

The Fujinosono Energy System

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Problem

The Children of Fujinosono on March 11 watched the earthquake crack their home. The building became a threat and lost its shelter function. After March 11, the public infrastructure had stopped to work. There was no water, no electricity, lack of fuel. Hourly, then daily aftershocks and Tohoku winter evenings in dark, freezing rooms put a lot of additional physical and psychological strain on the kids and staff of Fujinosono. Outside effects, not under control by Fujinosono, worsened the bad situation inside the house. Because the house depended on outside supplies, it took weeks to regain technically normal living. Then, even normal living in Fujinosono was not so comfortable. Ichinoseki has hot summers, cold winters, humid spring and fall. Because the old house was not insulated, drafty, even with energy cost of 50.000 Euro per year it was impossible to maintain comfort. Kids had to be asked for "gaman" to keep running cost under control. We can do much better than that.

Goal

The Fujinosono Energy System combines protection, comfortable living, environmental sanity, and economy, in both normal and emergency situations.

Concept

The key concept is Energy Self Sufficiency, realized with passive house grade building and solar energy. Energy self sufficiency means independence from blackouts. Energy self sufficiency means short and long term sustainability and scalability. Energy self sufficiency means running cost zero and carbon neutral operation.

Implementation

The Energy System of Fujinosono is actually quite simple.

Passive House Grade Building

First, we make it a good house. Good insulation, good windows, shading, natural light. Most of Japan's energy problem is not an energy problem but an architecture problem. We build to passive house standards. With low temperature permanent and full floor radiant heating. Don't let the house get hot in summer, don't let the house get cold in winter. We use heat recovery in ventilation. Ventilation for 100 people at 2 degC outside temperature then costs 2kW instead of 20kW heat loss. We use heat recovery of waste water. The residual heat of showers and baths is good enough for floor heating or pre-heating of warm water. I estimate that this reduces hot water energy demand by 1/3rd.

Choice of Energy Supply

Second, we cut all external energy supply lines. So we don't use nuclear power or fossil fuels. We don't dump nuclear waste at the kids and grandchildren of the kids of Fujinosono, Japan, or the world. We

dont spend money on fossile fuels which cause global warming and where a big part of the money creates more injustice and violence in the world. By cutting the energy supply lines we force ourselves to stay local, be self sufficient and be harmless, locally and globally.

Cooking: Propane

Cooking is the exception to confirm the rule: For cooking we use the fossile fuel propane gas. Propane gas comes in bottles. It is storable and portable, very important qualities during emergencies.

Solar Energy

Having a good building, we get the remaining energy from the sun. After all, Japan is the country of the rising sun.

Solar Thermal

We collect solar heat and store it in heat tanks, then use the heat for hot water and heating. We design the solar thermal system so that it covers average heat needs all year long, about 300m² of collectors and 120m³ heat tanks.

Biomass

For periods of really cold days, or when we have more people than usual, we heat the solar tanks with clean burning woodgas boilers. In winter, people will like the fire. The visible fire will give physical and emotional warmth to the kids of Fujinosono. We design the biomass heat sources so big that they can warm the building without sunshine, Total biomass heat supply is about 200kW.

Wood

Iwate is a green country. The City of Ichinoseki provides the fuel for free. Waste wood from forest maintenance. We turn the waste into a storable resource for comfortable living.

RiceHusk

Iwate is a rice producer. Another local fuel is rice husk, which we can use in an automated rice husk boiler. Usually rice husk is just burnt outside. We reduce pollution and make it into a resource.

Solar Electric

For evening lighting and electric devices important for normal operation of Fujinosono, we use standalone solar electricity, photovoltaics. 10W electricity gives light for one person. 2W electricity moves 1kW of heat with solar or heating circulation pumps. Battery capacity is planned at 20kWh. Total photovoltaics is about 50kWp, For high efficiency, any surplus is fed into the utility grid.

Solar Mobility

I also hope we will be able to use our own solar electricity to operate an electric car. As emergency vehicle when fuel is hard to get, as after March 11, and as clean everyday short range commuter. Energy self sufficient mobility.

Biomass Cogeneration

For electricity supply independent of sunshine, we use a generator. Not an ordinary generator, but a wood fired, external combustion, stirling engine. This cogeneration unit burns wood and produces 3kW electricity, 30kW heat. It uses fire wood, renewable, local energy. Solar energy in cans, produced by photosynthesis, This wood fired stirling engine cogeneration plant is produced in Iwate.

Solar Cooling / Dehumidification

For summer cooling, we use a solar thermal chiller. It makes use of the summer surplus heat of our solar system and produces about 10kW cold water for air drying and cooling.

Beyond the building

International help and international technology shape Fujinosono in cooperation with locally produced key components. Heat tanks from Sukagawa/Fukushima, Heat exchangers from Niigata, Humidity controllers from Shirakawa/Fukushima, Rice husk boilers from Koriyama/Fukushima, The biomass stirling cogeneration plants produced in Iwate. I hope, with projects following the steps of Fujinosono, Tohoku will grow a new industry of natural energy devices. New industry especially where the Fukushima nuclear pollution made agriculture and fishing so difficult.

The Kids

The kids of Fujinosono will be part of this. Each "family" unit will learn to operate its own complete solar thermal system, biomass boiler, and independent solar electric system. I am happy to report here that the kids of Fujinosono will even build their own solar thermal collectors: Emanuel Brender of Batec Solar in Denmark and Akira Hoshi of Ichinoseki Politechnic agreed to do a workshop in Ichinoseki to enable the kids to manufacture their own industrial quality solar collectors which we will use in our building.

Thanks

I am confident that the kids will be very proud of their new home and very proud of their own achievement. This will be part of their future. I am grateful to be a member of this great team. You made this possible. I want to thank you all for your wonderful support of the Children of Fujinosono.

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