Update on the ZEB Current Situation and Policy in Japan

March 7, 2024

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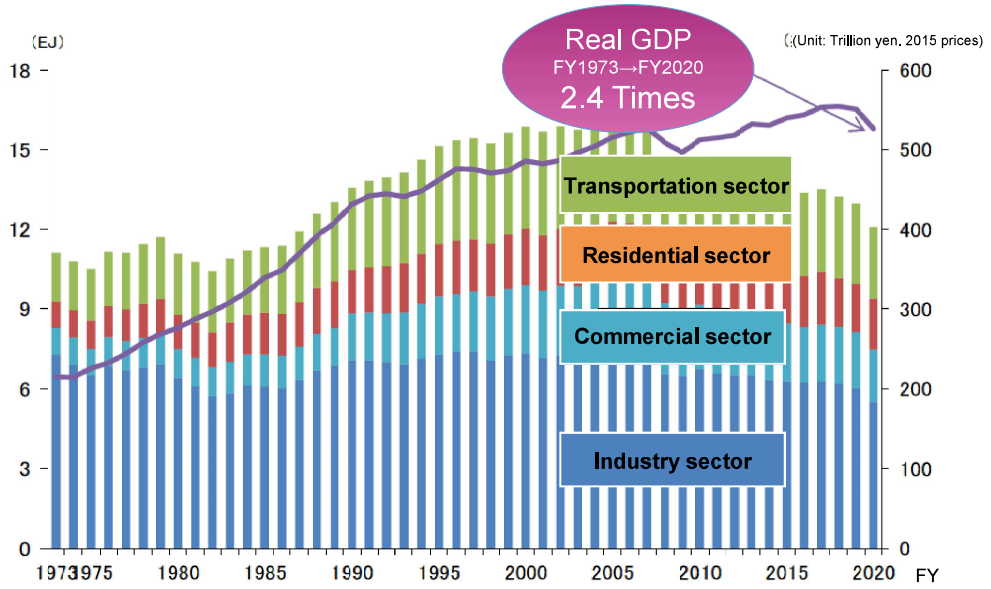
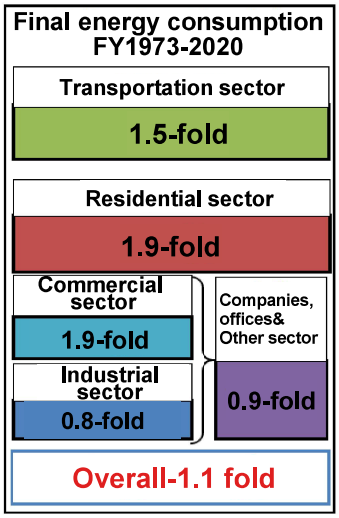
Contents

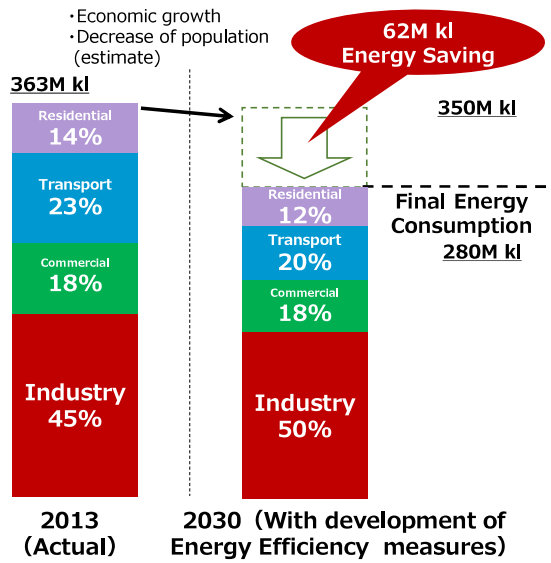
1. Introduction
1.1 Trends in the final energy consumption in Japan



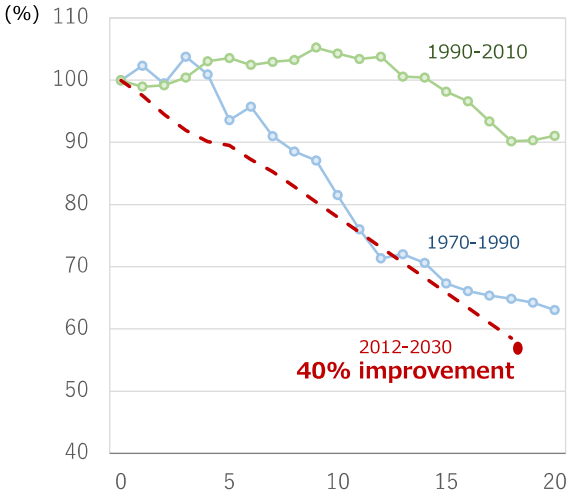


1. Introduction
1.2 Energy efficiency improvement towards 2030

Final energy consumption (Long-term energy demand & supply outlook)



