The Japan’s policy and strategy in the building sector towards “Carbon Neutrality”

International Affairs Office, Energy Efficiency and Renewable Energy Department Agency For Natural Resources and Energy (ANRE), Ministry of Economy Trade and Industry (METI), Japan

February 2023
1. Japan’s Energy Efficiency Overview

2. Points and Approach toward net Zero Energy Building (ZEB)

3. Japan’s Policy in building sector towards ZEB
   - Regulations
   - Supportive Measures
   - Information
Real GDP is up **2.6 times** since the oil crisis in 1970s, while final energy consumption is up **1.2 times**.

Trends in final energy consumption in Japan

- **Transport sector**: 1973 → 2018, **1.7 times**
- **Household sector**: 1973 → 2018, **1.9 times**
- **Office sector**: 1973 → 2018, **2.1 times**
- **Industrial sector**: 1973 → 2018, **0.8 times**

**Sources:** Total Energy Statistics, Annual Report on National Accounts, EDMC Handbook of Japan’s & World Energy & Economic Statistics
In the 6th Strategic Energy Plan formulated in 2021, we expect energy demand in FY2030 to be 280 million kl-oe with **62 million kl-oe reduction** in final energy consumption by **thorough energy efficiency**, promoting energy efficiency improvement with **regulation**, **supportive measures**, and **information**.

**Energy Efficiency in the 6th Strategic Energy Plan**

<table>
<thead>
<tr>
<th>FY2013</th>
<th>FY2019</th>
<th>FY2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>363 million kl</td>
<td>334 million kl</td>
<td>(350-62) million kl</td>
</tr>
</tbody>
</table>

- **Household**: 52 million kl
- **Transport**: 84 million kl
- **Office**: 65 million kl
- **Industry**: 160 million kl

**Economic growth (1.4%/year)**

- Population growth: -0.6%
- Passenger traffic: -2%

**62 million kl**

**Energy Efficiency**

**Regulations**
- Act on the improvement of energy consumption performance of **buildings** etc.

**Supportive measures (Incentives)**
- Subsidies etc.

**Information**
- ZEB Planner/ZEB leading owner registration system
- ZEB Design Guideline and ZEB Brochure
- Labeling system etc.
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Points for realizing ZEB (net-Zero Energy Building)

- ZEB is a building with considerably reduced annual energy consumption by **saving as much energy as possible** via better heat insulation, solar shading, natural energy and **high-efficiency** equipment as well as **creating energy** (e.g., with photovoltaic power generation), while maintaining comfortable environments.

Points for realizing ZEB

**Save energy consumption and utilize natural energy**
- Natural ventilation
- Solar shading
- Daylight utilization
- High thermal insulation

**Utilize energy efficiently**
- Air conditioning
- Ventilation
- Lighting
- Hot water supply
- Elevators

**Create energy**
- High-efficiency equipment system
- Energy conservation
- Solar power generation
Step by step approach toward ZEB

- ZEB is classified and defined as (Net)ZEB, Nearly ZEB and ZEB Ready depending on the amount of reduction from reference primary energy consumption.
- ZEB Oriented has been added to ZEB since 2019 to popularize ZEB in large-scale buildings (total floor area or over 10,000m²).

The same classification in ISO/TS23764

- Energy Saving and Efficiency
  1. High thermal insulation envelope
  2. Passive technologies
  3. High performance HVAC system

- Energy Independence
  4. Introduction of renewable energy

The diagram shows the classification of Zero Energy Buildings (ZEB) based on the energy consumption rate compared to a reference building. The categories include:

- **(Net)ZEB**: Primary energy consumption reduction rate 100% or over
- **Nearly ZEB**: 75% or over
- **ZEB Ready**: 50% or over
- **ZEB Oriented**: Total floor area 10,000m² or over

The diagram also indicates energy independence through the introduction of renewable energy technologies for different categories of buildings, such as hotels, hospitals, stores, etc., and office, school, factory, etc., with varying energy consumption reduction rates.
**Dissemination of ZEB in Japan**

