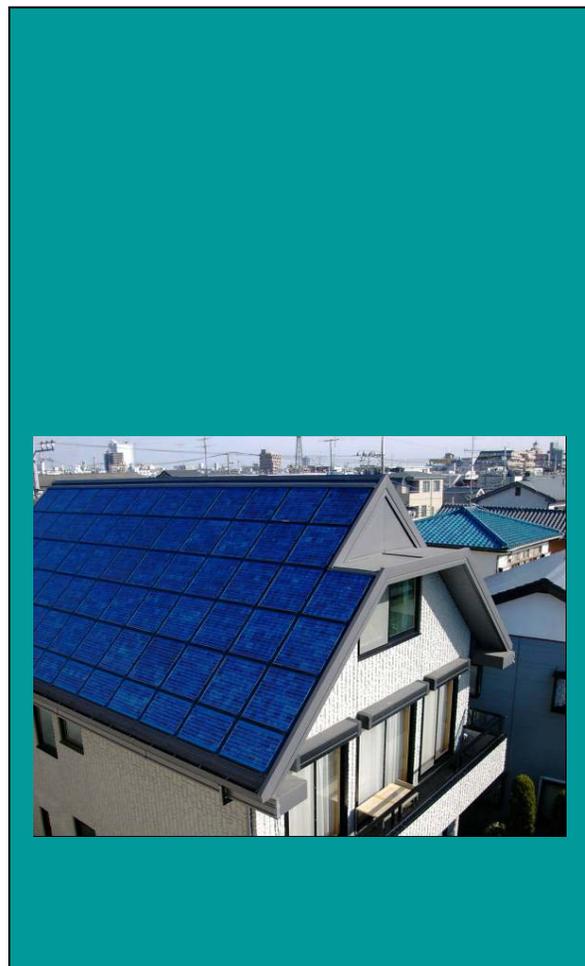
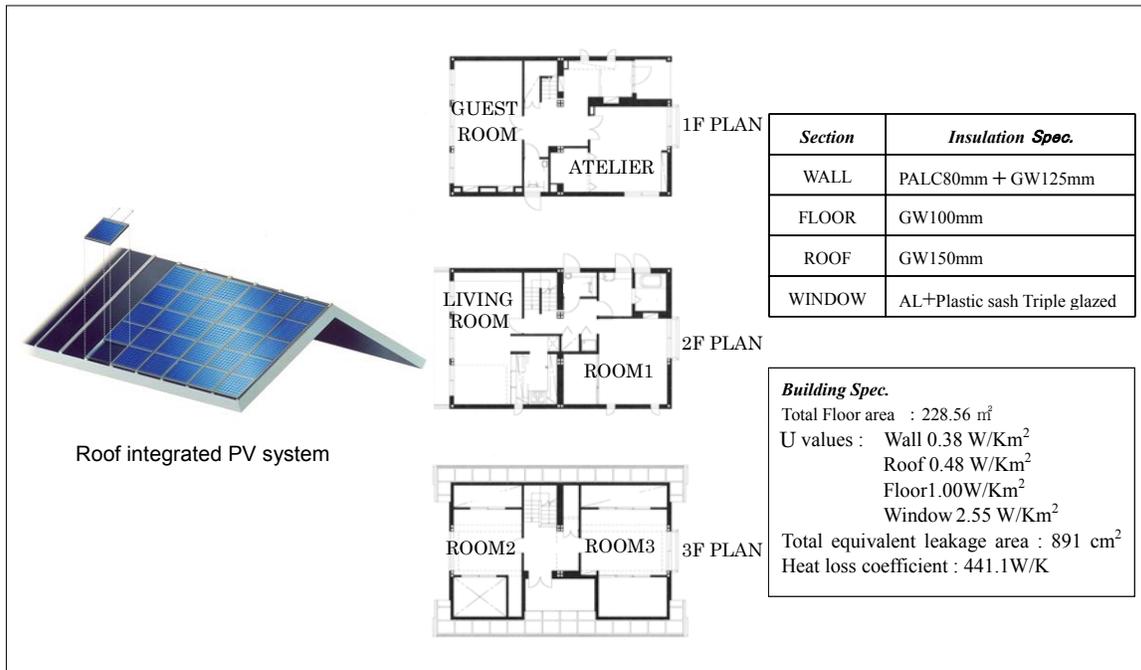


A ZERO ENERGY HOUSE
(a low energy house with PV
system) in
Kanagawa, Japan





The project

This house was built at Kanagawa pref. (near Tokyo) as a zero energy house. The building is a single-family house private development. The Zero Energy House (named Hybrid-Z), was developed through technology and the experience accumulated by Misawa Home, who are a housing developer that specializes in this kind of development.

