

Renewable Energy Integration in Buildings A Case Study in Portugal

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Abstract: This paper aims at the presentation of a proposal for the integration of solar thermal technology in buildings, particularised for the Portuguese context through a case study, a new sport public building in Coimbra, which consists of two swimming pools, gym, *jacuzzi* and sanitary facilities. Buildings are generally one of the main energy consumers in the urban context. According to recent data from energy balances of the Portuguese General Directorate for Energy and Geology residential and services buildings account for about 30% of final energy and more than 60% of all electricity consumed at the national level, that reflects in a greater weight in distribution of primary energy by sector and also a greater share of emissions of GHG.

The main objective and challenge of renewable energy integration in buildings is the incorporation of systems technically and economically viable in collecting and processing of renewable energy sources that are useful for building, contributing to the achievement of energy efficient buildings.

For this purpose, in the framework of a Master dissertation, we are currently developing a proposal which the main objective is the selection of the most appropriate technological solution for the integration of renewable energy in buildings. In this paper we propose the selection of the most appropriate technological solution for the integration of three thermal solar systems in the new building. Two systems are used for heating the swimming pools and the third one is dedicated to domestic hot water. The selection of the best solution for this specific building takes into account the constructive aspects of the building (location, orientation, construction materials), the building's energy needs (lighting, air conditioning, hot water), local resources viability, market availability and technology maturity.

From the economic analysis, it was found that solar thermal technologies can be a sustainable option, economically viable, financially rewarding and environmentally friendly, namely for domestic hot water systems and for applications with high thermal requirements. For the building under study, a simple pay-back of 11 and 12 years, and with an internal rate of return of 7,1 % and 6,7%, respectively, were found.

Key words

Renewable energies, Solar energy, Solar thermal technology, Integration, Buildings,