- The **number of ZEB** in Japan is **increasing steadily**
- The **proportion of ZEB** compared with total non-residential buildings is still **small**

**Trend of ZEB**

<table>
<thead>
<tr>
<th>(number)</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Net)ZEB</td>
<td>31</td>
<td>159</td>
<td>145</td>
<td>204</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Nearly ZEB</td>
<td>31</td>
<td>37</td>
<td>84</td>
<td>28</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>ZEB Ready</td>
<td>12</td>
<td>24</td>
<td>59</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ZEB Oriented</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

**Trend of ZEB in non-residential buildings***2

<table>
<thead>
<tr>
<th>(number)</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZEB</td>
<td>60,818</td>
<td>62,191</td>
<td>59,380</td>
<td>56,866</td>
<td>48,214</td>
<td>49,599</td>
</tr>
<tr>
<td>Non-ZEB</td>
<td>31</td>
<td>152</td>
<td>60</td>
<td>95</td>
<td>106</td>
<td>198</td>
</tr>
</tbody>
</table>

※1 **Including factories, etc. from total**

※2 **Excluding factories, etc. from total**
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**Regulation on energy efficiency of building**

- **[The present (1/4/2021~)]**
  - **Non-residential**
    - **Large-scale** (2,000㎡ or over)
      - **Mandatory** (Energy efficiency standards)
    - **Mid-scale** (300㎡ to 2,000㎡)
      - **Mandatory** (Energy efficiency standards)
    - **Small-scale** (under 300㎡)
      - **Voluntary** (Energy efficiency standards) + Obligation to notify

- **[2024~2026]**
  - **Non-residential**
    - **Mandatory**
      - Raise standards by 2024 (Energy efficiency standards ▲ 15~25%)
    - **Mandatory**
      - Raise standards by 2026 (Energy efficiency standards ▲ 20%)
    - By 2025 **Mandatory**
    - ※Considering further raising energy efficiency standards by FY2030

[^1]: Act on the Improvement of Energy Consumption Performance of Buildings
Supportive measures for ZEB

- METI supports realizing ZEB in cooperation with MOE (Ministry of the Environment) in accordance with the division of responsibilities depending on the building scale.

### METI Subsidized Project (※)

**[Subsidized Project]**
- **New private** building
  Total floor area: **10,000㎡** or over
- **Existing private** building
  Total floor area: **2,000㎡** or over
  * Install unevaluated technology

**[Subsidy]**
- Within 2/3 for subsidized costs
  (Max. ¥500 million/year, ¥1 billion/project)

**[Subsidized costs]**
- Design cost
- Equipment cost
- Construction cost

**[Adoption method]**
- Judgement method

### MOE Subsidized Project (※)

**[Subsidized Project]**
- **New private** building
  Total floor area: under **10,000㎡**
- **Existing private** building
  Total floor area: under **2,000㎡**
- **Local public** building: **No area limit**

**[Subsidy]**
- Principle, within 2/3~1/3 (depend on scale, quality, etc) for subsidized costs
  (Max. ¥500 million (under 2,000㎡: ¥300 million)/project)

**[Subsidized costs]**
- Design cost
- Equipment cost
- Construction cost

**[Adoption method]**
- Judgement method

(※ Excerpts of application guidelines)

### Common (Mandatory requirement to apply for subsidized project)

- Register the building owner as ZEB leading owner
- Involve ZEB planner to implement subsidized project
- Acquire BELS label based on Building Energy Efficiency Act
Demonstration of unevaluated technologies for ZEB
(METI subsidized project)

- It is difficult to realize ZEB in large-scale buildings only with existing energy efficiency technologies.
- METI aims to disseminating ZEB in large-scale building by demonstrating “unevaluated technologies\(^\text{[1]}\) in Web Program\(^\text{[2]}\)”, which have high energy efficiency potential, through subsidized projects.

