

Green Solar Regions



Aim of the Project:

The "Green Solar Regions" project has been realised from January 2000 to September 2003 with demonstration project activities in Denmark, Poland and Italy. The project has been part of the ongoing "European Green Cities" co-operation, which started in 1996 with realisation of 11 different solar low energy building projects until year 2000. See also www.europeangreencities.com

It has been the aim of the Green Solar Regions project to demonstrate how to optimise use of innovative solar energy technologies together with energy savings on optimised energy supply for different types of buildings. The aim was to start an urban ecology management process as part of a common European Green Solar Cities project. Here a co-operation between builders, cities, contractors, suppliers/producers and utilities was aimed at.

CO2 neutral Low-energy Wooden House



A small 32 m² mobile low-energy wood house has been designed and built. It has paper granulate insulation, and a new thing is that the wood construction system has been constructed in a way to make the house completely airtight and without cold bridges. Monitoring tests of air leaks of the house have shown the leaks to be so small, that they nearly cannot be measured by Cenergia's "blower door test" equipment. Besides a thermo photography shows, that there is in fact no cold bridges at all.

Further more energy windows have been used, and as regards ventilation a high-efficient heat recovery ventilation

(HRV). On the metallic roof facing south PV modules are installed. This system has been developed by the Finnish manufacturer Rannilla, in such a way that the intake air is directed into a gap under the total roof so a solar heating of the ventilation air is possible.

At the same time the idea is that the PV modules (about 13 m²) produce electricity, which on a yearly basis makes the house CO₂-neutral as regards heating and ventilation.

Cenergia Energy Consultants
Sct. Jacobs Vej 4
DK 2750 Ballerup
Tel.: +45 4466 0099
Fax: +45 4466 0136
www.cenergia.dk



Heat Recovery Ventilation System

In co-operation with the Danish company EcoVent it has been possible to develop a new type of thin and compact heat recovery ventilation unit, HRV, for housing projects which has a thickness of only 15 cm, so it is easy to integrate in most housing units.

At the same time the electricity use is only 20-30 W depending on the air volume and the noise level is below 25 dB which is very difficult to hear. The heat recovery efficiency is designed to be at least 85% with airflow rates from 50-130 m³ per hour.

Supplier: EcoVent, Rudolfgårdsvej 19, 8260 Viby J.
Contact: John Steen Jensen.
Tel.: +45 7023 8802
Fax: +45 7023 2180
E-mail: jsj@ecovent.dk
Web: www.ecovent.com



Green Solar Regions



Valby Communal Building:

On the roof of the communal building a console with 18 amorphous PV-modules (5,2 m²) has been installed. The console has an inclination of 30° from horizontal and the solar cells are oriented towards south. Under the PV-modules there is a so-called Canadian solar wall, consisting of a trapezoidal plate with holes, where air for ventilation is directed through. In this way ventilation air is preheated, and the solar cells are cooled. The solar cells produce electricity to a ventilation system with heat recovery.

The ventilation system ventilates a large conference room just beneath the roof. The heat exchanger unit and ventilation aggregates etc. are placed under the console, and from the ventilation box on the roof the ventilation channels are brought down to the conference room. A control box regulates the rotational speed of the ventilators and with that also the air volume flow rate. The fans can be regulated manually. There is a basis ventilation of 360 m³/h and the maximum air volume flow rate is 3000 m³/h.



Design Study Valby Skole



Valby Communal building

Folehaven:



A solar cell gable with preheating of ventilation air has been developed and installed on the south oriented gable of the laundry in Folehaven. The gable is oriented 10° from south towards east.

The PV gable consists of 76 vertically placed PV-modules with a total installed power of 2,44 kWp and a total area of approx. 32,9 m². Furthermore 8 PV-modules has been installed along the side of the solar cell field on the roof with a slope of approx. 30° facing east and west. The PV-modules on the roof has a power of 0,55 kWp and a total area of approx. 8,1 m².

Munkesøgård:

The Munkesøgård settlement consists of 5 different dwelling groups with 20 apartments in each. Three of the dwelling groups are public housings for young people, seniors and families. The other two groups are of type ownership and multi-ownership. The main idea of Munkesøgård building was that the building should be most possible sustainable regarding to the environment. The tenants have during the whole progress participated actively in decisions regarding to the design of the building and it has during whole time been necessary to find the solutions, which meet the demands of the tenants best possible both for environment and economy. The building consists of different experimental initiative, a result of compromises, to fulfil the demands of the tenants regarding to environment, economy, ecology, sustainability and well-being.



Green Solar Regions



Sustainable urban development in Glostrup, Roskilde and Copenhagen:

Green Build presents an operational tool for sustainability evaluations to decision makers, builders, engineers and other actors involved in designing building projects of all sizes, from single houses up to whole urban areas.

