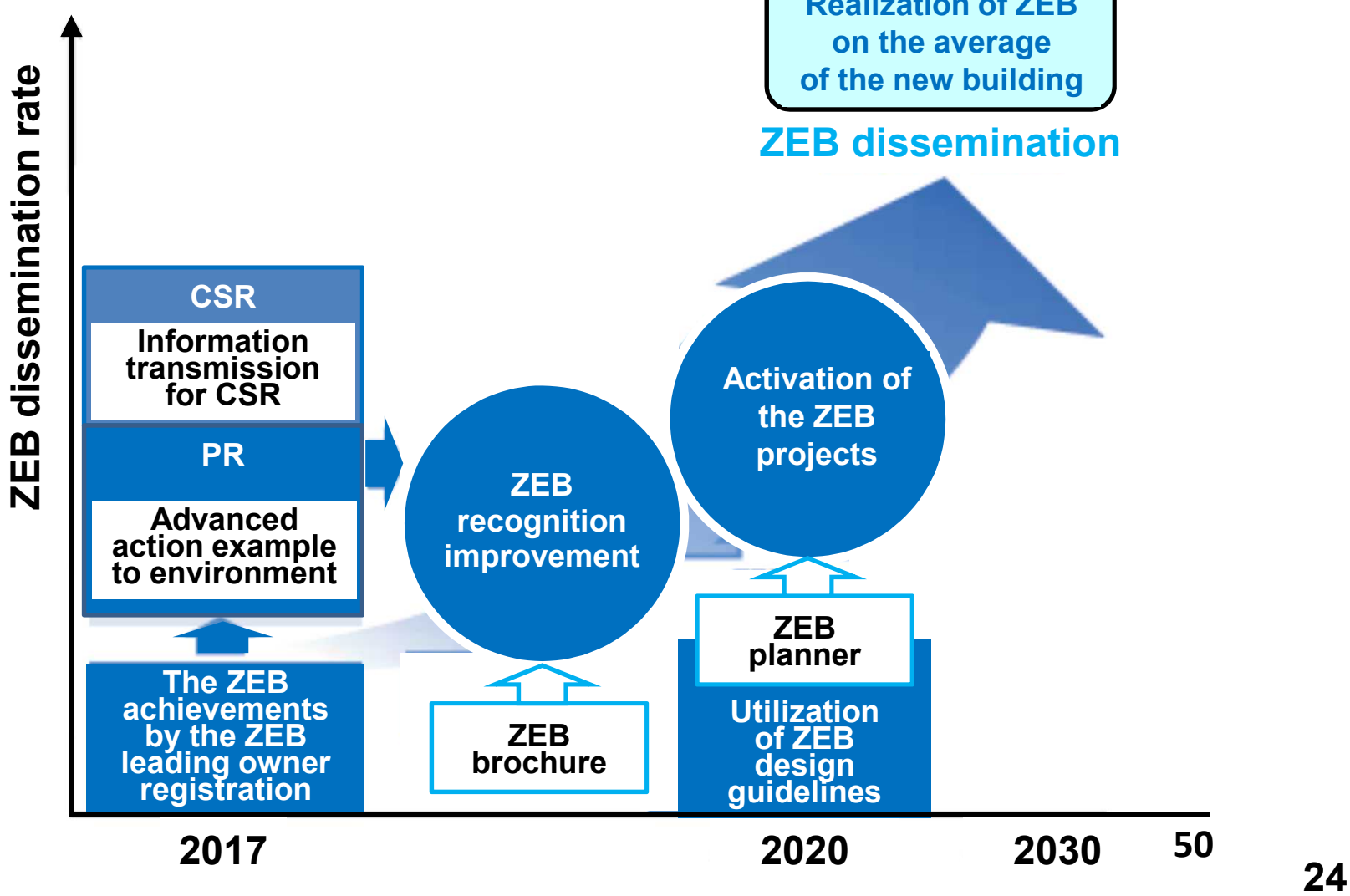
◎ Primary energy consumption amount $\dfrac{\text{Design value (excludes home appliances etc.)}}{\text{Standard value (excludes home appliances etc.)}} \leqq 0.85$

◎ Exterior U_A Design value $\leqq$ Standard value
η_{AC} Design value $\leqq$ Standard value

Contents

4.1 Progress image of ZEB

The government has been implementing the various measures and improve ZEB dissemination rate.



