

# GreenBuilding

enhanced energy efficiency for non-residential buildings

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# The GreenBuilding Programme

Energy efficiency plays a key role in European energy policies. It improves the security of energy supply, strengthens the competitiveness of European businesses and contributes to fulfilling the Kyoto commitments for the reduction of greenhouse gases.

The building sector accounts for more than 40% of the final energy demand in Europe. One third of this demand can be attributed to non-residential buildings, such as offices, factories, schools, hospitals or hotels. At the same time, some of the largest potentials for energy savings can be exploited by e.g. improving heating and cooling systems of buildings as well as by optimising the building envelope. A strong effort is therefore needed by all Europeans, particularly by private and public organisations, to realise this substantial potential for energy savings.

GreenBuilding is a voluntary programme which was initiated by the European Commission in 2005. The programme intends to raise aware-

ness and trigger additional investments in energy efficiency and renewable energies among owners of non-residential buildings and to give advice and public recognition to those, who are ready to implement ambitious measures in their buildings, resulting in substantial energy savings. These savings not only contribute to the European fight against climate change, but make also good business sense as it will reduce energy costs.

On the following pages, please find examples of successful GreenBuilding projects from nine European countries. Be inspired by the large variety of energy efficiency measures performed in the buildings of various types all over Europe. And, most important, consider to become a GreenBuilding Partner, showing your commitment to contribute to the mitigation of climate change.

The brochure will inform you about what it takes and whom to contact.

Paolo Bertoldi  
European Commission, Joint Research Centre

# how to join **GreenBuilding**

## **Together for Energy Efficiency**

GreenBuilding gives information about energy efficiency and renewable energies in non-residential buildings, encourage building owners to participate in the programme and create publicity and recognition for those, who successfully participate in the programme.

Initiated by the European Commission and implemented with the help of National Contact Points in presently 10 European countries (see page 12), GreenBuilding is the most important campaign for the promotion of energy efficiency in non-residential buildings in Europe.

## **Who can participate in GreenBuilding?**

- Owners of non-residential buildings; they can become **GreenBuilding Partner**.
- Businesses from the building sector, contributing to energy efficiency in the non-residential building sector with their products or services; they can become **GreenBuilding Endorser**.

The participation in GreenBuilding is free of charge.

## **How to become GreenBuilding Partner**

For becoming GreenBuilding Partner, you implement energy efficiency measures in your building(s):

- Refurbishment of existing non-residential building(s): primary energy consumption reduced by at least 25% (if economically viable), total or related to the end-use or subsystem, which is being modernised.
- New non-residential building(s): primary energy consumption 25% below building standard (if economically viable) or below the consumption of “conventional” buildings presently constructed.
- Building(s) already renovated or refurbished (after 01.01.2000): primary energy consumption reduced by at least 25% or the building(s) consume 25% less energy than required by the national building standard in force at that time.

There are three steps in becoming a GreenBuilding Partner:

1. Performing an Energy Audit
2. Development and submission of an Action-Plan based on the audit, describing the measures to be performed
3. Reporting about the success of the Action-Plan implementation



#### **How to become GreenBuilding Endorser**

Businesses with products or services contributing to energy efficiency in the non-residential building sector can become GreenBuilding Endorser, if they successfully assist one building-owner to join the GreenBuilding Programme and actively promote GreenBuilding among their customers.

Further information on the participation in GreenBuilding is available in the downloadable Partner and Endorser Guideline on the internet site [www.eu-greenbuilding.org](http://www.eu-greenbuilding.org).

#### **How GreenBuilding assists you**

On the GreenBuilding website you will find the GreenBuilding guidelines and the technical modules, the newsletter registration, the Best Practice Inventory and also the links to the GreenBuilding websites in national language. The National Contact Points will assist you in joining GreenBuilding.

#### **How you gain from GreenBuilding**

There are many benefits in the participation in GreenBuilding, e.g.

- Saving money through reduced energy bills
- Increasing the value of the building
- Improving working conditions
- Growing attention of consumers and investors
- Enhanced publicity through press coverings, presentations on the internet, brochures and a catalogue of success stories
- The right to use the GreenBuilding logo.

# La Vola



The environmental services company LA VOLA is the first Spanish GreenBuilding Partner. LA VOLA got the Partner Status in July 2006 with its new office building inaugurated a few months before. The building is situated in Manlleu, in the province of Barcelona. With a total area of 1.100 m<sup>2</sup>, the building hosts approximately 50 persons.

A reduction of the total primary energy demand of the building by more than 30% has been obtained compared to a conventional office building due to an optimised building envelope, a highly efficient lighting system, low consuming electrical equipments, use of solar energy for DHW and electricity production, high efficiency heat and cold production systems, and a centralised energy management system permitting to adapt the energy consumption to the thermal load of the building at each moment.