Energy Efficiency Improvement



Energy efficiency rate = Final energy consumption ／real GDP

1. Introduction
1.3 Policy overview on energy efficiency in houses/ buildings

Total <62 million kl>

Industry <13.5M kl>

- Efficient lights including LED [1.08M kl]
- Industrial heat pump [0.88M kl]
- Efficient motors and inverters [1.66M kl]
- Energy management through FEMS [0.74M kl]

Commerce <13.8M kl>

- Efficient lights including LED [1.95M kl]
- Improvement of energy-saving performance of equipment (top runner program) [3.42M kl]
- Energy management through BEMS [2.38M kl]
- Energy-saving buildings (ZEB) [5.46M kl]

Residence <12.1M kl>

- Efficient lights including LED [1.93M kl]
- Improvement of energy-saving performance of equipment (Top runner program) [1.73M kl]
- Energy-saving house (ZEH) [3.44M kl]

Transportation <23.1M kl>

- Next-generation automobiles [9.90M kl]
- Efficient freight transport [8.52M kl]
- Efficient Passenger transport [4.63M kl]

Main measures are listed in each sector

Source: METI Website

1. Introduction
1.4 ZEB dissemination

(1) Necessity of ZEB dissemination in Japan

1. The current energy efficiency measures cannot achieve COP21 requirements for reduction of greenhouse gas (GHG) in Japan.
2. The current Japanese E. E. Law for buildings does not have enough power to achieve the target for reduction of GHG in building sector.
3. Therefore, the following target has been set in order to promote and disseminate high level energy efficient buildings, “ZEB Ready” first and realize (net)ZEB by step-by-step approach though the continuous efforts.
   → **ZEB Family Concept (ISO TS23764)**

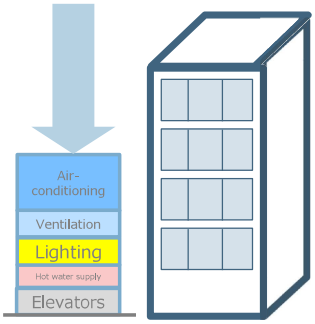
Target

To realize ZEBs in average for newly constructed public and private buildings by 2030

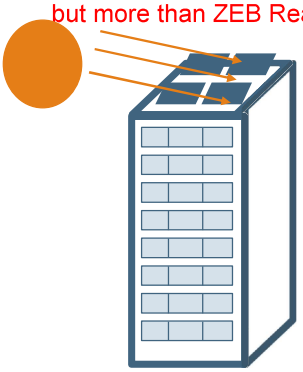
(2) Step by step approach toward ZEB

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

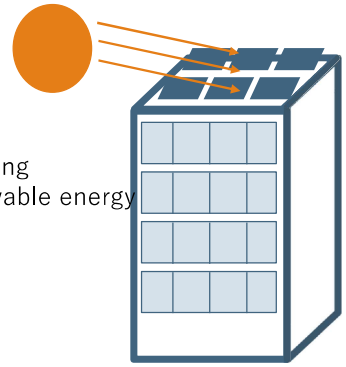
ZEB Ready
(Significant energy saving more than 50% from reference point)



Nearly ZEB
(Net energy saving (RE) not reach 100including% but more than ZEB Ready)



(net)ZEB
(Net energy saving (including RE) of 100% or more)



(3) ZEB Ready (Super energy efficient building)