The Green Build energy and environmental rating system adopts a combined building and urban area related approach reflecting:

- Methods of sustainable urban management
- Urban development area, including site, infrastructure, energy/supply and immediate environment
- Waste management
- Materials;
- Energy efficiency and renewable energy
- Indoor climate conditions
- Water

The idea about development of an energy and environmental rating system took its start at the aim to make a classification system (by rating) of healthy building materials for in-door use in connection to the European Green Cities co-operation. This work was made in a co-operation between environmental co-ordinator, Jan Kaare Oxlund and architect Klaus Boyer Rasmussen, SolarVent and Peder Vejsig Pedersen from Cenergia. And it was after a while recognised that the best way to promote healthy building materials was by using an "energy and environmental point" rating system, which we have named "Green Build".

Poland:

Solar heating system on hospital in Rawicz, Poland

The solar heating installation in Rawicz hospital was designed for preparing the domestic hot water for local use. It interacts with existing installations of DHW. The idea was to install 110 m² collectors, but the energy audit showed that it was more economically efficient with an installation two times bigger. Consequently 204 m² collectors were installed for about 18 m³ daily hot water preparation. The energy audit done by NAPE showed, that it is economically and energy efficient to install 75 solar collectors, with 234,8 m². This allow to reduce the demand for hot water from the central system about 45% - from 3.650 GJ/z to 2006,5 GJ/a.

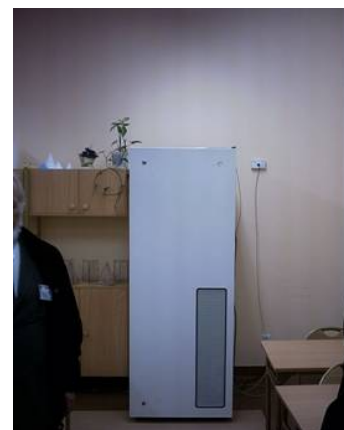


PV Assisted Ventilation Solutions for School in Wasaw, Poland



PV-operated ventilation system with heat recovery is used in one of Polish secondary schools. A co-operation has been made with the city of Piaseczno concerning use of a PV-VENT system. The PV-VENT system with PV assisted heat recovery ventilation is a completely new idea to be used in Poland. The pilot installation should allow estimating the heat savings and improvement of indoor air climate.

Ecomaster R 800 is a heat recovery ventilation unit which has been developed for decentralised school ventilation. This means that the ventilation unit is used for only one class room and can be individually controlled here. 80 – 90 % of the energy from the exhaust air is transferred to the fresh inlet air by help of the very efficient counter flow heat exchanger in aluminium from Ecovent. The exchange of air is made by help of energy efficient low energy fans, which can supply up to 800 m³ per hour of air in 5 different fan speed levels.



Green Solar Regions



Italy:

The demonstration project in Italy consisted in the realisation of a “prototype building” based on energy saving and environmental respect criteria according to the bio climatic architecture requirements. The project consisted in a building block with 5 staircases and 2 heated floors for a total of 20 apartments. In the same area a similar building (20 apartments too and same exposition) has been built following the traditional building practice, in order to compare the energy efficiency of the two buildings.

The innovative interventions were:

- Centralised low temperature heating system with condensing boiler and radiant panels;
- Solar assisted heat recovery mechanical ventilation system for the apartments by means of a passive solar system;
- Water solar collectors for DHW production;
- PV system for electricity production;
- Energy meter system connected to an EMS;
- Ecological building material guaranteed by certification;
- Low energy lighting system;
- Extra insulation of the building envelope;
- Water saving (recovery system of the raining water and grey domestic water).

Conclusion:

There has been a lot of interesting results from the Green Solar Regions project in Denmark, Poland and Italy. Here the work on the demonstration projects have been supported. But one of the very interesting aspects of the project has been the horizontal oriented work on how you can affect sustainable urban planning and building. However, the conclusion is that it is still very difficult to make a big influence on how building projects are realised due to many obstacles like engineers and architects who do not want to be bothered with extra work focusing on new sustainable building and energy efficiency, and builders who are only interested in their budget and time schedule even though they say that they want to have energy efficient and sustainable building.



With the new EU - Energy Performance Directive for Buildings we, however, now can see a way ahead, and that is to:

1. Develop very clear quality standards, e.g. like performance requirements and check systems for best available technologies, and
2. Introduce environmental quality together with energy quality in a total sustainable building process, where building projects with the best cost effective energy and environmental quality can be promoted by clear preferably certified quality building systems for the users

Partners

Cenergia Energy Consultants, DENMARK
Green City Denmark, DENMARK
Municipality of Roskilde, DENMARK
National Energy Conservation Agency, POLAND
Municipality of Rawicz, POLAND
Metec Engineering, ITALY
ATC Torino (public housing association), ITALY

The project is supported by EU - DG TREN