Report on energy efficiency improvement and promotion of clean energy in a new urban project located in Sanchidrián, Ávila

Local Project included in the IEE ENPIRE Project, collaborating with the Energy Agency of Avila.

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INTRODUCTION

In order to reduce the CO_2 emissions and to reach the Kyoto protocol greenhouse gases emissions targets and beyond, there is an urgent need in Europe to reduce its energy intensity in all activity sectors. Significant efforts are currently being made in order to improve technological development and to develop guidelines on energy use, especially in high-energy consumption sector, such as urban developments, building and housings.

This local project, under the umbrella of the Energy and Urban Planning in Restructuring Areas Project (ENPIRE, included into the Intelligent Energy Europe program from the European Commission), aims to promote rational use of energy and renewable energy sources in a new urban development in Sanchidrián, municipality in the province of Avila.

New approaches towards sustainable urban planning must include aspects of clean energy and energy efficiency in the process. All the actors involved in energy conscious urban planning shall work intensively together, thus the importance of setting-up common guidelines and instruments to facilitate the integration of sustainable energy use into urban renewal schemes. , using a common instrument to help through the process called “energy vision”. These document, within Working Package nº 3, leads to recommendations and guidelines for local policy process in allt the European localities included in the ENPIRE project. The basis instrument for the development of the guidelines is called, Energy Vision, and has already been successfully used in The Netherlands.

Proposed recommendations have been assessed, according to advantages, disadvantages, local resources, capacities, etc. This process is completed by estimating the energy and monetary savings for the most appropriate measures, indicating the necessary investments and resources for their successful implementation. The objective is to bring energy efficiency technologies into action wherever and whenever possible. The conclusions, results and difficulties during the development of this case study, together with the other local projects, will be incorporated into the general guidelines of the ENPIRE project, in order to develop a common set of guidelines towards integrating energy efficiency, rational use of energy and promotion of the use of clean energy sources in urban developments in the EU Member States. A close co-operation between European, national, local and regional level and all involved stakeholders is needed to act (not only talk) and to watch that energy efficiency measures will be properly implemented

1 PROJECT DESCRIPTION

The site is located in the north of the city of Avila, in the municipality of Sanchidrián, in a former agricultural land. The projected development plan includes a private new golf course and four different types of residential houses, in total 870.000 m^2. At the first stage of this plan, 48 new dwellings will be built during the next 1 or 2 years. The building programme in the whole area consists of 100% private housing, with a proposal for building up to 800 houses during the next 8 years, besides hotels and other buildings within the urban site. The area will consists mainly of detached dwellings (over 80%), together with some semi-detached houses (around 16%). Many of these houses are expected to be used as holiday homes, although it could be possible that it will be more a residential area with people commuting everyday to work in the nearby cities (Ávila, Arévalo, Madrid, etc.)

Currently the project is at initiation/design stage and it is expected to start by 2009's end, thus modifications and improvements can be made to enhance the energy performance of the project, as well as to the assurance of the economic competitiveness of the project. The promoter has already obtained the mandatory licenses and the approval from the relevant authorities. The project satisfies all the legal requirements according to the Spanish Law in force, including those regarding to energy efficiency as well as renewable energy use.

1.1 STAKEHOLDERS

Urban planning is complex by nature, and has to address many stakeholders and touches economy, culture, politics, environment and society in many ways. Various urban planning stakeholders may have conflicting views on development plans and proposals. In order to achieve a shared understanding and facilitate decision making among stakeholders, it is necessary to create a collaborative urban planning workspace. When choosing the stakeholders it has been considered the future replicability of the project in other urban developments in the region by involving other parties. The main stakeholders identified so far are:

- ☒ Sanchidrian Town Council, as the municipality where the project will be located
- ☒ Builder- promoter of the urbanization
- ☒ Future owners of the housings
- ☒ Other District Councils and local authorities in the province of Ávila, where it will be possible to easily translate the recommendations for this project into similar projects to be developed in the area.
- ☒ Several Professional Associations: Architects, Builders and Engineers. Their participation is considered quite important, as they will be assessing the recommendations for this study, and use them in similar projects.

1.2 LAWS AND EXISTING POLITICS

Spain's rapid economic growth over the last ten years has contributed to an increase in greenhouse gas emissions to a level already considerably above the 15% target established within the EU Burden Sharing Agreement, under Article 4 of the Kyoto Protocol. The main issue for Spain is how to reduce Greenhouse Gas emissions (and therefore meet its international commitments) without imposing an excessive burden on the economy. Given the significance of energy-related activities in producing these emissions, the focus of most emission reduction efforts should be optimization of energy consumption. Most of Spain's policies are directed toward convergence with the EU and increasing economic development.

The main measures in the residential, commercial and institutional sectors are related to the normative preparation and regulation process to obtain more efficiency and energy savings in new and existing buildings. Among those rules it has to be

emphasized those linked with the 2002/91/CE Directive on the energy performance of buildings, with are specified in:

- ☒ The Technical building code (CTE, Royal Decree 314/2006)
- ☒ The Regulation for Thermal Installations in Buildings (RITE, Royal Decree 1027/2007)
- ☒ Energy Certification of Buildings (Royal Decree 47/2007)

Moreover, there is a recently approved Royal Decree regulating the energy efficiency of outdoor lighting, RD 1890/2008 of 14th November.

