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A techno-economic review of solar-driven multi-effect distillation

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ABSTRACT

The provision of clean drinking water is one of the greatest challenges in our time. Global population increase puts a lot of stress on current water desalination plants to meet the rising demand for freshwater and requires an increase in capacity. Conventional desalination plants are powered by fossil fuels and hence are a major cause of climate change as well as being unsustainable in the long term. There is a need to develop a sustainable desalination process, which does not contribute to climate change and is also economically competitive. Coupling solar thermal energy with the multi-effect distillation (MED) process is one of the most promising alternatives. This paper reviews extensively research on coupling solar thermal energy with MED from a technical and economic point of view. The MED process is discussed, the most suitable solar collectors are presented and various plant configurations are critically analyzed. The review highlighted the advances in knowledge obtained from experimental and modeling research studies. In addition, the main challenges in solar-driven MED such as storage, adaptability issues and cost are discussed. The review also provides general remarks about the literature and research gaps that should be addressed in the future.

Keywords: Solar thermal; Multi-effect distillation; Techno-economic; Desalination

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