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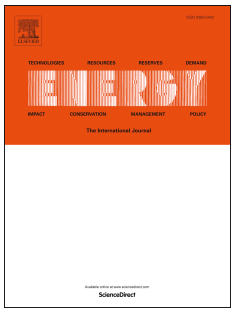

Multi-objective optimization framework for the selection of configuration and equipment sizing of solar thermal combisystems

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Multi-objective optimization framework for the selection of configuration and equipment sizing of solar thermal combisystems

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Abstract

Solar combisystems supplying thermal energy for both domestic hot water and space heating can reduce primary energy consumption for residential buildings. As their overall performance depends on their design, this paper presents the development and use of a multi-objective optimization framework for the selection of configuration and equipment sizing of a residential solar combisystem in Montreal, Quebec, Canada. A generic solar combisystem model, which enables different configurations to be chosen, is first developed, and then coupled with a micro-time variant multi-objective particle swarm optimization, which was developed and used to find the non-dominated combisystem design alternatives. The life cycle cost (LCC), energy use (LCE), and exergy destroyed (LCX) of the solar combisystem are used as objective functions to find the best feasible designs. For the minimum LCC, only one flat-plate collector is required to store energy within one thermal storage tank, whereas seven evacuated-tube collectors and two thermal storage tanks are used for the minimum LCE value. The micro-time variant multi-