**Example of unevaluated technologies introduction in ZEB demonstration projects**

15 unevaluated technologies
- Outside air amount control by CO\(_2\)
- Natural ventilation system
- Advanced air conditioning pump control
- Advanced air conditioning fan control
- Cooling tower fan/inverter control
- Light zoning control
- Free cooling system
- Desiccant air conditioning system
- Cool/heat trench system
- Hybrid hot-water supply system
- Advanced geothermal heat utilization
- Advance cogeneration system
- Natural lighting system
- Advanced high efficiency transformer
- Heat recovery heat pump

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\(^\text{[1]}\) Unevaluated technology : 15 technologies with high energy efficiency potential are published by The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan

\(^\text{[2]}\) Web Program : The program for calculating energy consumption efficiency
To promote ZEB business, design companies, construction companies, and consulting companies that have knowledge to realize ZEB are registered as ZEB Planner from which building owners can get consultation service. Building owners that have actual results and introduction plans of ZEB are registered as ZEB leading owner and publish the examples of ZEB.

**ZEB Planner/ZEB leading owner registration system (April.2017~)**

- The number of ZEB planner: 449
- The number of ZEB leading owner: 318
  (As of 09/2022)

**“ZEB leading owner”**

- Disclosure information:
  - Owner information
  - ZEB targets
  - Actual results and introduction plans of ZEB
  - Introduction of projects (overviews of buildings, facilities, energy saving performance, etc.)

**Influence to new ZEB owners**

- Increases in the number of reference cases
- Awareness development on the benefits of ZEBs
- Social Capacity building through communicating best practices

**“ZEB Planner”**

- Design
- Building construction
- Consulting

Disclosure information:
Company information, target of ZEB sales, achievements, contact points for (potential) customers

※Detail [https://sii.or.jp/zeb04/](https://sii.or.jp/zeb04/)
ZEB Design Guideline and ZEB Brochure

- **ZEB design guidelines** for design engineers and **ZEB Brochure** for building owners has been created and published on the website.

### ZEB Design Guidelines (for design engineers)

- Combination of technologies for ZEB conversion
- Energy saving effects of the technologies, additional cost, etc.
- Actual design examples

### ZEB Brochure (for building owners)

- Benefits of ZEB (energy-saving benefits improved working environment, etc.)
- How to achieve ZEB, actual design examples
- Available support measures, etc.
**ZEB Label** has been formulated since 2017 to improve awareness of ZEB, which can be used in **BELS** (Building-Housing Energy-efficiency Labeling System).

**Baseline:** Energy Efficiency standard

<table>
<thead>
<tr>
<th>Baseline</th>
<th>In case of office building</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20%</td>
<td>2 ★</td>
</tr>
<tr>
<td>-30%</td>
<td>3 ★</td>
</tr>
<tr>
<td>-40%</td>
<td>4 ★</td>
</tr>
<tr>
<td>-50%</td>
<td>5 ★ ZEB Ready</td>
</tr>
<tr>
<td>-75%</td>
<td>5 ★ Nearly ZEB</td>
</tr>
<tr>
<td>-100%</td>
<td>5 ★ (Net)ZEB</td>
</tr>
</tbody>
</table>

※ In **BELS**, renewable energy is evaluated only for self consumption.

※ In the evaluation of **ZEB** in **BELS**, renewable energy is evaluated both for self consumption and surplus electricity sold.
ZEB is a building with considerably reduced annual energy consumption by saving as much energy as possible, improving energy efficiency, and creating energy, while maintaining comfortable environments.

Classifying ZEB as (Net)ZEB, Nearly ZEB and ZEB Ready, which are also defined in ISO/TS23764, enables and promotes practical step-by-step approach toward (Net)ZEB.

Japan aims to disseminating ZEB through regulations on building performance, supportive measures such as subsidies for ZEB projects, and information such as ZEB Planner/ZEB leading owner registration system, ZEB Design Guideline and ZEB Brochure, and Labeling system related to ZEB, which contribute to improving awareness of ZEB.
Thank you for your attention