4.2 Measures to promote ZEB in Japan

Specific Measures for Promotion of ZEB in Japan

Design guidelines through the ZEB demonstration project are available

The techniques, methods, and costs for designing ZEBs should be clarified (ZEB designing guidelines for offices, schools, hospitals and so on).

Train engineers (ZEB planner program)

Train engineers capable of designing, calculating, diagnosing, and proposing ZEBs

Source: METI Website

ZEB Design Guidelines and ZEB Pamphlets series

ZEB Design Guidelines

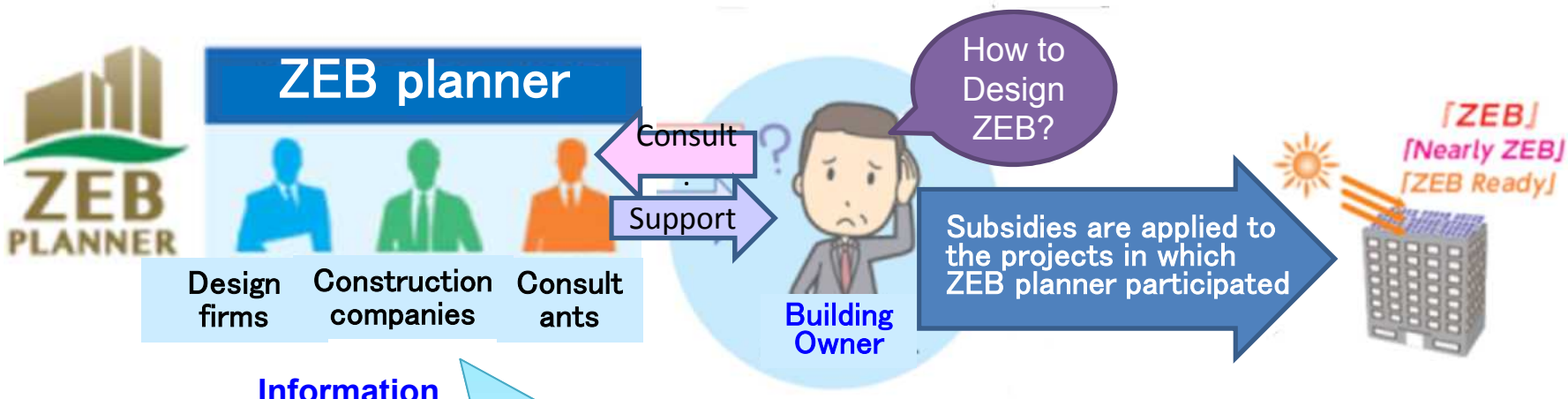
ZEB Pamphlets

Source: METI Website

4.3 Measure for dissemination of ZEB in Japan (1)

“ZEB planner registration system”

Objectives are:
(1) Capacity building of the engineers working for ZEB and
(2) Establish voluntary target management.



Information disclosure

- **Planner information (scope, area, usage)**
- **Voluntary action plan for the ZEB order**
- **Examples on planning in ZEB**
- **List of ZEB consultation windows**

