

Energy Conservation in Hotels

XENIOS- Development of an audit tool for hotel buildings and the promotion of rational energy use and renewable energy sources

Municipality of Calvià, Spain

Summary

By working with hotels to reduce their energy consumption, municipalities can positively affect greenhouse gas emissions, reduce the use of water and other natural resources, and also influence the environmental behaviour of guests, staff, and suppliers. This project aims to promote solar thermal applications in hotels, increase awareness of the applications of renewable energy sources (RES) and provide support in promoting these goals among local authorities, hotels, and their associations.

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input type="checkbox"/> Energy efficiency
<input checked="" type="checkbox"/> Refurbishment of buildings	<input type="checkbox"/> Households	<input type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input checked="" type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input type="checkbox"/> Local and regional authorities	<input type="checkbox"/> CHP
<input type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input type="checkbox"/> Sustainable communities	<input type="checkbox"/> Utilities	<input checked="" type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input type="checkbox"/> ESCOs	<input type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input type="checkbox"/> Other	<input type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other

Context

Tourism's relationship with the environment is complex and may involve many activities that can have adverse environmental effects, especially related to greenhouse gas emissions and climate change. However, tourism also has the potential to raise awareness about environmental values and can serve as a tool to finance the protection of natural areas and increase their economic importance. The two sides of this relationship can be seen in the many municipalities of the Mediterranean basin that are, to a large extent, dependent on tourism and therefore also dependent on the quality of their natural resources to attract visitors. In these communities, energy consumption in hotels is among the highest in the non-residential building sector in terms of absolute values (for example, 280 kWh/m² in Greece, 420 kWh/m² in France). Most of the existing hotels in the Mediterranean basin were built during the tourism boom of the 1970s and 1980s. They are commonly low quality

buildings—at least by today’s standards—with high-energy consumption levels, low performance equipment, and systems that exploit natural resources in an unsustainable manner. Fifteen to twenty five years after their construction, most of these buildings need complete or partial refurbishment.

Calvià, a municipality on the Spanish island of Mallorca, is a typical example of a northwestern Mediterranean sun and beach holiday destination, with 60 kilometers of coastline, quality natural landscapes, and a variety of ecosystems. Tourism accounts for 95% of the municipality’s economic activity, with some 1,675,000 visitors per year filling the municipality’s 120,000 tourist beds. As in so many other mature tourist destinations of the Mediterranean, the symptoms of a destination threatened with decline were already becoming obvious in Calvià at the end of the 1980s. To address these concerns, Calvià Town Council set up a Local Agenda 21 project based on the principles of environmental sustainability, local economic development, quality tourism, and citizen participation in November 1994. Calvià’s tourist industry continued to boom. This increase in human pressure on the environment led to 15% to 20% increases in water and energy consumption, waste production, carbon dioxide emissions, etc. between 1997 and 2000. During the course of Calvià’s Local Agenda 21 program, the municipality set up various schemes with hotels in order to try and address these high consumption levels. The Energy Plan for the Balearic Islands, passed in 2001, decrees that the Balearics must aim to reduce dependency on energy and promote the diffusion of renewable energy in order to achieve an increase in social welfare.

Objectives

This project aims to promote solar thermal applications in hotels, increase awareness of the applications of renewable energy sources (RES) and provide support in promoting these goals among local authorities, hotels, and their associations. For the municipality of Calvià, the goal of the XENIOS Project was to demonstrate the significant potential of renewable energy and energy conservation measures. For the municipality of Calvià, the goal of the XENIOS project was to demonstrate the significant potential of renewable energy and energy conservation measures. There is ample opportunity for a town that enjoys more than 300 days of sunshine per year to harness the power of the sun’s rays. Apart from private residential housing, hotels are the most numerous types of building in Calvià. The hotel sector needed to be informed about the potential of solar energy and other RES, which had until then only partially been explored.

In implementing the project, Calvià aimed to spread the findings and innovations of XENIOS to as wide an audience as possible. The hotel sector is uniquely placed to provide the impetus for change within the tourism industry because of its multiplier effect on guests, staff, and suppliers. Due to the age of many southern European tourism facilities and the major financial importance of tourism to these regions, the XENIOS Project offered an ideal opportunity for promoting renewables and the rational use of energy (RUE). It also helped identify the most cost-effective renovation plans, thereby helping businesses to remain competitive.

Process

The Municipality of Calvià began the XENIOS Project in January 2002. Funded by the municipality and the European Commission’s Altener Programme, the project involved ICLEI as well as other organizations. The main objective was to create a methodology for a preliminary audit to assess where and how to integrate the most cost-effective energy efficient renovation practices, technologies, and systems. Additionally, the project aimed to increase awareness about the benefits of using RES and RUE techniques in the hotel sector. The XENIOS Project focused on municipalities in several southern European countries, including Calvià, because of their common hotel typologies and characteristics, including:

- ❑ climatic conditions and vast availability of solar resources,
- ❑ scarcity of conventional energy sources especially in the summer,
- ❑ environmental concerns and problems with natural resources (i.e., fresh water scarcity) especially on islands,
- ❑ coastal areas and environmentally sensitive tourist resorts.

In Calvià as in the other participating communities, the XENIOS Project was directed at engineers and hotel technicians involved in the design, construction, maintenance, and operation of hotel buildings and installations, as well as at hotel owners, managers, and decision makers seeking opportunities and technologies to improve the environmental performance of their hotel and set priorities for their hotel refurbishment plans.