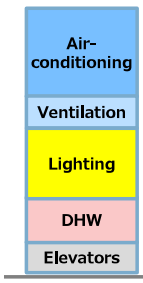
Requiring a minimal amount of energy

High thermal insulation

Solar shading

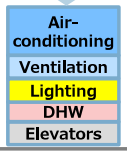
Natural ventilation and Daylight use

Standard buildings



ZEB Ready

Energy saving of 50% or more



Efficient use of energy

+

High-efficiency air-conditioning

High-efficiency ventilation

High-efficiency lighting

High-efficiency elevators

High-efficiency Domestic Hot Water Systems

Source: METI Website

1. Introduction
1.4 ZEB dissemination

ZEB Design Guideline and ZEB Brochure

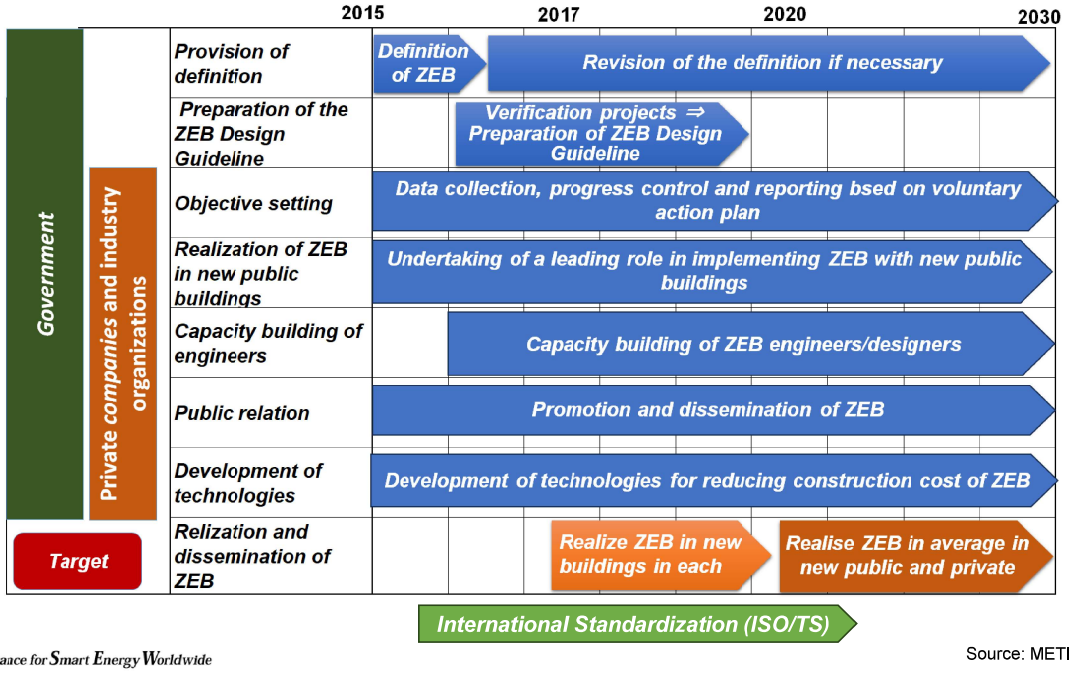
ZEB Design Guidelines

✓For design engineers
- Combination of technologies for ZEB conversion
- Energy saving effect of the technology, additional cost
- Actual design cases

ZEB Brochure

✓For building owners
- Benefits of ZEB (energy-saving benefits, improved working environment, etc.)
- How to achieve ZEB, actual design examples
- Available support systems, etc.