## Building data

### Building type

Office Building (New Building)

### Size

1.100 m<sup>2</sup>

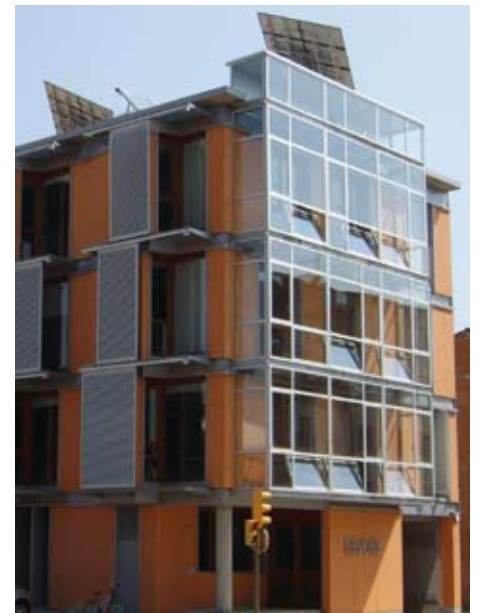
### Energy savings

- 31% primary energy savings compared to conventional office building
- Electricity consumption reduced by 27%
- Gas consumption reduced by 40 %
- CO<sub>2</sub> savings: 13.500 kg CO<sub>2</sub> / a

### Measures performed

- Optimised building envelope (ventilated facade, automated movable shading devices, high insulation levels, green roof...)
- Heat and cold distribution by radiant floor
- Heat recovery systems and air preheating in greenhouse facade
- Cross-ventilation with interior patio
- Air quality control sensors for optimised air renovation

- High efficiency lighting system and low consuming lifts
- Photovoltaic and solar thermal energy production
- Centralised energy management system



# Câmara Municipal de Lisboa



Câmara Municipal de Lisboa (CML), the local authority responsible for the management of the Lisbon municipality, became the first Portuguese GreenBuilding Partner in July 2006. The candidature of CML was based on a set of 5 new municipal swimming pools built in 2005/2006 with a total area of 14.185 m<sup>2</sup> and designed to integrate energy efficient technologies, including renewables (solar thermal), as well as a modern energy management system.

## Building data

### Building type

Swimming pool (Piscina Municipal do Vale do Fundão, New Building)

### Size

2.054 m<sup>2</sup> on 3 floors

### Year of construction

2005

### Energy savings

- Integration of 120 thermal solar collectors that will guarantee two thirds of hot water de-

- mand including facilities and services (restaurant, showers and general public toilet).
- Installation of electronic ballasts to achieve lighting electricity savings of about 30 %
- 4 way heat pumps (free-cooling system) to heat the main hall, allowing reductions of approximately 35% in the consumption of electric energy and thermal energy
- Incorporation of passive solar measures (double glazing, external shading devices, etc.), resulting in energy savings of more than 30 %



# HUSÖ



## Fastighets AB

The first Swedish GreenBuilding Partner is HUSÖ Fastighets AB. HUSÖ is a private property owner with both residential and non-residential buildings in Söderhamn, Hudiksvall and Bollnäs. The buildings HUSÖ joins GreenBuilding with a police station situated in Söderhamn and a Swedish district courthouse in Hudiksvall.

The district courthouse was built in 1909 and renovated in 2005. It has a total area of 2.006 m<sup>2</sup> and is heated by district heating, based on almost 100 % renewable fuels. Before the renovation, the building was heated with oil. In the process the renovation energy efficiency measures were implemented, resulting in energy savings of 131.950 kWh per year.

Styr och ställer AB has carried out the energy audits for the two buildings and is currently helping HUSÖ to implement the energy efficiency measures in the police station. The expected energy savings in this building are 25 %. Styr och ställer AB is the first accepted GreenBuilding Endorser from Sweden.

### Building data



#### Building type

Office Building (Courthouse in Hudiksvall, Modernisation)

#### Size

2.006 m<sup>2</sup>

#### Energy savings

- The heating energy demand was reduced by 30 % (105.000 kWh) per year
- The electricity demand for ventilation was reduced by 68 % (13.000 kWh) per year
- The total energy savings amount to 131.950 kWh per year

#### Measures performed

- Change from oil to district heating, using 99,7 % renewable fuels
- Ventilation with 80 % heat recovery
- Computerised control system for heating and ventilation
- Improved insulation



# Protestant church of Stadl Paura



The protestant church of Stadl Paura in Upper Austria was built in 1974 and was renovated in 2005. The renovation which amounted to costs about 70.000 Euro, was organized and financed with substantial support from the local rectorate. An energy certificate describes the situation before and after the renovation. The church became GreenBuilding Partner in March 2006.

