



## Integrated PV-thermal system for desalination and power production

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### ABSTRACT

A new process configuration for efficient utilization of solar energy for simultaneous production of potable water and electricity is presented. The proposed configuration incorporates photovoltaic/thermal (PVT) collectors to produce electricity and to collect thermal energy, which is used to drive a low temperature phase-change desalination process to produce potable water. This configuration takes advantage of the fact that PVT collectors operating at lower temperatures are more efficient than the traditional PV panels; and low temperature phase-change desalination processes are more efficient than the traditional ones. Results from the theoretical analysis and mathematical modeling of the integrated system show that the PVT area of 30 m<sup>2</sup> with a cooling mass flow rate of 40–50 kg/h m<sup>2</sup> is adequate to supply the electricity (16–18 kWh) and freshwater needs (120 L) of a household of four. A case study was conducted to study the annual performance of the integrated system to provide the needs of the freshwater and electricity. Based on the economic analysis, additional costs incurred to modify an existing PV system will result in freshwater costs of 12.9\$/m<sup>3</sup> which is acceptable for small scale desalination systems.

**Keywords:** Desalination; Solar energy; Photovoltaic thermal collectors; Electricity; Renewable energy

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