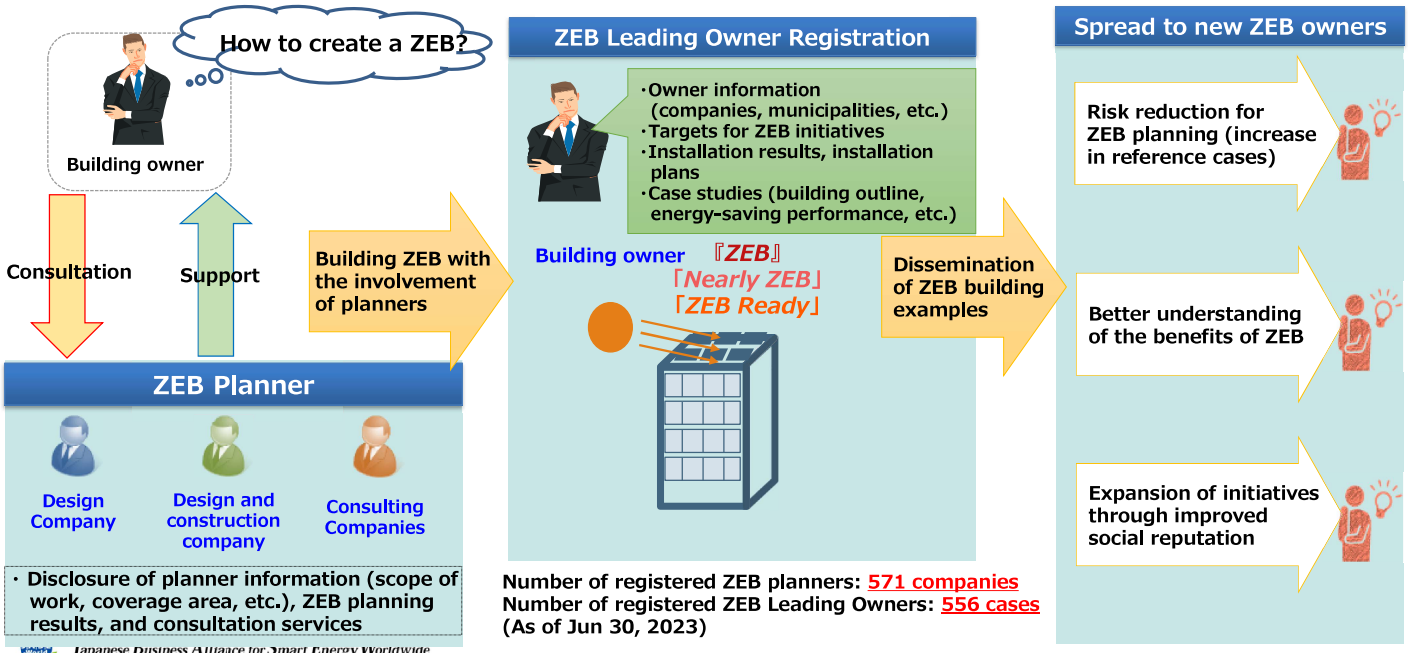
2. The measures for ZEB dissemination in Japan
2.1 The road map toward the realization and dissemination of ZEB (2015-2030)



Source: METI Website

2. The measures for ZEB dissemination in Japan
2.2 Data collection, progress control and reporting based on voluntary action plan

(1) ZEB Planner / ZEB Leading Owner Registration System

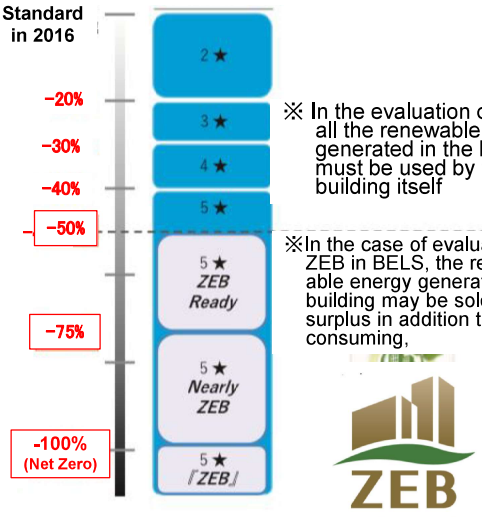


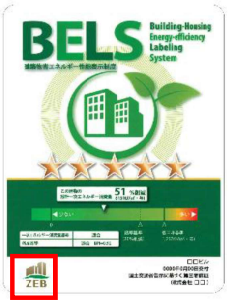
Number of registered ZEB planners: 571 companies
Number of registered ZEB Leading Owners: 556 cases
(As of Jun 30, 2023)

Source: METI and Sii Website

2. The measures for ZEB dissemination in Japan
2.3 Promotion and Dissemination of ZEB・ZEH-M

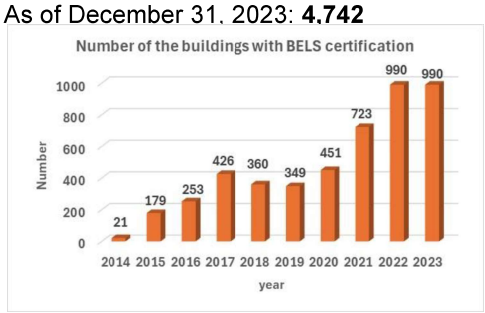
BELS (Building Energy-Efficiency Labeling System)
Labeling system and Positioning of ZEB





Status of BELS certification (Non-residential)

・As of December 31, 2023: **4,742**



Five levels(one star to five stars) and BEI

Stars	Residential	Non-residential	
		Offices, school, factories,etc.)	Hotel, hospital, department stores, etc.)
★★★★★	0.8	0.6	0.7
★★★★	0.85	0.7	0.75
★★★	0.8	0.8	0.8
★★	1.0	1.0	1.0
★	1.1	1.1	1.1

