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Life Cycle Assessment of Solar Energy Conversion Systems in Energetic Retrofitted

Buildings

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Abstract

This paper investigates impact of solar energy conversion systems in a pre-existing detached single-family house in Greece on resources and the environment, and compares it to that of conventional fossil fuels, which such systems substitute. The solar energy conversion systems used cover 100% of its energy requirements turning the house into a Net Zero Energy Building (NZEB). To that purpose, a cradle to grave Life Cycle Assessment (LCA) of active solar conversion systems is conducted over their useful life of 25 years based on two scenarios. The case study employs the dynamic energy simulation for the energy analysis, whereas SimaPro software and the Ecoinvent database were used for the LCA. The LCA shows that the retrofitted building can cover 100% of its energy needs, while also breaking even, in terms of emissions, in less than 2 years in the worst case scenario examined.

Keywords:

NZEB; Solar Thermal Systems, Photovoltaics; LCA; TRNSYS

1. Introduction

In an effort to reduce energy consumption in the building sector, a growing number of countries around the world over the last thirty years enacted legislation that makes the use of renewable energy conversion systems and the application of energy efficiency measures obligatory. In the European Union (EU), where the building sector accounts for almost 40% of final energy consumption [1], two Directives have come into

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