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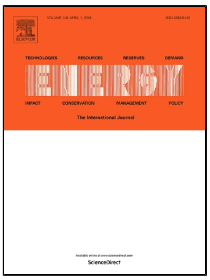

A life-cycle cost analysis for an optimum combination of cool coating and thermal insulation of residential building roofs in Tunisia

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A life-cycle cost analysis for an optimum combination of cool coating and thermal insulation of residential building roofs in Tunisia

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Abstract

The interaction between the roof thermal insulation and the cool roof effects is assessed in order to determine an optimum combination of the two measures. Dynamic simulations and estimation of the annual energy requirements are performed using EnergyPlus. Two roof structures, three insulation materials and three reflectivity scenarios are considered while taking into account the ageing of the cool material. An energy-based optimization shows that the summertime benefits induced by the rise of reflectivity outweigh the winter penalties, and that the optimum value of the roof reflectivity is the highest possible value. Moderate roof insulation levels with cool roof surfaces of as high as possible reflectivity values are recommended in the Tunisian climate. A 20-year life-cycle cost analysis proves the cost-effectiveness of aged and restored cool roof scenarios for uninsulated roofs with a net saving