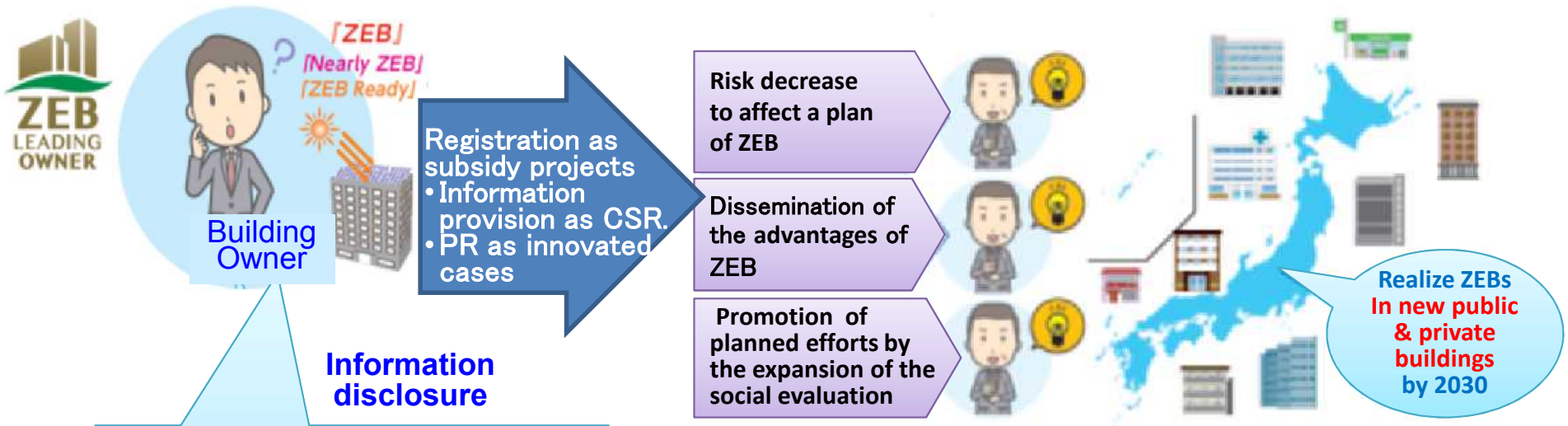
At January 15, 2019
The number of registration：design 87, construction 65, consulting 103
※Prulal business registration is possible for one company

Source: METI Website

4.3 Measure for dissemination of ZEB in Japan (2)

“ZEB leading owner registration system”

Objectives are:
(1) Public relations and branding of ZEB and
(2) Realization of the proactive action on the new public building.



Information disclosure

- **Information of the owners (companies, local gov., etc.)**
- **ZEB achievements and plans**
- **Action target and plan to ZEB**
- **The actual cases of ZEB (summary, facilities, performance, etc.)**