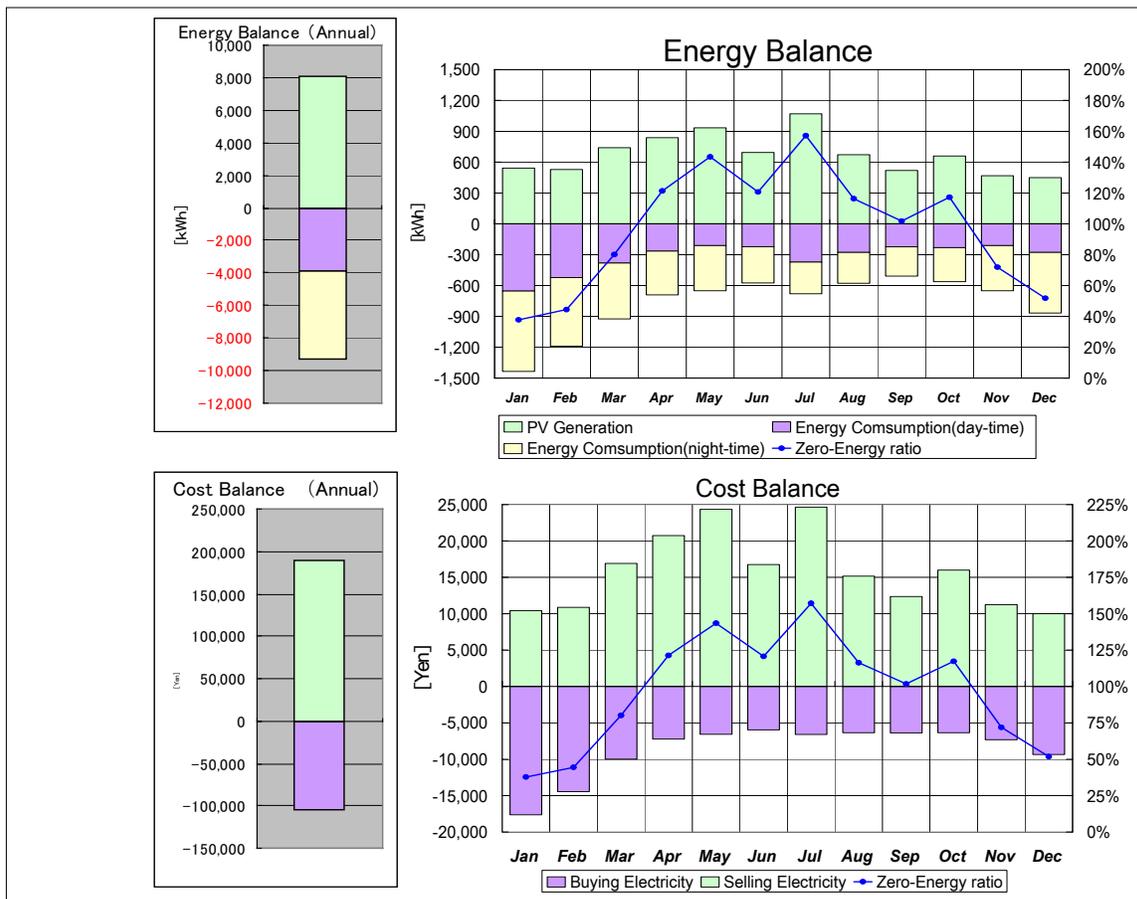
Objectives - Goals

The main goal for the home was to create a comfortable living space with a low energy demand. It is impossible to enjoy comfortable indoor life through all seasons due to Japanese climate condition without some technological intervention. Misawa Homes to ensure that a development has a energy demand close to zero by the adoption of energy saving technology and reduction of energy consumption. We define this house as "Zero Energy House". The home aims to not be reliant on external sources of energy from, for example, gas and oil. This means supplying energy required for living by renewable sources of energy such as photovoltaic power generating system.

