Application of Renewable Energy for ZEH and Its Contribution to the Grid

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1. ZEH: Definition and Road Map

2. ZEH+: Definition and Expected Contribution to Regulating Capacity of the Grid
Net Zero Energy House (ZEH): Qualitative Definition

Net annual energy consumption by a household: Near to ZERO or less

Minimum use of Energy
(Cool in summer, warm in winter)

Use Energy Efficiently
Typical residence

Generate Energy

Source: Policies for Promotion of ZEH and Related Budget Bills for FY2018, Agency for Natural Resources and Energy, METI, March 2018

Highly insulative (Energy Efficiency)

Highly Efficient Equipment (Energy Efficiency)

Solar PV Generation (Energy Creation)
Economic Benefit from PV Power Generation

Accumulated Profit (Economic return – Domestic expenses)

*Post FiT Price = 11yen/kWh, Cash purchase

As currently the post FiT price is not fixed, we set 11 yen/kWh for an average economic value after FiT for estimation. This is just for reference.

In this estimation, PV panel durability is set as 25 years long. From 25th-30th year we assume PV panels continuously generate as previous years without any repairment.

Note: FiT purchasing ends at the 10th year.
This estimation is based on several hypothetical conditions, and the calculated results are not guaranteed.

*Estimation results vary based on conditions including building plan, PV capacity, location, family type, life style, policy programs.
*Not a guaranteed price/profit.
Co-benefit of ZEH: Resilience

For disaster-prone Japan, resilience is critical

■ Energy Creation

**Q29**

Have any power source available in a blackout?

☐ Yes ☐ No

Solar PV, fuel cell, gas engine co-generation, batteries, and PHV & EV equipment can power communications, lighting and other appliances you cannot live without even in a blackout.

■ Enhanced Insulation

**Q30**

Prepared for a few days you must keep off the cold without heating?

☐ Yes ☐ No

A highly insulative house keeps out the cold with no heating when lifelines fail after a natural disaster. Alternative heaters and cold weather protection gear also help.

Source: Resilient House Checklist (FY2016) Japan Sustainable Building Consortium
**ZEH: Builders Report**

**FY2016**
- Total (companies): 6,236
- ZEH: None: 0%
- ZEH: DK/NA: 10%
- ZEH: 1 - 49%: 7%
- ZEH: 50%<=: 20%
- Approx. 34,000 / 300,000 Houses (Custom-built single-family house)

**FY2017**
- Total (companies): 6,604
- ZEH: None: 0%
- ZEH: DK/NA: 8%
- ZEH: 1 - 49%: 24%
- ZEH: 50%<=: 20%
- Approx. 42,000 / 300,000 Houses (Custom-built single-family house)

Source: Adopted by AP-ZEH from SII website.
ZEH (Zero Energy Houses) Promotion Programs (2018 Budget)

Three ministries (METI, MLTI, MoE) collaborate to promote energy efficiency and CO2 reduction in houses. Aiming that more than 1/2 new custom houses built by housing manufacturers to be ZEH by 2020 and an average of all new houses including ready-built houses and multi-family residential buildings to be ZEH by 2030.

**Advanced low carbon houses highly reduced CO2 emissions** (Life-cycle carbon minus houses (LCCM house))

- **FY2018 Max. 10,221 million yen** (MLIT)

**Support to ZEH**

- **ZEH to be promoted to scale up the supply**
  * Higher performance ZEH, ready-built house, multi-family residential building (medium to high rise)
  - **FY2018 Max. 60,040 million yen** (METI)

- **ZEH to be continuously promoted**
  * Custom house, multifamily residential building (low rise)
  - **FY2018 Max. 8,000 million yen** (MoE)

- **ZEH to be built by collaboration among small and medium builders**
  * Incentive for builders with little experience
  - **FY2018 Max. 11,500 million yen** (MLIT)