### Building data



#### Building type

Church (Modernisation)

#### Measures performed

- 60 m<sup>2</sup> solar heating system with 5.700 l water storage for the church and the parsonage
- The roof of the church was insulated with 25 cm cellulose
- New lighting system with reduced power load (- 50 %)
- Monitoring: several heat meters, which are monitored monthly

#### Energy savings

- The electricity consumption of both buildings was reduced by more than 50 %
- Reduction of electricity consumption: 4.600 kWh / a
- CO<sub>2</sub> savings: 4.630 kg CO<sub>2</sub> / a



# City of Nuremberg



The City of Nuremberg, which became the first German GreenBuilding Partner in March 2006, received the partner status for the refurbishment of the 19th century administration and cantina building of the Nuremberg abattoir. In the conversion of the 3-storey building to a nursery school with an information centre, the energetic standard of the building in neo-renaissance style has been enhanced significantly.

A reduction of the total primary energy demand by more than 80 % has been achieved due to an optimised building envelope, a very efficient lighting system and the installation of a highly efficient condensing boiler.

The building's energy demand is 32 % below the German building regulations and even 5 % below the requirements for comparable new buildings. The thermographic analysis, which was performed after the refurbishment measures were completed, proves the excellent thermal standard of the building.

## Building data

### Building type

Office Building (Modernisation)

### Size

1.862 m<sup>2</sup>



Nursery School Philipp-Körber-Weg 2 in Nuremberg



### Energy savings

- More than 80 % primary energy savings compared to before the renovation
- Heating energy demand reduced by 75 %
- CO<sub>2</sub> savings: 80.000 kg CO<sub>2</sub> / a

### Measures performed

- Installation of an efficient gas condensing boiler for heating and warm water supply (80 kW, 350 litre storage tank)
- Floor heating in ground floor and first floor with single room regulation, steel panel radiators in the top floor
- Installation of energy saving fluorescent tubes with electronic ballasts
- Installation of wood frame windows and doors with enhanced thermal protection (U 1,5 – 1,6)
- Interior insulation of all outer walls (U 0,5 - 0,7)
- Insulation of the cellar ceiling (U 0,25)
- Insulation of the outer walls (U 0,25 – 0,7)
- Insulation of the roof (U 0,25)



# University of Arts Berlin



The University of Arts of Berlin received the GreenBuilding Partner Status in July 2006. The energy supply systems in all 9 buildings of the University have been refurbished. The buildings are partly historical and partly modern – with construction years between 1880 and 1988. The purposes range from concert and theatre halls to auditories and administration buildings.

Siemens Building Technologies (SBT) will realise energy saving measures within the Energy Saving Partnerships (ESP) in Berlin. ESP was developed and implemented in Berlin as a model for efficient Performance Contracting with the aim of achieving ambitious objectives for climate protection and reducing energy costs in the face of a tight budgetary position.

## Building data

### Building type

Administration buildings (University, Modernisation)

### Size

52.000 m<sup>2</sup> (9 buildings)

### Energy savings

- 4.870 MWh / a
- CO<sub>2</sub> savings: 1.180.000 kg CO<sub>2</sub> / a

### Measures performed

- Air conditioning & ventilation
- Heating & hot water production
- Lighting
- Control system
- Contracting

SBT invested about 930.000 € in refurbishments of the heating supply system, insulation of pipelines, optimisation of hot water production, air conditioning, electronic devices as well as in lighting. Through these investments and the optimisation of the system, app. 28 % of the total energy consumption as well as about 238.000 € energy costs are saved per year.



# Menerga d.o.o. Maribor



Menerga d.o.o. from Maribor is the first Green Building partner from Slovenia. It is a private company working on the design of energy efficient ventilation and heat recovery systems. In 2004 they have moved in a newly built office building. The extra costs of the energy improvement measures amounted to 61.600 €.

## Building data

### Building type

Office building (New Building)

### Size

3.117 m<sup>2</sup>  
5 Storeys

### Energy savings

- 8.920 €
- Energy 224,8 MWh (62 %)
- CO<sub>2</sub> savings: 46.400 kg CO<sub>2</sub>/ a

### Measures performed

- Building envelope with improved insulation
- Ventilation systems with 90% heat recuperation
- Ground water heatpump
- Heating and cooling system, in connection with thermal activation of a concrete construction
- Energy efficient lighting
- Intelligent central control system



www.menerga.si

# Piraeus Bank



Piraeus Bank is one of the largest private banks in Greece, expected to have 600 branch offices in operation in Greece and the Balkans by end 2007. It is participating in several energy related projects. It has been a Greenlight member since 2002 – and has received numerous National awards.

