

A Review of Sustainable Energy-Saving Solutions in Active and Passive Solar Systems of Zero Energy Buildings Based on the Internet of Things

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Abstract : In general, buildings are responsible for a considerable share of consumed energy and carbon emissions worldwide and play a significant role in formulating sustainable development strategies. Therefore, a lot of effort is put into the design and construction of zero-energy buildings (ZEBs) to help eliminate the problems associated with the reduction of energy resources and environmental degradation. Two strategies are significant in designing ZEBs: minimizing the need for energy utilization in buildings (particularly for cooling and heating) through highly energy-efficient designs and using renewable energies and other technologies to meet the remaining energy needs. This paper reviews the works related to these two strategies concerning sustainable energy-saving solutions using renewable energy technologies and the Internet of Things in ZEBs. Drawing on the theories and recently implemented projects of energy engineers in ZEBs, we have reported the required technologies within the framework of this paper's objectives. Overall, solutions based on renewable and sustainable technologies such as photovoltaic (PV) modules, thermal collectors, Phase Change Material (PCM) techniques, etc., are used in active and passive systems designed for various applications in such buildings as cooling, heating, lighting, cooking, etc. The results obtained from examining these projects show that it is possible to minimize the amount of energy required to be produced for and consumed by these buildings.

Keywords : active and passive renewable energy systems, internet of things, storage, zero energy buildings

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