**Standardizing the applications using Building-housing Energy-efficiency Labeling System (BELS)**

**One-window information provision**

Source: METI document
### Road Map for Promotion of ZEH

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Subsidies</th>
<th>Capacity Building</th>
<th>PR, Blanding</th>
<th>R&amp;D</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 Annual</td>
<td>Establish definition</td>
<td>Subsidy for construction</td>
<td>Establish know-how in small builders</td>
<td>ZEH PR and Blanding</td>
<td>Dissemination: ZEH technology</td>
<td>ZEH Road Map Follow-up Committee Report, May 2018</td>
</tr>
<tr>
<td>2017 Annual</td>
<td>Enhance Definition/ target</td>
<td>Construction subsidy based on grade</td>
<td>Dissemination of know-how</td>
<td>Dissemination: Sales strategy</td>
<td>Standardizing know-how</td>
<td>All rights reserved</td>
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<tr>
<td>2020 Annual</td>
<td>Establishing rating, registration system</td>
<td></td>
<td></td>
<td>ZEH element technology, Standardizing specification: ZEH element technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2030 Annual</td>
<td>Revise definition/ target when necessary</td>
<td></td>
<td></td>
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</tbody>
</table>

- **Over half of the new single family home constructions to be ZEH**
- **Expansion of ZEH in new single family homes without subsidies Average new residential construction perform as ZEH**
Key points

1. ZEH+, a new concept
   → See next page for details.
   (1) In-depth energy saving solutions
   (2) Enhanced insulation
   (3) Advanced energy management (ECHONET Lite)
   (4) Application of EV

2. Clear target set for 2030
   "ZEH" should be achieved as a total among all the newly-built single-family houses, ready or custom-built.

3. Closer coordination among policy programs and modification of upper targets.
   (1) Renewable energy policy
   (2) Policies for coordination and upgrade of the grid, incl. DR and VPP
   (3) Policies for controlling global warming
   (4) Houses with other solutions than energy saving (insulation) (IoT, LCCM, etc.)
ZEN+: Definition

Subsidy target technology

<table>
<thead>
<tr>
<th></th>
<th>Insulation</th>
<th>EE</th>
<th>IEE+RE</th>
<th>Promote self-consumption</th>
<th>Subsidy FY2018</th>
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</thead>
<tbody>
<tr>
<td><strong>ZEH+</strong></td>
<td>Standard for insulation for ZEH</td>
<td><strong>25%</strong></td>
<td>100%</td>
<td>2 options out of 3 above</td>
<td><strong>115万円/戸</strong></td>
</tr>
<tr>
<td><strong>ZEH</strong></td>
<td></td>
<td>20%</td>
<td></td>
<td></td>
<td>70万円/戸</td>
</tr>
</tbody>
</table>

Source: Extracts from materials released by METI

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Provide support for demonstration of **ZEH+, an initiative for increasing self-consumption of power.**

Besides a 25% energy saving (20% for ZEH), at least two of the three actions should be implemented to demonstrate effectiveness for more self-consumption of renewable energy: (1) Further enhancement of envelope thermal performance; (2) Application of advanced energy management for controlling water heaters and other appliances; and (3) Charging of EVs.

As ZEH+ is defined as less energy consuming by 5%, smaller PV installation is required.
Curtailment seems imminent by Kyushu Electric Power: Electricity Generation in Kyushu (May 3, 2018)

Power Supply-Demand in Kyushu area (3 May, 2018)
Renewables 96%(Solar 81%, Hydro 11%, Geo 3%)

Soon, at peak hours for solar PV output:

**Demand < Supply** and **Balancing mechanism required.**

**Priority Dispatching Rules (extracts)**

- Thermal plants shut down
- Pumped-storage stations started
- Cross-regional coordination
- Mega solar Curtailment
- Household solar Curtailment

**Instead of Curtailment**

**ZEH+ for Self-Consumption!**
ZEH+ is expected to provide the grid with regulating capacity. Participation in DR and VPP will deliver economic benefits.

**DR: Demand Response**

**VPP: Virtual Power Plant**

Source: Agency for Natural Resources and Energy (METI) website
RZEH+ Contributes Regulating Capacity to the Grid.

Smart house realized by “ECHONET”

Source: ECHONET Consortium (Reprint Permission: # 0174)
Thank You.

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