In 2005, Piraeus Bank joined GreenBuilding as a Partner for the renovation of one of its main office buildings in central Athens. This building with 7 floors above the ground and 5 underground garage floors has a total area of 19.250 m<sup>2</sup>. For the renovation, an energy design study was realised, which included the examination of energy saving potentials for the complete refurbishment of its systems - refrigeration, lighting, shading, control, ventilation and electricity compensation systems. Through the study, the following seven interventions, with the equivalent energy saving, were decided to be realised.

## Building data

### Heat Recovery

- Heat recovery from conditioned air stream mechanically exhausted from the building

### Window shades

- Installation of regulated venetian blinds in the internal space. Control of lighting conditions

### Cooling Towers

- Increase cooling tower capacity

### Artificial lighting level control

- Utilisation of natural lighting using dimmable ballasts. Sensors used to measure local lighting level

### Building Management System

- Installation of BEMS. Monitoring the indoor temperature, humidity etc., and controlling relevant subsystems (heating, cooling, lighting etc.)

### Ventilation

- System for measuring the quality of air in the underground parking. It will control fans operation based on the level of pollutant gases (as CO)



### Power factor correction

Add capacitor systems at the main electricity supply board

The renovation is expected to be complete by end of 2006 and the total energy savings are expected to exceed 475 MWh / year



www.piraeusbank.gr



## I.T.I.S. „C. Zuccante“

The Provincia di Venezia is a provincial planning authority for Venice and the surrounding areas. The Provincia di Venezia also manages almost one hundred educational buildings, as well as a number of fire stations, barracks and many administrative buildings. In the last year the Provincia di Venezia has launched a general program to improve efficiency in energy end uses (gas, electricity and water) in the buildings it manages. Savings have already been achieved by improving and extending centralized control and monitoring of heating energy consumptions. In order to establish a guiding example for future renovations a pilot project has been developed for the administrative block of a secondary school, I.T.I.S. “C. Zuccante” located in Mestre (VE). The Provincia di Venezia and Rockwool Italia S.p.A. achieved respectively GreenBuilding Partner and Endorser status in October 2006. The energy audit, which includes thermodynamic building simulation, has been completely financed by the Endorser.

### Building data



#### Building type

- Offices (administrative block of a secondary-school)
- Renovation

#### Size

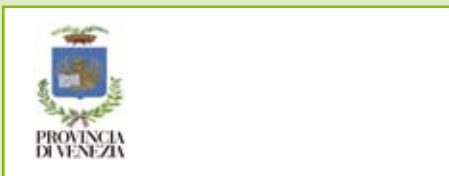
- 2.748 m<sup>2</sup> (2.579 m<sup>2</sup> heated ; 169 m<sup>2</sup> unheated)
- 3 Storeys

#### Energy savings

Expected savings are 161 MWh/year of primary energy for heating, which means about 50% of reduction after renovation.

#### Measures performed

- Improved thermal resistance of walls, roof and ground floor by means of additional external continuous insulating layer
- Substitution of old windows (metallic frame and single glass pane) with new frames with thermal break and double low-emissive glazing (filled with argon)
- Roof covering with light and infra-red-reflective painting
- Installation of ventilators in the roof for night ventilation in summer



# Renewable Energy House



## Brussels

The Renewable Energy House, a 2.000 m<sup>2</sup> large office building with modern meeting facilities built in 1885, is since 2006 the central address for renewable energy issues in Brussels. It shows, that any sustainable energy solution has to contain measures on both the demand and supply side, thereby taking into account energy efficiency and renewable energy technologies.

### Building data

#### Building type

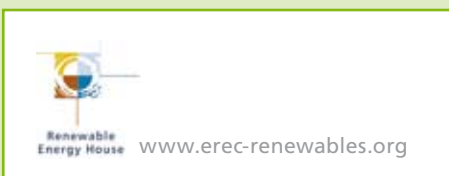
- Office Building (Modernisation)

#### Measures performed

- 80 kW pellets boiler
- 60 m<sup>2</sup> of solar heating system with 5.000 l water storage
- 25 kW heat pumps (four geothermal energy loops – 115 m deep)
- 37,5 kW thermally driven cooling machine
- Installation of highly efficient ventilation system (85% heat recovery)
- Highly efficient lighting system
- 15 cm mineral wool insulation of the roof

#### Energy savings

- 50 % less energy consumption compared to a reference building (650 GJ)
- Demonstration building for nearly all kinds of renewable energy technology



# GreenBuilding Partners

The complete list of GreenBuilding Partners, which is continually growing, is available at the above mentioned internet sites.



# GreenBuilding Endorsers

The complete list of GreenBuilding Endorsers, which is continually growing, is available at the above mentioned internet sites.



# how to contact **GreenBuilding**

For the up-to-date list of GreenBuilding National Contact Points, please consult the internet site <http://www.eu-greenbuilding.org> or <http://energyefficiency.jrc.cec.eu.int/greenbuilding/>



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