The XENIOS Project was divided into seven phases as outlined below. The work was conducted by XENIOS staff and the participating local authorities. *Phase 1*—A “Specifications Guide” was prepared to lay the groundwork for the deliverables of the project. This included an examination of the indoor environmental air quality of hotels and potential ways to improve this quality. *Phase 2*—The XENIOS multimedia software tool, used as an energy and refurbishment audit tool, was prepared, as well as a solar central processing unit (CPU) with corresponding software. The unit can remotely manage a solar installation and can be used to extract information on the performance and the profitability of a solar thermal installation in a user-friendly manner. The CPU software is flexible, and can be configured for use in sanitary water and swimming pool installations. It runs in a PC Windows© environment. *Phase 3*—Guides, leaflets and brochures for hotel managers and hotel guests were created. Also prepared was general information on solar thermal systems to demonstrate the best strategies for exploiting solar energy in the hotel sector and to support local governments in promoting the use of solar energy systems in their municipalities. *Phase 4*—Field tests were conducted where preliminary audits were carried out in each of the four countries taking part in the project. *Phase 5*—An expert evaluation of the main deliverables of the project was held, with national workshops in each of the four countries. *Phase 6*—The final deliverables were prepared. *Phase 7*—The final outcomes and outputs were disseminated. As one of the participating municipalities, Calvià’s role in the project was to install and test the solar CPU in a local hotel. Calvià chose to install the solar CPU in a local hotel that already used solar thermal panels. Thus it was possible to generate statistics to demonstrate the profitability of the installation. Data collected by the CPU are automatically transferred to a webpage and the managing system is accessible in real time. The unit also generates an easily accessible “history” database. Alerts about the performance of the solar installation can be sent by text message to the technical manager’s mobile phone. These tools will be very useful for financial analysis and evaluation of the energy saving potential of the system over the long term. Calvià also hosted and organized the final seminar of the project. The seminar brought together all the partners for a final evaluation. Energy audits were conducted in Calvià during the project and so the municipality prepared a guide about these audits. The Municipality of Calvià also prepared a CDROM on the benefits of solar thermal installations for local and regional dissemination, as well as a general brochure on solar thermal energy, together with the Municipality of Kalithea in Greece (Hellas). Calvià also hosted a local seminar about the benefits of using solar thermal energy.

Financial resources and partners

The municipal budget for the XENIOS Project in Calvià totalled US\$98,819, of which the European Commission’s Altener Programme funded 50% and 50% was provided by the Municipality of Calvià. The budget for the entire XENIOS Project was \$842,758 of which the European Commission funded 48.96% and the rest was provided by the partners.8

Approximately 30 people staffed the XENIOS Project. This includes staff from the project's 10 partner organizations. Three staff members from Calvià took part—a technician from the tourism department, an engineer, and a project coordinator.

Results

The work performed within XENIOS was of great interest to the hoteliers, given that the information they had previously received concerning the benefits of RUE, RES, and specific indoor environmental problems was very general and vague. The XENIOS auditing software offered a concrete approach and a well-structured methodology for assessing the deterioration status of a hotel. It provided an easy-to-use tool for a first assessment of the renovation costs, as well as a parallel estimate of the energy savings from the application of RUE and RES techniques that can be incorporated into a general refurbishment plan. The response of technical managers to the XENIOS multimedia-auditing tool was particularly good because it was felt that none of the existing software with a similar purpose was as user-friendly or as globally coherent. Technical personnel with engineering backgrounds found the tool very practical in providing the profitability of energy conservation measures from both an energy and financial point of view. However, the XENIOS software seems more appropriate for independent hotel owners rather than for large hotel chains, except when these hotel chains do not have the technical personnel required to perform complete or partial refurbishment of the hotel themselves. In any event, the XENIOS software can serve as a complementary tool to other mechanisms and practices. The innovation of the XENIOS solar CPU means that technical managers are able to check the results from their own personal computer in real-time or even receive updates via text messages to their mobile phone. An online presentation of the results of the monitoring solar CPU is accessible through the project's webpage (<http://env.meteo.noa.gr/xenios/>). The *Managers' Guide* was considered to be very comprehensive, well illustrated, well structured and an easy-to-read document with useful best practice examples. The *Managers' Guide* and the *Guests' Guide* will both be available electronically and can therefore be tailored to meet various needs. Results from the awareness campaign have yet to be evaluated.

Lessons learned and repeatability

XENIOS methodology is flexible enough to allow the auditor to fit the audit according to their needs. Depending on the size of the buildings and the complexity of the installations, the audit may be completed within three full days by two experts. This may vary according to data availability and need for surveying. The overall audit procedure was generally well accepted and the diagnosis checklist allowed for assessment of the building's conditions separately in its various elements or in its entirety.

The XENIOS Project provided the hotels with an opportunity to promote energy efficiency and environmental awareness, while at the same time saving money and energy. The solar energy information campaign will provide a key awareness-building opportunity for millions of hotel guests who will pass through the participating hotels from the beginning of the project, way into the future. The Mediterranean basin is naturally ideal for the exploitation of the sun's energy; however, as the studies have shown, numerous other less sunny locations still benefit enormously from the energy-saving potentials of RUE and RES. The structure and most aspects of the XENIOS methodology (e.g., environmental audit, assessment, calculation tools, and computational infrastructure) will be applicable to hotels worldwide.

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