At January 15, 2019 The number of registration：87 companies, 193 examples

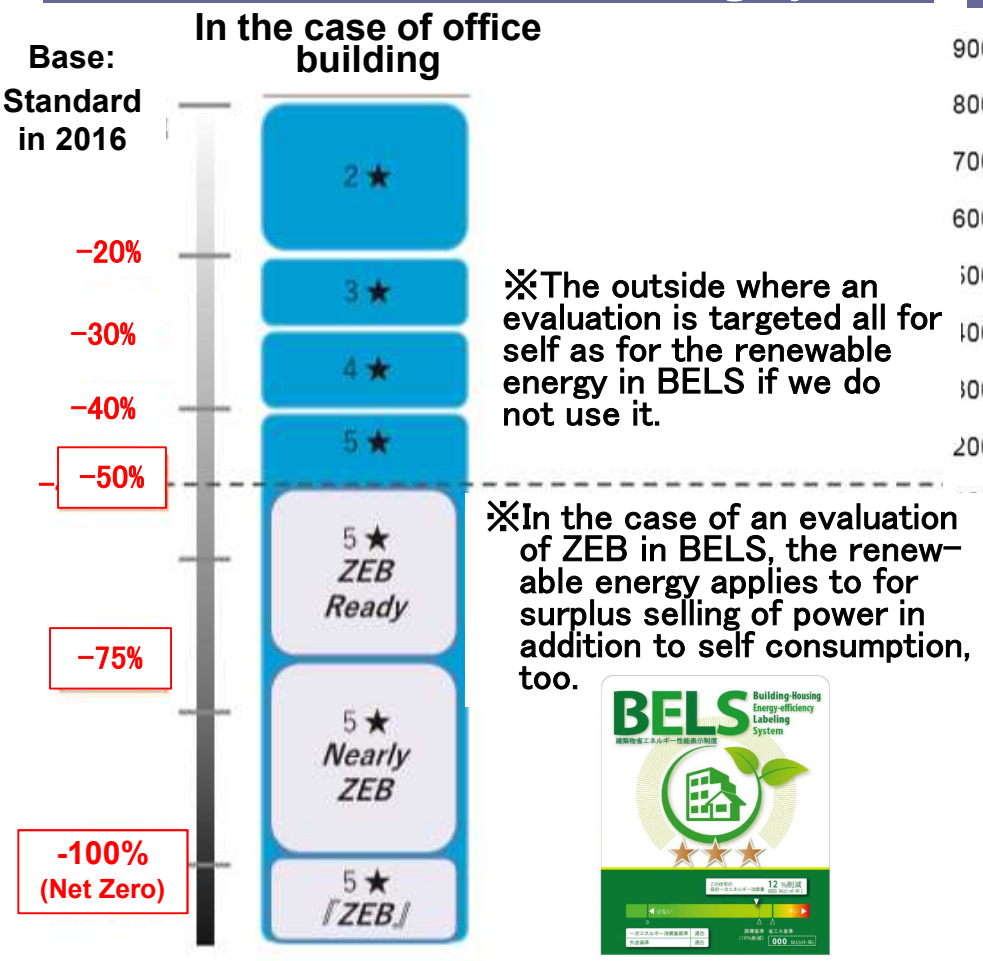
CSR : Corporate Social Responsibility

Source: METI Website

4.3 Measures for dissemination of ZEB in Japan (3)

Labeling system and Positioning of ZEB

ZEB certification and labeling system

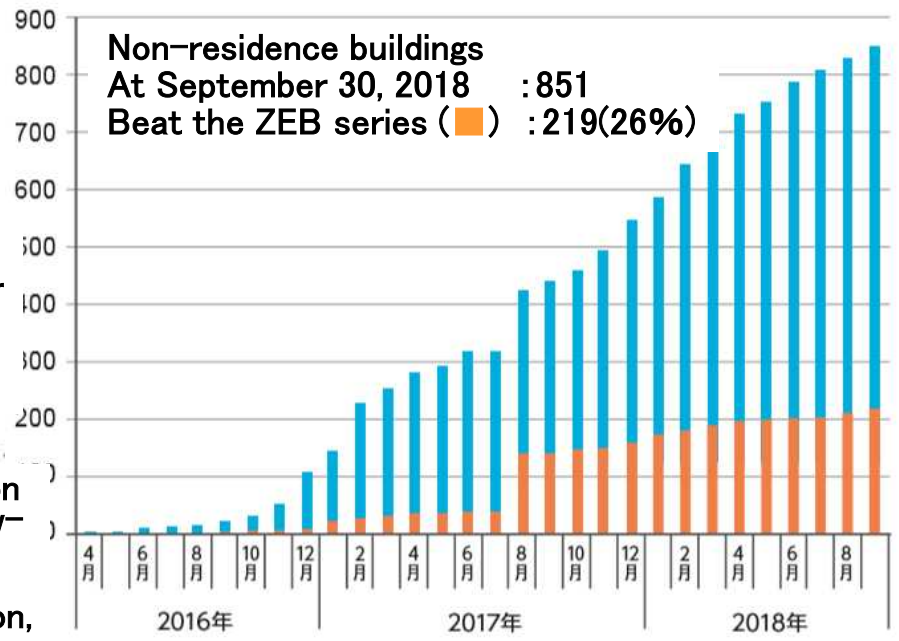


※The outside where an evaluation is targeted all for self as for the renewable energy in BELS if we do not use it.

※In the case of an evaluation of ZEB in BELS, the renew-able energy applies to for surplus selling of power in addition to self consumption, too.

Source: METI Website

The number of BELS acquisition



We showed ZEB mark for cognitive expansion of ZEB, the activation of the market, the expansion of the leading figure of ZEB.

ZEB

4.4 Japan's collaboration with ASEAN on ZEB

ZEB Family (ZEB Ready) dissemination in ASEAN for EE

METI's policies on EE business in Asia region	• To Introduce energy conservation policies and systems in Japan and exchange ideas with the companies to promote excellent energy-saving technologies in Japan. • To cooperate with each countries to establish systems & policies to promote energy saving measures			
	2017	**2018**	**2019**	2020
JASE-W Public – private collaboration Activities	• Proposal of ZEB family concept for AJEEP Inception Meeting in KL • One training workshop for private and public sectors in Japan.	• Proposal of ZEB Ready Building award in the special submission category in ASEAN Energy Award • One seminar & workshop in AMSs: Malaysia • Two training workshop for private and public sectors in Japan • Participation to the ASEAN Energy Business forum	• **The seminar & workshop in Thailand** • **Dispatch two experts to the seminar on Green Buildings in Philippines.** • **Dispatch experts to the Seminar in Malaysia,**	• **Two seminar & workshop in AMSs**
ECCJ Activities	• ECAP 14 of AJEEP The study of ZEB award in AEA	• ECAP 17 of AJEEP Preparation of the guideline for ZEB award in AEA.	**ECAP 20 of AJEEP** →	