Source: METI Website

2. The measures for ZEB dissemination in Japan
2.3 Promotion and Dissemination of ZEB · ZEH-M

(2) Utilize the Energy Conservation Grand Prize (conducted by ECCJ)

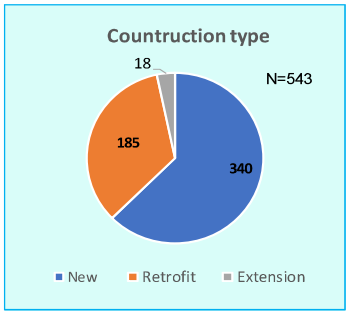
In order to further enhance awareness of ZEB and to impress upon building owners and investors the benefits of ZEB, the framework of **the Energy Conservation Grand Prize**, which is already widely recognized as an award system for home appliances, etc., will be utilized. **The "ZEB/ZEH field" was newly established** in the "Energy Conservation Best Practice Category" and "Product and Business Model Category" of the Energy Conservation Grand Prize in fiscal year 2021.

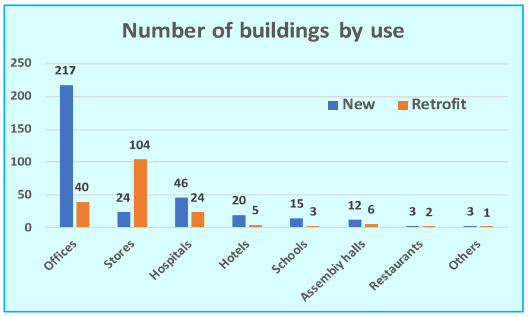
	Energy Conservation Best Practice Category	Product and Business Model Category
Evaluation targets	• Projects that are expected to lead to the future spread of ZEH and ZEB through activities that have achieved energy savings by converting to ZEH and ZEB. • Projects that have achieved a high ratio of ZEH in their own house supply or a large supply of ZEH on a national scale. • Activities of building owners that contribute to EE&C through the conversion of their buildings to ZEB	• Products that have achieved ZEH/ ZEB, have excellent functionality and design considering the surrounding environment and customer needs and are expected to be widely used in the future, • Standardized ZEB that is expected to spread in the future
Evaluation items	a. Innovativeness and originality b. Energy efficiency and conservation c. Replicability and spillover potential d. Sustainability of improvement	a. Development Process b. Innovativeness and originality c. Energy efficiency d. Resource saving/recyclability e. Marketability and economic efficiency c. Environmental preservation and safety

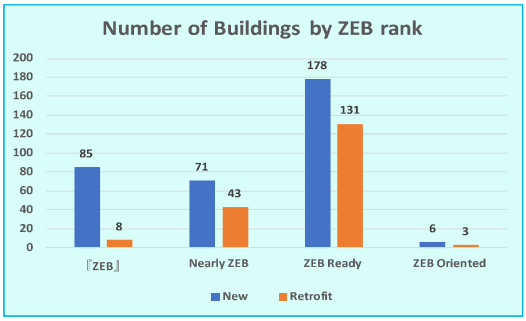
Note: ZEH in the Energy Conservation Grand Prize is "Nearly ZEH" and higher. ZEB is "ZEB Ready" or higher.

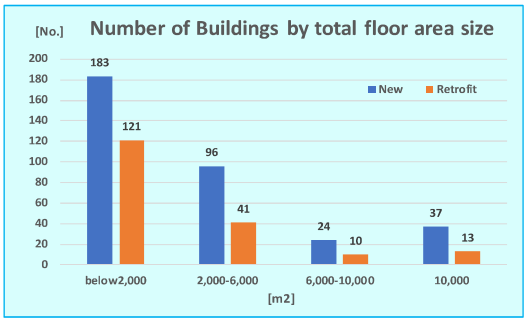
Source: Report of ZEB / ZEH-M Committee (2021)

3. ZEB retrofitting in Japan
3.1 ZEB retrofitting in statistics









(Source:'ZEB Leading Owner Registration System ' as of August 25 ,2023 by Sustainable Open Innovation Initiative)

3.2 Advantages of ZEB Retrofit

Reduction of utility costs

-By introducing highly efficient equipment and control technology, etc., significant energy savings can be achieved compared to before the retrofitting, and utility costs can be reduced.