The photovoltaic power generating system can produce the energy equivalent to consumption energy. The photovoltaic power generating system should not be the only solution, we should also seek to reduce our consumption. Improvement of thermal insulation performance and the design of a home that reduces energy consumption of the air conditioning is important. Using high efficiency products for air conditioning, water supply and kitchen reduces consumption of energy in this home also. It is necessary, however, that this technology is at a reasonable price for wide spread use. Therefore an affordable price is a main goal for the project. After considering all the factors, "Zero Energy House" is designed and built by Misawa Home.

Building construction

The outer wall covering of this house, Hybrid Z, which is a laminated wall of 234mm thick based on new ceramics (PALC) of 80mm thick, wraps around the whole house. Windows, which have great thermal loss, employ triple glass sash, which improves thermal insulation and air-tightness of housing itself. Realizing a house that is naturally kept cool in summer and warm in winter positively serves to suppress excessive energy consumption in air conditioning.



Technical systems

The PV system on the roof of this house has a 11.3kW value over all (east side:5.2kW, west side :6.1kW). This is made of reinforced glass surface and crystallized silicon has a high durability, and never causes harmful substance or noise in generating power. When the electricity generated by photovoltaic power generation system is in excess of energy consumed in the house, surplus electricity is automatically sold to power companies. It is the very ideal system in terms of environmental preservation as well as for enriched living. Energy-saving technology such as this is the base for realizing zero-energy homes,. Further energy-saving technology, for example in the air conditioning, is provided by a heat pump system and the COP is over 3.0, in hot water supply, the hot-water is heated during the night to benefit from lower electricity costs and reduces power consumption at the day-time at peak-cost. In kitchens, IH portable cooking heater is adopted with thermal efficiency as high as 90% and less waste heat, contributing to improvement of efficiency of equipment.

Energy performance

Actual data that makes reference to the energy performance of this house are shown in the above figures. The energy consumption of this house is 8,500kWh/year whereas the PV generation is 8,000kWh/year. The PV generation, therefore, covers 94% of the consumption.

(Electricity)

Heating	1,600kWh
Cooling	1,200kWh
Domestic hot water	2,100kWh
Lighting and appliances	4,000kWh
Total	8,900kWh

Costs

This house was subsidized from New Energy Foundation in accordance with the subsidy program for residential PV system. The subsidy ratio of this program is 1/3 in the total installation cost. In result, the total additional cost compared to a reference standard house is 7 million yen, and the saving running cost is about 300,000yen per year.

Planning tools for LCA, energy performance, solar energy design and more

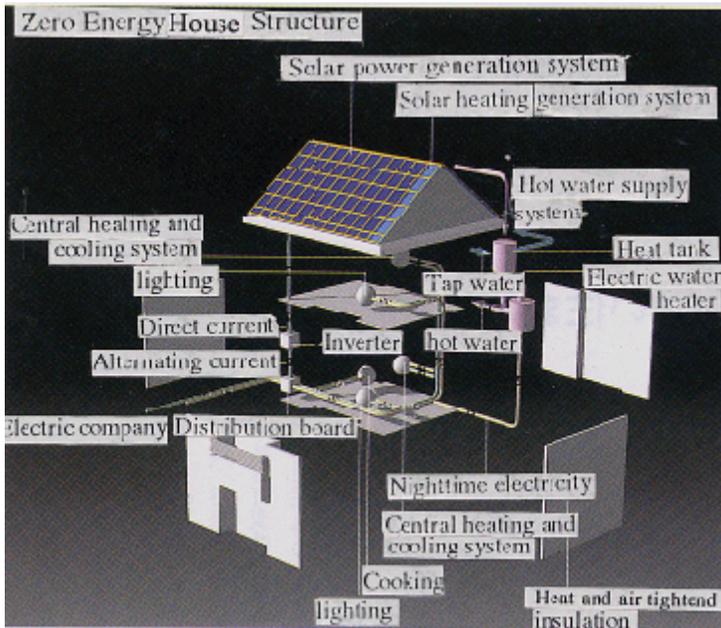
Air conditioning load calculation software "SMASH"
Parametric analysis method (PV generation)

Other information

H Ida, I Ohta (Misawa Homes Institute of R&D co., Ltd);
"Zero Energy Home", ECO DESIGN 2001 in Tokyo

Marketing strategy

Hybrid-Z, which satisfies basic condition of "Photovoltaic power generation system all over the roof" "High thermal insulation" and "Equipment with high efficiency", was authorized as the first zero-energy house by the Institute for Building Environment and Energy Conservation (IBEC).



Direct current electricity generated by the solar power generation system is converted to alternating current by the inverter. Equipments in the house are all high-performance ones and can utilize the solar power.