4.5 AJEEP ECAP Program will Continue to support EE&C for Buildings in ASEAN

(1) Outline of ECAP 17 implemented by ECCJ under METI

1. ECCJ held the ECAP 17 workshop on 5–9 November 2018 in Tokyo, for capacity building for BOJ members of ASEAN Energy Award(AEA) or the representatives **to improve their knowledge and skills to evaluate the EE&C of buildings in AMSs as well as to develop and refine BEC and GBC.**
2. Through lectures, field visits and discussions, the participants could effectively and **efficiently learned ZEB promotion and those best practices, and other new EE&C policies in Japan**
3. The participants **agreed with the ZEB-ready evaluation criteria in the AEA Special Submission Category and implementation of this award in 2019**
4. For the further EE&C promotion of buildings in the framework of AJEEP, on the basis of METI's instruction, ECCJ is going to continue this workshop in future for further progress in the EE&C of buildings in the ASEAN region

Group photo

Discussion

Site visit

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4.5 AJEEP ECAP Program will Continue to support EE&C for Buildings in ASEAN

(1) Outline of ECAP 20 to be implemented by ECCJ under METI

1. ECAP20 is a workshop **on refinement and development of BEC / GBC** in each AMS and **enhancement of awareness on "ZEB Family Concept"** for ZEB promotion in ASEAN region along with private sector involvement.

   (1) To **discuss the measures to further enhance awareness on "the ZEB Family Concept"** in ASEAN region in order to promote entry and understanding of the BOJ judges on "ZEB Ready" subcategory of the special submission category of EE&C Buildings of ASEAN Energy Award.

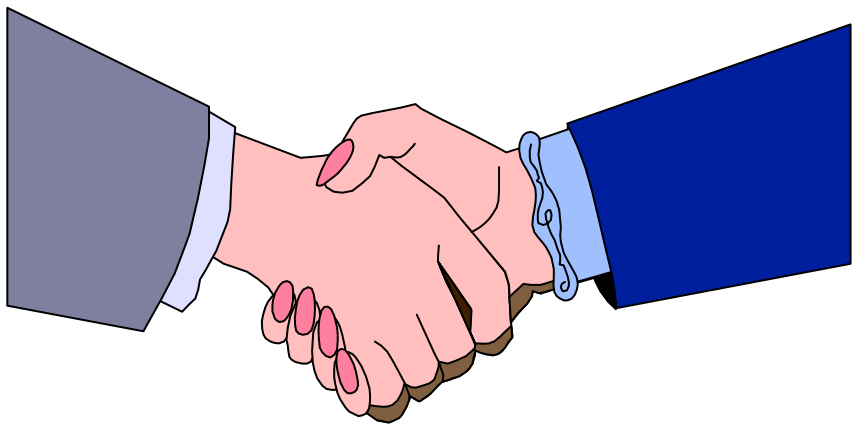
   (2) To **develop the knowledge and measures for development and refinement of BEC / GBC** through the presentation of the present status of each country and the group discussion.

2. ECAP 20 will be held on **December 2th – December 5th 2019.**
3. Maximum **eleven (11) participants**: One (1) participant from each of the following ten (10) AMS:

5. Summary

- The energy efficiency in building is one of key issues for the Japanese EE&C policy.
- The current Japanese E. E. Law for buildings does not have enough power to achieve the target for reduction of GHG in building sector. Therefore, the government implemented the policy of “ ZEB Family Concept” to promote and disseminate high level energy efficient buildings, “ZEB Ready” though the continuous efforts to realize (net)ZEB finally.
- In 2017, Japan enforced new EC Building Code with primary energy standard, which is more comprehensive and practical, specifies how to determine the baseline in order to define the ZEB Family, “ZEB Ready”, “Nearly ZEB” and “Net ZEB.
- Japanese government is implementing the various measures to promote and disseminate “ ZEB Family Concept” in Japan and overseas, particularly in ASEAN.

Thank You Very Much



SMART CLOVER

ECCJ is promoting “Four Leaf Clover “, which is considered to bring happiness, as “SMART CLOVER”, the symbol of the persons who implement EE&C .

The Energy Conservation Center, Japan

URL: http://www.eccj.or.jp