In Spain, it has been created an Energy Efficiency Label, on a scale A-G, being A the lowest energy consumption band. The label must state the contents of the Energy Efficiency Certificate and whether the certificate belongs to the project or to the finished building. All the new buildings in the project have obtained the lower energy qualification, “E”.

1.3 AMBITIONS

To develop energy and cost-efficiency standards for the new 48 dwellings and for the design of the public streets (public lighting, pedestrians, segregated cycle tracks, etc.) All the measures considered will overcome the European and national law.

The ENPIRE project aims to improve the energy efficiency of the houses 30% beyond their current design situation, or more. To achieve this goal, the energy performance coefficient (EPC) will be reduced. Low EPC values stand for higher efficiencies, and it is calculated by dividing the characteristic energy consumption of a building (including installations) by the standardised energy. At present EPC for housing construction must not exceed 1,4. The improvement in the EPC of the buildings can be translated into a lower energy efficiency band (B or better). But specific software, CALENER, has to be used for doing these calculations. Calculations using the specific software will be carried out for the most unfavourable design.

Regarding the urban development, the project aims to reduce the energy consumption in around a 20% compared with the usual installations.

1.4 AGREEMENTS

Agreements among the stakeholders are required in order to assure the implementation of the selected measures, technologies and policies. The agreements shall:

- ☒ Be voluntary.
- ☒ Involve, at least, the municipality, the building promoter and some professional association.
- ☒ Obey the Spanish law.

1.5 RESULTS

The selected measures will be fully identified, assessed (technical and economical) and valuated using the building qualification software required by the Spanish law.

2 INVENTORY

2.1 ENERGY OPTIONS INVENTORY

The improvements and measures to be implemented in the project aim to increase the energy efficiency of the project as well as to promote the use of renewable and clean energy sources in:

1. Buildings.
2. Urban area.

2.1.1 Improvements of the energy efficiency of the buildings

The current energy qualification obtain by the buildings is “D”, which is quite low, thus the energy performance of the buildings can be improved. The measures studied so far includes:

- Improvements in thermal isolation (walls, roof…). Energy savings from 12% to 45% can be obtained.
- Improvements in windows (frames and glasses) and doors. Energy savings over 40% can be obtained.
- Improvements in the efficiency of the equipment: heating and heat distribution systems
- Improvement in the efficiency of the lighting systems. Energy savings up to 60%.

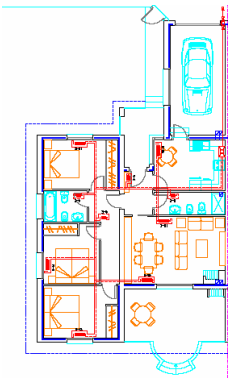
- Promote clean renewable energy sources.
- Study the possibility of using micro combined heat and power generation (microCHP).
- Water-saving devices and measures.

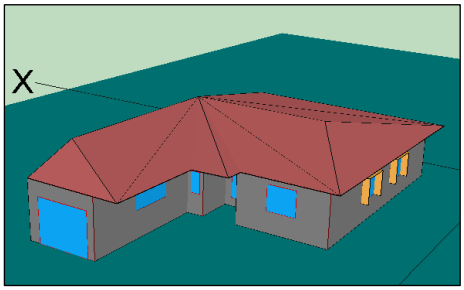
2.1.2 Improvement in the energy efficiency of the urban area

- Energy Efficiency in Public Lighting
    - Efficient lamps, monitoring and management, on-off astronomic control, etc.
    - Voltage regulators.
    - Solar street lamps.
- Good urban planning
    - Place's analysis
    - Correct distribution of built areas and free spaces.
    - Correct street design
    - A good building's distribution and a correct gap between them
    - A correct design of urban vegetation and green areas.
- Use of renewable energies and CHP plants.
- Selective waste planning.
- Information, education and raising awareness.

3 PRELIMINARY RESULTS

To carry out the study and the impact of the selected measures, the most unfavourable building has been selected. The building simulated is as followed:





3.1 ENERGY OPTIONS

A preliminary list of measures and technologies has been selected for their implementation in the study. The results so far are as follows:

3.1.1 Improvement of thermal layer (windows, walls, roofs…)

- Change of glass, from double glass 4-9-4 to low emissive glass 4-9-4 in each window of the building.
- Change of poliestirene insulation, from a coefficient of 0,037 W/mºK, for another type with a lower coefficient of 0,029 W/mºK.
- Increase the thickness of the roof's insulation in 1 cm
- Implementing these measures reduces the heating demand in a 30% (from 105,1 kwh/m^2 to 73,9 kwh/m^2) and the CO_2 emissions have been reduced in a 38% (from 2,9 kg CO_2/m^2 to 1,8 kg CO_2/m^2).

3.1.2 Improvement of Heating equipment improvement and heat distribution systems

- Radiators are changed by radiant floor.
- Standard heaters are changed by condensation heaters.
- Implementing these measures reduces the heating demand n a 28% (from 105,1 kwh/m^2 to 75,8 kwh/m^2) and the CO_2 emissions have been reduced in a 48% (from 2,9 kg CO_2/m^2 to 1,5 kg CO_2/m^2).

3.1.3 Change of conventional fuel boilers for biomass ones

- Biomass is widely available in the area, thus a biomass heater can be used.

- This will reduce the heating demand in a 28% (from 105,1 kwh/m^2 to 75,8 kwh/m^2) and the CO_2 emissions have been reduced in a 100% (from 2,9 kg CO_2/m^2 to 0 kg CO_2/m^2).