Improvement of comfort and productivity

-By introducing an advanced control system, environmental settings can be set for each space, which, combined with the improved insulation performance of the envelopes, will improve comfort and productivity.

Improvement of business continuity

-Even if lifelines are disrupted in the event of a disaster, the use of solar power generation, storage batteries, etc. will enable the building to maintain its functionality for an extended period of time.

Increase of real estate value

-Could lead to higher rents, etc. through acquisition of environmental certification
-A growing appreciation for environmentally responsible corporate behavior, such as SDGs and ESG investment.

(Source:'Collection of retrofit ZEB Cases', 2023.5, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry)

3.3 Key Points to Achieve ZEB through Retrofitting

Combination of available technologies

In many cases, energy performance has been improved to ZEB Ready levels not only by introducing advanced technologies that require a significant cost increase, but also by combining existing general-purpose technologies. Energy-saving technologies installed in more than 80% of buildings include envelope insulation, high-efficiency air conditioners, LED lighting, and photovoltaics, all of which utilize existing general-purpose technologies.

Optimization of equipment capacity

In many cases, equipment installed in newly constructed buildings is selected with excessive capacity, assuming a margin over the capacity of the equipment originally required, because the actual future use of the equipment is unknown. During renovation, energy consumption (running costs) can be reduced by replacing equipment with smaller capacity equipment based on actual usage and energy consumption to date.

Step by step construction under a good plan

When aiming for a significant improvement in energy performance, such as retrofitting ZEB, it may be difficult to achieve this in a single construction project. The current energy performance can be assessed and then ZEB can be implemented. it is also important to proceed with ZEB in stages according to the retrofit plan which was prepared based on better understanding of the current energy performance, and then to gradually improve the energy performance. It is also important to distribute the initial costs by dividing the retrofitting work into separate phases. The initial cost can be spread out by dividing the retrofitting work into separate phases.

Source: website of Ministry of Environment Japan

3.3 Key Points to Achieve ZEB through Retrofitting
(1) Combination of available technologies

Main elemental technologies implemented in the retrofit ZEB

Category		Technology	Implementation rate
Passive technology		Envelope thermal insulation (roof, exterior walls, floor, etc.)	◎
		Envelope thermal insulation (openings)	○
		Solar shading (louvers, eaves, Blinds, etc.)	△
Active technology	Air conditioning	High efficiency air conditioner (PAC, EHP, GHP)	◎
		High efficiency air conditioner (RAC)	△
		Total heat exchanger	△

※ Implementation rate:

◎ Over 80%

○ 50～79%

△ 20～49%

※ Total of technologies implemented in existing buildings adopted for Ministry of the Environment subsidized projects.

Category		Technology	Implementation rate
Active technology	Lighting	LED lighting equipment	◎
	Ventilation	High-efficiency fans	△
	Hot-water supply	High-efficiency heat pump water heater	△
	Power substations・consent	High-efficiency transformers	△
		Storage battery	○
	Energy management	BEMS	○
Energy creation technology		Solar power generation	◎

(Reference)Technologies implemented at a low rate in retrofit ZEB, but widely implemented in newly constructed ZEB

- Daylight utilization system
- Radiation air-conditioning
- Night purge system
- Task & ambient lighting systems
- High-efficiency elevator systems

Japanese Business Alliance for Smart Energy Worldwide

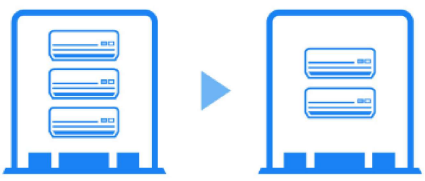
Source: website of Ministry of Environment Japan

3.3 Key Points to Achieve ZEB through Retrofitting
(2) Optimizing of equipment capacity

Reducing energy consumption and equipment replacement costs by downsizing means that aiming for ZEB may lead to cost reductions rather than cost increases and is considered to be an important approach for many existing buildings. In addition, by regularly checking the energy-saving effects of downsized equipment and improving its operation, running costs can be further reduced.

Downsizing (Optimization of equipment capacity

- Installing and operating equipment with appropriate capacity improves effectiveness compared to operating equipment with excessive capacity
- Reduced running costs as well as initial costs and effective use of space



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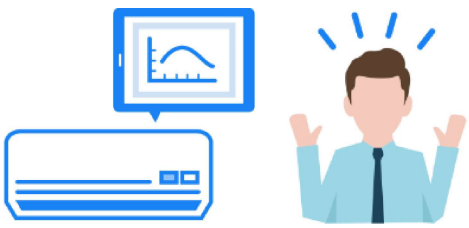
Confirmation of energy saving and operation improvement

- Reduce unnecessary energy loss I
- Lower initial costs and lower running costs



Japanese Business Alliance for Smart Energy Worldwide

Source: website of Ministry of Environment Japan

3.3 Key Points to Achieve ZEB through Retrofitting
(3) Step by step construction under a good plan

An example of short-term retrofitting a 15-year-old building into ZEB in a single renovation)

Built 15 years ago

Completion of construction ・・・ Present Overall retrofitting ・・・

Timing of retrofitting	The timing of major tenant changes, or the case that building use can be changed flexibly to some extent in self-owned buildings, etc.	• If a major overall renovation is planned in the near future, it is possible to consider the realization of ZEB along with the renovation
Target level	ZEB Ready BEI = 50%	• Compare and consider the target level with the associated costs. • First, it is necessary to calculate the BEI including the current situation.
Equipment to be retrofitted	Envelope, central heat source, total heat exchanger and solar power generation, etc.	• Select equipment to be retrofitted that can achieve the target level while keeping costs low. • However, it is also necessary to assess the balance between costs and the benefits obtained.
ZEB cost	ZEB cost General renovation costs	• Since the additional costs required for ZEB could be minimal compared to a regular renovations without aiming for ZEB, it is important to consider how to evaluate these "additional costs" in balance with the "benefits".

Japanese Business Alliance for Smart Energy Worldwide

Source: website of Ministry of Environment Japan

3.3 Key Points to Achieve ZEB through Retrofitting
(3) Step by step construction under a good plan

An example of long-term retrofitting a 15-year-old building into ZEB in 5 years

Built 15 years ago Built 20 years ago

Completion of construction ・・・ Present Partial retrofitting Partial retrofitting Overall retrofitting ・・・

Timing of retrofitting	Replacement with high-efficiency equipment at the time of failure, etc.	Retrofitting work at the timing of tenants moving out of one floor, etc.	Timing of major tenant changes, etc.	• Separate the work that can and cannot be retrofitted while staying in the house and implement significant energy savings along with the overall renovation.
Establishment of the long-term plan (Target level)	BEI＝90%	BEI＝75%	ZEB Ready BEI＝50%	• Establish a plan to convert to ZEB for the entire retrofit through partial retrofitting. • First, it is necessary to calculate BEI including the current situation.
Equipment to be retrofitted	Individual heat source (air conditioning)	Lightings Individual heat source (air conditioning・hot-water supply) Total heat exchanger	Envelope, lightings Individual heat source (air conditioning・hot-water supply) Total heat exchanger Solar power generation, etc.	• Retrofitting a building systematically for facility updates by partially and entirely
ZEB cost	ZEB cost General renovation costs	ZEB cost General renovation costs	ZEB cost General renovation costs	• ZEB costs need to be regarded as total costs in line with a long-term plan, rather than estimated for a single retrofitting work. • Since the additional costs required for ZEB could be minimal compared to a regular renovations without aiming for ZEB, it is important to consider how to evaluate these "additional costs" in balance with the "benefits".

Japanese Business Alliance for Smart Energy Worldwide

Source: website of Ministry of Environment Japan

4. "ZEB Family Concept" dissemination in ASEAN

METI cooperates with each ASEAN Member State to establish the systems & policies to promote energy saving measures through the introduction of the advanced Japanese energy conservation policies, systems and technologies.

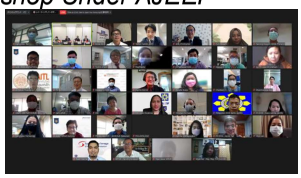
Eme eme eme	2017	2018	2019	2020	2021	2022	2023
JASE-W Public – private collaboration activities	① Introduction of ZEB family concept in AJEEP* Program ② Ttraining workshop for private and public sectors in Japan.	① Proposal of ZEB Building Award in AEA ② S&W in AMS: Malaysia ③ Two training WS for AMS in Japan ④ Introduction in AEBF	① S & W in Thailand & Malaysia, ② S & W in Philippines ③ Started ZEB Ready Building Award in AEA	The online seminars: • Vietnam (Dec 7-8), • Malaysia (Dec 14 and Mar 1) and • Indonesia(Feb.1)	The online seminar • Indonesia (June 15) • AEBF (Sep 15)	The online seminar • Vietnam(Sep 27) • Malaysia (Oct 19)	• **Seminar in Vietnam (May 8 and Aug 9),** • **Indonesia (July 25)** • **Philippines (Sep 28),** • **Malaysia (Mar 7,'24),** etc.
AJEEP * Activities	• The study of ZEB award in AEA in ECAP 14 of AJEEP	• Draft of the guideline for ZEB award in AEA in ECAP 17 of AJEEP.	ECAP **20 under AJEEP in Japan (Dec)	ECAP 23 of AJEEP by online (Dec 8, 2020)	ECAP 26 by online (Dec 15-16, 2021)	ECAP 29 of AJEEP by online Dec 20 and 21)	**ECAP 32 (Dec11-15) WS in Japan** **CN EA activity (AJEEP Scheme 5) (Dec)**

*ASEAN-Japan Energy Efficiency Partnership, ** Energy Conservation Workshop Under AJEEP

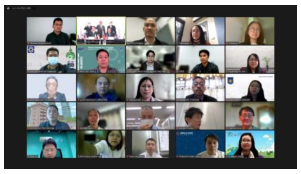
Oct. 2019@Bangkok

Feb. 2020@Malaysia

Dec. 2020 @ Vietnam



Dec. 2021@ ECAP 26 (AJEEP)



Feb. 2022@ ECAP29 (AJEEP)

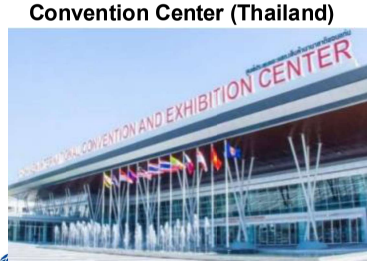
4. "ZEB Family Concept" dissemination in ASEAN

Winners of the ASEAN Energy Award 2021
Special Submission Category of EE Building Area, ZEB Ready Sub-category (2021)

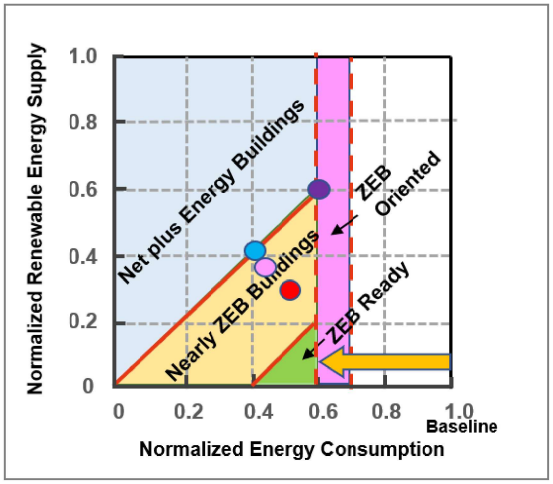
● **Nanyan Technological University (Singapore)**

● **Ulu Pandan Bus Stop (Singapore)**

● **Khonkean International Convention Center (Thailand)**



● **Dhanaphiphat Building (Thailand)**

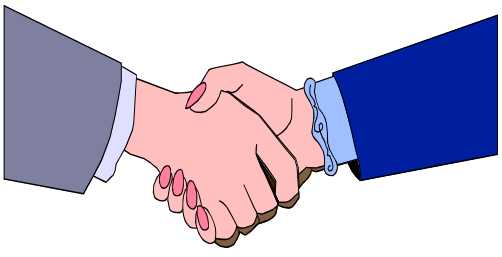


Source: ACE presentation in ECAP26 in Dec. 2021

5. Summary

- ***The energy efficiency in buildings is one of the key issues for the Japanese EE&C policy, and dissemination of ZEB and ZEH is one of the important measures to implement this policy.The current Japanese E. E. Law for buildings still does not have enough power to achieve the target for reduction of GHG in the building sector. Therefore, the government has implemented the policy of " ZEB Family Concept" to promote and disseminate high level energy efficient buildings, "ZEB Ready" and to finally realize (net)ZEB by further energy efficiency and conservation as well as applying renewable energy.***
- ***The government has been implementing further measures to disseminate ZEB.***
  - *Data collection, progress control and reporting based on voluntary action plan*
  - *Promotion and dissemination of ZEB・ZEH-M*
- ***ZEB retrofitting in Japan***
- ***The Japanese government has also been promoting " ZEB Family Concept" in ASEAN region.***

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